UNIT: 01
HISTORICAL BACKGROUND OF BAKING

STRUCTURE

1.1 INTRODUCTION

BREAD!!!!…….A word of many meanings, a symbol of giving, one food that is common to so many countries….but what really is bread ????. Bread is served in various forms with any meal of the day. It is eaten as a snack, and used as an ingredient in other culinary preparations, such as sandwiches, and fried items coated in bread crumbs to prevent sticking. It forms the bland main component of bread pudding, as well as of stuffing designed to fill cavities or retain juices that otherwise might drip out.

Bread has a social and emotional significance beyond its importance as nourishment. It plays essential roles in religious rituals and secular culture. Its prominence in daily life is reflected in language, where it appears in proverbs, colloquial expressions ("He stole the bread from my mouth"), in prayer ("Give us this day our daily bread") and in the etymology of words, such as "companion" (from Latin comes "with" + panis "bread").

1.2 OBJECTIVE

The Objective of this unit is to provide:

1. The student with the different types of equipments and tools used in bakery.

2. Different types of flours used and their characteristics
3. Processing of flour into different bi-products.
4. To learn the testing procedure of flour before the start of baking procedure.
5. Baking terminology,
6. Principles of baking
7. Process of Baking

1.3 HISTORICAL BACKGROUND OF BAKING

Bread is a staple food of about 65% world population. It is prepared from dough of flour and water, usually by baking. Throughout recorded history it has been popular around the world and is one of the oldest artificial foods, having been of importance since the dawn of agriculture.

Grains have been the most important staple food in the human diet since prehistoric times, so it is only a slight exaggeration to say that baking is almost as old as the human race. Because of the lack of cooking utensils, it is probable that one of the earliest grain preparations was made by toasting dry grains, pounding them to a meal with rocks, and mixing the meal to a paste with water. Later it was discovered that some of this paste, if laid on a hot stone next to a fire, turned into a flatbread that was a little more appetizing than the plain paste. Unleavened flatbreads, such as tortillas, are still important foods in many cultures. A grain paste left to stand for a time sooner or later collects wild yeasts and begins to ferment. This was, no doubt, the beginning of leavened bread; although for most of human history the presence of yeast was mostly accidental.

Proportions of types of flour and other ingredients vary widely, as do modes of preparation. As a result, types, shapes, sizes, and textures of breads differ around the world. Bread may be leavened by processes such as reliance on naturally occurring sourdough microbes, chemicals, industrially produced yeast, or high-pressure aeration. Some bread is cooked before it can leaven, included for traditional or religious reasons. Non-cereal ingredients such as fruits, nuts and fats may be included. Commercial bread commonly contains additives to improve flavor, texture, color, shelf life, and ease of manufacturing.

The Hungarians have a saying that bread is older than man is. More than 12000 years ago, primitive people made flat breads by mixing coarsely ground grain and water and placing these cakes in the sun to bake. Later, bread was baked/cooked on heated rocks or in the ashes/embers of the fires.

It was the Egyptians who are credited with using a starter of wild yeast from the air that was kept and mixed with the dough to create a leavened product. Legend has it that a slave in a royal Egyptian household forgot about some dough he had made and kept aside. When he returned, it had doubled in size. Trying to hide the mistake, the dough was punched down furiously and baked. The result was lighter bread than anyone had ever tasted.

By the time of the ancient Greeks, about five or six hundred years BCE, enclosed ovens, heated by wood fires, were in use. People took turns baking their breads in a large communal oven, unless they were wealthy enough to have their own oven. Several centuries later, ancient Rome saw the first mass production of breads, so the baking profession can be said to have started at that time. Many of the products made by the professional bakers contained quantities of honey and oil, so these foods might be called pastries rather than breads. That the primary fat available was oil placed a limit on the kinds of pastries that could be made.

Only a solid fat such as butter enables the pastry maker to produce the kinds of stiff doughs we are familiar with, such as pie doughs and short pastries.

The ancient Greeks had over 50 kinds of bread (Fig. 1A). The government built public bakeries and ovens for every ones use and were popular places to meet the neighbors. Housewives would bring dough that they had prepared to the baker, who would tend the oven and bake them into bread. As time went on, bakers would also sell their own goods, and in that some bakers acted dishonestly, tricks emerged: for example, a baker might have trap door(s) in the oven or other obscured areas, that would allow a hidden small boy or other apprentice to take off some of the dough brought in for baking. Then the dishonest baker would sell bread made with the stolen dough as their own. This practice and others eventually lead to the famous regulation known as Assize of Bread and Ale, which prescribed harsh penalties for bakers that were found cheating their clients or customers. As a safeguard against cheating, under-filled orders, or any appearance of impropriety, bakers commonly began to throw in one more loaf of bread; this tradition now exists in the phrase "baker's dozen", which are 13.

Fig.1A

Baking flourished during the Roman Empire. Beginning around 300 BC, the pastry cook became an occupation for Romans (known as the pastillarium) and became a respected profession because pastries were considered decadent, and Romans loved festivity and celebration. Thus, pastries were often cooked especially for large banquets, and any pastry cook who could invent new types of tasty treats was highly prized. Around 1 AD, there were more than three hundred pastry chefs in Rome, and Cato wrote about how they created all sorts of diverse foods and flourished professionally and socially because of their creations. Cato speaks of an enormous number of breads including; libum (sacrificial cakes made with flour), placenta (groats and cress), spira (our modern day flour pretzels), scibilata (tortes), savaillum

(sweet cake), and globus apherica (fritters). A great selection of these, with many different variations, different ingredients, and varied patterns, were often found at banquets and dining halls. The Romans baked bread in an oven with its own chimney, and had mills to grind grain into flour. A bakers' guild was established in 168 BC in Rome.

After the collapse of the Roman Empire, baking as a profession almost disappeared. Not until the latter part of the Middle Ages did baking and pastry making begin to reappear as important professions in the service of the nobility. Bread baking continued to be performed by professional bakers, not homemakers, because it required ovens that needed almost constant tending. In much of Europe, tending ovens and making bread dough were separate operations. The oven tender maintained the oven, heated it properly, and supervised the baking of the loaves that were brought to him. In early years, the oven may not have been near the workshops of the bakers, and one oven served the needs of several bakers. It is interesting to note that in many bakeries today, especially in the larger ones, this division of labor still exists.

The chef who tends the ovens bakes the proofed breads and other products that are brought to him or her and may not have any part in the mixing and makeup of these products. It was also in the Middle Ages that bakers and pastry chefs in France formed guilds in order to protect and further their art. Regulations prohibited all but certified bakers from baking bread for sale, and the guilds had enough power to limit certification to their own members. The guilds, as well as the apprenticeship system, which was well developed by the sixteenth century, also provided a way to pass the knowledge of the baker's trade from generation to generation.

Bakers also made cakes from doughs or batters containing honey or other sweet ingredients, such as dried fruits. Many of these items had religious significance and were baked only for special occasions, such as the Twelfth Night cakes baked after Christmas. Such products nearly always had a dense texture; unlike the light confections we call cakes today. Non-sweetened pastry doughs were also made for such products as meat pies. In the 1400s, pastry chefs in France formed their own corporations and took pastry making away from bakers. From this point on, the profession of pastry making developed rapidly, and cooks developed many new kinds of pastry products. The European discovery of the Americas in 1492 sparked a revolution in pastry making. Sugar and cocoa, brought from the new world, were available in the old world for the first time. Before, the only significant sweetener was honey. Once the new ingredients became widely available, baking and pastry became more and more sophisticated, with many new recipes being developed. By the seventeenth and eighteenth centuries, many of the basic pastries that we know today, including laminated or layered dough's like puff pastry and Danish dough, were being made. The nineteenth century saw the development of modern baking as we know it. After the French Revolution in 1789, many bakers and pastry cooks who had been servants in the houses of the nobility started independent businesses. Artisans competed for customers with the quality of their products. The general public—not just aristocrats and the well-to-do—were able to buy fine pastries. Some

of the pastry shops started during that time still serve Parisians today. The most famous chef of the early nineteenth century was Marie-Antoine Carême, also known as Antonin Carême, who lived from 1784 to 1833. His spectacular constructions of sugar and pastry earned him great fame, and he elevated the jobs of cook and pastry chef to respected professions. Carême's book, Le Pâtissier Royal, was one of the first systematic explanations of the pastry chef's art.

Ironically, most of Carême's career was spent in the service of the nobility and royalty, in an era when the products of the bakers' and pastry chefs' craft were becoming more widely available to average citizens. Carême had little to do with the commercial and retail aspects of baking. The nineteenth century was also a time of great technical progress. Automated processes enabled bakers to do many tasks with machines that once required a great deal of manual labor. The most important of these technological advances was the development of roller milling. Prior to this time, flour was milled by grinding grain between two stones. The resulting flour then had to be sifted, or bolted, often numerous times, to separate the bran. The process was slow. Roller milling is much faster and more efficient has made tremendous boost to the baking industry. Another important development of the period was the new availability of flours from the wheat-growing regions of North America. These wheat varieties were higher in protein than those that could be grown in northern Europe, and the export of this wheat to Europe promoted the large-scale production of white bread.

In the twentieth century, advances in technology, from refrigeration to sophisticated ovens to air transportation that carries fresh ingredients around the world, contributed immeasurably to baking and pastry making. At the beginning of the twenty-first century, the popularity of fine breads and pastries is growing even faster than new chefs can be trained. Interestingly enough, many of the technological advances in bread baking have sparked a reaction among bakers and consumers alike, who are looking to reclaim some of the flavors of old-fashioned breads that were lost as baking became more industrialized and baked goods became more refined, standardized, and-some would say-flavorless. Bakers are researching methods for producing the handmade sourdough breads of times past, and they are experimenting with specialty flours in their search for flavor. Those entering a career in baking or pastry making today find opportunities in three areas: restaurants and hotels, retail bakeries and pastry shops, and large-scale bakeries and industrial production of baked goods.

1.4 Introduction to Large, Small Equipments and Tools

Baking can be a lot of fun, but without the right equipment, it will only cause you a lot of headaches. Just as a mechanic requires the proper tools for fixing a car, you're going to need the proper tools for your baked goods. If you're just getting into the baking scene, check out the list below, and make sure you have these equipments and tools in your kitchen. You're going to need them if you plan to make any kind of baked good.

1. OVENS (Fig 1 B)

Convection oven- Convection ovens contain fans that circulate the air and distribute the heat rapidly throughout the interior. The forced air makes foods cook more quickly at lower temperatures. Because the strong forced air can distort the shape of items made with batters and soft doughs, and because the air may be strong enough to blow baking parchment off sheet pans, convection ovens are not as versatile for the baker as the other kinds of ovens discussed here.

Fig. 1 B Ovens

Rack oven- A rack oven is a large oven into which entire racks full of sheet pans can be wheeled for baking. Normal baker's racks may hold from 8 to 24 full-size sheet pans, but racks made specifically to go into rack ovens usually hold about 15 to 20 pans. Rack ovens hold one to four of these racks at once. These ovens are also equipped with steam injectors. Although this usage is not strictly correct, sometimes you may hear the term rack oven used for

conventional ovens such as those found in restaurant ranges because the pans are placed on racks rather than directly on the bottom as for deck ovens.

Rotary/revolving/mechanical oven - In a mechanical oven, the food is in motion while it bakes. The most common type is a revolving oven, in which the mechanism is like that of a Ferris wheel. This mechanical action eliminates the problem of hot spots or uneven baking because the mechanism rotates the foods throughout the oven. Because of their size, they are especially useful in high volume operations. Revolving ovens can also be equipped with steam injectors.

Deck or cabinet- Deck ovens are so called because the items to be baked—either on sheet pans or, in the case of some breads, freestanding—are placed directly on the bottom, or deck, of the Breads baked directly on the floor of the ovens and not in pans are often called hearth breads, so another name for these ovens is hearth ovens. Deck ovens for baking bread are equipped with steam injectors. Wood-fired brick ovens are similar in function to deck ovens in that items are baked directly on the oven floor. These ovens are used in some operations that produce artisan breads, as well as in some restaurants that serves pizzas and similar items. The heat is generated by a wood fire built inside the oven. This fire heats the thick brick floor and walls, which retain the heat enough to bake foods. Gas-fired brick ovens are similar, but the heat is more easily controlled **oven.** There are no racks for holding pans in deck ovens. Deck ovens are also called stack ovens because several may be stacked on top of one another.

Microwave ovens- It is a kitchen appliance that heats and cooks food by exposing it to microwave radiation in the electromagnetic spectrum. The radiation generated by the oven penetrates partway into the food, where it agitates the molecules of water. The friction this agitation causes creates heat, which cooks the food.

Dutch oven- Dutch oven is a thick-walled (usually cast iron) cooking pot with a light –fitting lid. It has been used as cooking vessels for hundreds of years. They are called "casserole dishes" in English speaking countries other than the USA, and cocottes in French. They are similar to both the Japanese *tetsunabe* and the Sac, as traditional Balkan cast-iron oven.

2. OTHER HEATING EQUIPMENTS (Fig. 1 C)

Bread toaster- electrical equipment to toast bread slices. It may be manually, pop-over or roller.

Double boilers- A double boiler is a kitchen tool used for applying gentle heat on the stovetop, for delicate tasks like making hollandaise sauce, melting chocolate, or preparing custards.

Gas range- a single burner domestic gas range fitted with mushroom type burner is ideal for bakery.

Blow torch/gun- or blow lamp is a fuel-burning tool used for applying flame and heat to various applications, usually metalworking mostly gas-fuelled and is used for gratinating custards and pies.

Heat gun- is an electrically operated device used to emit a stream of hot air, especially used in icing and decoration.

Induction heaters- used for melting and cooking.

3. MEASURING TOOLS (Fig 1 D)

Measuring cups- Dry measuring cups are used to measure all dry ingredients such as flour, sugar, and oats, also for semisolid ingredients such as jam, shortening, sour cream, and peanut butter. All liquid ingredients, such as water, milk, or juice are measured in a liquid measuring cup. Liquid measuring cups should be made of clear glass or plastic, have a pouring spout, and have clear measurement markings on the side.

Fig. 1 C Other heating equipments

Measuring spoons - Are available in sets; usually include measurements of 1/4, 1/2, 1 teaspoon, and 1 tablespoon; stainless steel is recommended. Utensils for measuring small amounts of both dry and liquid ingredients accurately.

Fig. 1 D Measuring tools

Weighing scale- These are used to measure dry ingredients, along with nuts, dried and fresh fruits, and chocolate, and to measure out portions of dough. The scale is also helpful to determine if multiple cake pans have the same amount of batter.

Timer- is used to in timing baked products, the rising of yeast and to check the doneness of cakes.

Thermometers- are used to measure the temperature of sugar and frozen desserts.

4. PREPARATORY TOOLS (Fig.1 E)

Flour shifter- Small device used to move dry ingredients across a screen area to remove any lumps and mix and aerate them.

Whiskers- Two types: balloon, rigid balloon - beating egg whites or light batters rigid - mix thick sauces and batters

Cooling racks- used for placing cooked foods onto a surface that will enable the food to be cooled on all sides after being baked, either food still in a hot pan or food removed from a baking sheet or pan and placed directly onto the rack. They are made of stainless steel wires that are formed into a mesh squares of small crisscrossed bars or a number of straight, closely aligned parallel bars so that food to be cooled can easily be supported without falling through, yet allowing enough air to reach the bottom of the food so it does not retain too much moisture and become soggy.

Fig. 1 E Preparatory tools

Cake board- is a flat support placed under a cake, to make it easy to lift and transport. A cake is placed on a Cake Board and then spends the rest of its "life span" on the board: it is decorated on the board, transported on the board, and served from the board. It may be of any shape as desired.

Colander- is a bowl-shaped kitchen utensil with holes in it used for draining food such as pasta or rice. The perforated nature of the colander allows liquid to drain through while retaining the solids inside. It is sometimes also called a pasta strainer or kitchen sieve.

Can opener- A can opener or tin opener is a device used to open metal cans. It may be lever type or rotating wheel type.

Pastry brush- Pastry brushes are used to brush liquid type ingredients onto pastries or breads.

Spatula/Turners - Small utensil like a knife but used often to spread frosting, level dry ingredients when measuring or slice butter. It comes in different sizes; small spatula are used to remove muffins and molded cookies from pans which is 5 to 6 inches; large spatula for icing and frosting cakes; flexible blade is used for various purposes.

Juicer- appliance for extracting juices from fruits and vegetables

Ladles- A ladle (dipper) is a type of spoon used for soup, stew, or other foods. Although designs vary, a typical ladle has a long handle terminating in a deep bowl, frequently with the bowl oriented at an angle to the handle to facilitate lifting liquid out of a pot or other vessel and conveying it to a bowl.

Rolling pins- Tool used to flatten dough for rolls, pizza, cookies or crusts.

Pastry bags - Cloth or plastic container for whipped cream, meringue, frosting or other soft ingredients that enables the cook to gently squeeze the ingredients through a tip and control the rate of flow plus the position of the food when garnishing, decorating cakes and pastries and filling containers.

Nozzles/pastry tips - are funnel shaped pastry tips used to pipe decorative borders of icing or chocolate onto cakes and cookies, or for pressing out small cookies or chocolate shapes.

Pastry cloth- Cotton woven cloth used when rolling out pastry as it is used under the dough and rubbed with flour to prevent sticking. It can be used to help move or roll dough.

Utility tray- is used to hold ingredients in large quantities.

Microplaners- Microplane graters / zester are used for the grating of various food items, such as nutmeg and cheese, and also as zesters for citrus fruit.

Cake comb- a square flat stainless steel or plastic tool with three sets of serrated edges, used for making decorations in cake and pastry frosting. It is also called icing comb.

Scrappers- Used to scrape surfaces and cut dough into equal pieces. Also known as a pastry scraper, a dough scraper is a small, flexible plastic scraper that is rounded on one edge and flat on the other. The rounded edge is used to get every last bit of batter, dough, or frosting out of a mixing bowl, or flour and dough bits off your rolling pin.

Strainers- a device having holes punched in it or made of crossed wires for separating solid matter from a liquid.

Parchment papers- Parchment paper is used to line baking sheets before baking cookies, ensuring cookies that won't stick to the pan, lining cake pans to allow cakes to slide right out of the pan, and for folding into cones for piping icing or chocolate.

Rotary cake stand- stainless steel or cast iron stand attached with rotating broad top base. It is used in cake decoration and icing.

5. MIXING TOOLS (Fig. 1 F)

Mixing bowls- These basic kitchen utensils have varying sizes and can be in metal, plastic or glass/ceramic. They used for mixing, whipping creams or egg whites, preparing ingredients, raising breads, or just storing food in the refrigerator

Wooden spoons- is also called mixing spoon which comes in various sizes suitable for different types of mixing.

Rubber spatula- is used to remove bits of food inside of the bowl.

Fig. 1 F Mixing tools and equipments

Planetary mixers- The planetary mixer is electrical equipment conceived/made to prepare bread dough or other type of product, replacing manual labour through a mechanical system that allows to produce, continuously, large quantities of dough. It consists of a bowl and an agitator. The bowl remains static, whilst the agitator is rapidly moved around the bowl to mix its contents. Planetary mixers can be used to whip and blend ingredients.

Electrical and handy mixers- Electric device that can vary the speed at which ingredients are mixed, also used in beating eggs or whipping cream.

Blender- A blender is a great tool for pureeing fruits and vegetables, mixing bar drinks and smoothies, chopping ice, making dips, and chopping small amounts of nuts. Blenders will chop, mix, whip, and blend almost anything

Food processor- machine for chopping, dicing, mixing pastry dough, mixing some cookie dough's, and pureeing fruit.

6. CUTTING TOOLS (Fig.1 G)

Pastry blender- Hand held utensil used to "cut" firm shortening or butter into small pieces while mixing with flour mixtures which is the first step in making most pastry.

Pastry wheel- Utensil has a blade knife used to both cut and or seal edges of pastry foods. They are also used to cut strips of pastry, such as for making a lattice top pie crust, or pieces of dough for turnovers or ravioli. Pastry wheels may have a smooth blade or have a jagged or fluted edged blade.

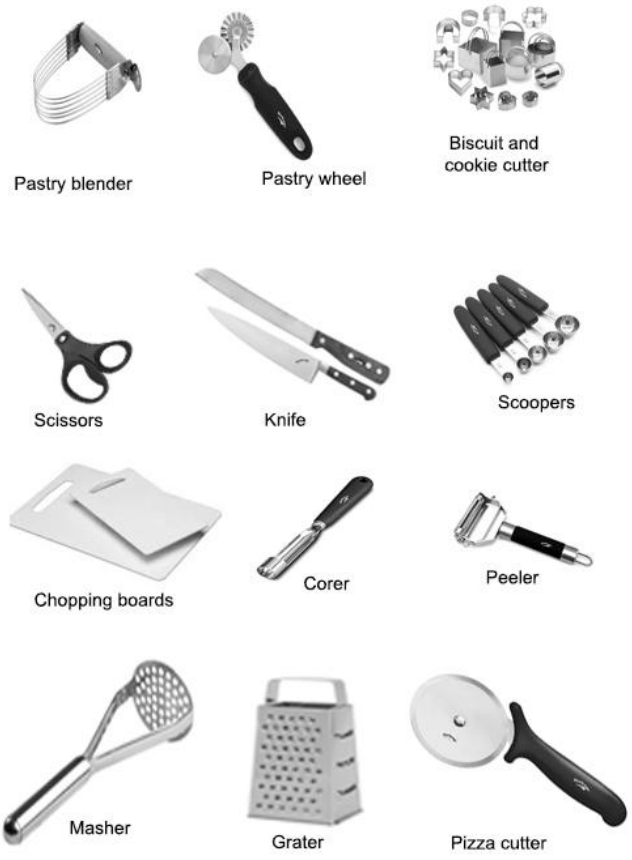

Fig. 1 G Cutting tools

Biscuit and dough cutter- Metal or plastic tool created to cut all sorts of shapes of dough for interesting presentations. A Biscuit cutter, either plain or fluted, will help produce high-rising biscuits as the biscuit cutter has a sharp edge to produce a clean cut; cutters that have a dull edge will compact the dough and the biscuits will not rise as well when baking

Chopping boards- generally white coloured chopping boards used in bakery.

Knives- of various shapes used in bakery. Vegetable knives and paring knives are used to peel, cut and chop vegetables and fruits. Bread knife is used to slice loafs.

Scoopers- is a handy tool cleverly designed only suited for scooping many types of vegetables and fruits such as tomatoes, cucumbers, avocados, melons etc. different sized scoop is used for making drop cookies, mini muffins or cupcakes.

Graters- is used to grate cheese, chocolate, and other fresh fruits.
Scissors- This utensil is made with a plastic or rubber coated handle which are often textured allowing for ease of cutting and gripping.

Corer- A bladed speciality knife for removing the cores and seeds of eggplant, melons, potatoes, or zucchini. Also referred to as a "cutter" the Fruit or Vegetable Corer may be v-shaped or formed into a half circle that has scooped sides.

Peeler- is a kitchen tool consisting of a slotted metal blade attached to a handle that is used to remove the outer skin or peel of certain vegetables, often potatoes and carrots, and fruits such as apples, pears, etc.

Masher-is toll used to mash vegetables, chocolates, biscuits, cookies etc. It has a firm handle with a perforated round base. It s available in stainless steel or in wood.

Pizza cutter-Cutting tool useful for cutting noodles, doughs, cooked pizza, etc

7. BAKING PANS AND TOOLS (Fig. 1 H)

Tube center pan- It is deeper than a round pan and with hollow center, it is removable which is used to bake chiffon type cakes.

Sauce pans- are available in various sizes and make. Some are of stainless steel, where as some are of aluminum.

Cake pans (round, square, rectangle, or heart shaped)- Pan with taller sides which can be round, square, rectangular or have special shapes primarily used for preparing cakes and other desserts.

Jelly roll pan- is shallow rectangular pan used for baking rolls

Bundt pan- is a round pan with scalloped sides used for baking elegant and special cakes.

Custard cup- is made of porcelain or glass used for baking individual custard.

Griddle pans- are used to bake griddles.

Pop-over pans- Larger than traditional muffin tins, the popover pan will typically be made with individual cups joined by wire racks that are constructed to hold the batter and keep the baked contents away from touching the adjacent popovers as they enlarge when baked. Popover pans generally are available in several sizes, both giant and small. The number of cups included in each pan may be 4 or 6.

Fig. 1 H Baking pans and tools

Macaroon molders- Macaroon molders are a pan or sheet, similar to a cupcake pan. They have shapes to mold the macaroon during baking.

Baking sheets- Thin, flat metal pan with no or only shallow sides used to bake a variety of foods. They are rimless, flat metal sheets, perfectly designed for placing rows of cookies. They normally have a small rim on the short sides for easy gripping. The long flat edges allow you to slide cookies off the sheet after baking.

Cookie sheets- are rimless, flat metal sheets, perfectly designed for placing rows of cookies. They normally have a small rim on the short sides for easy gripping. The long flat edges allow you to slide cookies off the sheet after baking.

Tart Pans- Used to bake items with delicate crusts (ex. tarts, quiches); range from 4.5-12.5 inches in diameter; fluted or smooth sides

Cup cake or muffin pans- Pan that is divided into many smaller sized compartments to hold foods so that they bake evenly and quickly; often lined with paper liners.

Soufflé dishes- a special kind of cup shaped dish in which soufflé is prepared.

Loaf pan - Baking pan traditionally used for bread baking, but also useful for meatloaf, loaf cakes and banana bread. It may be metal, glass or ceramic. It can be covered or uncovered.

Cookie press- A cookie press is used to extrude cookies into various shapes

CHECK YOUR PROGRESS -I

Q.1 What is the role of Marie-Antoine Carême in bakery?

Q.2 Name the types of oven used in bakery Industry?

Q.3 Name the types of oven used in bakery Industry?

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1.5 WHEAT

Wheat is a cereal grain belongs to the genus triticum with 30,000 families. The kernel is 1/8 –1/4 inch long, ovoid in shape, rounded in both ends. Along one side of the grain there is a crease, a folding of the aleurone and all covering layers. Wheat is consumed mostly in form of flour and small quantity s used in breakfast foods such as wheat flakes and puffed wheat. Other cereal grains include corn (maize), oats, rice, and rye. Widespread consumption of cereal grains began in the Middle East about10, 000 years ago, when agriculture first began. It was then that wheat was first planted and cultivated. Today, thousands of varieties of wheat are grown throughout the world, most requiring fertile soil and a temperate climate. Several locations in North America have ideal conditions for growing high-quality wheat, including the Midwestern United States and the southern prairie region of Canada. Other major wheat growing countries include China, India, France, and Russia. Wheat is more popular than any other cereal grain for use in baked goods. Its popularity stems from the gluten that forms when flour is mixed with water. Without gluten, raised bread is hard to imagine. Wheat is also preferred because of its mild, nutty flavor. Both factors, no doubt, account for wheat being the most widely grown cereal grain in the world.

Composition:

- Carbohydrate 95 %
- Proteins 5 %
- Minerals 3%
- Vitamins 1 %
- Water 1 %

Classification of wheat: Flour plays a major role in our bakery industry. The flour is obtained from wheat. So it is necessary to learn about wheat. Wheat is the most important cereal among all grains. We can get quality flour from good quality wheat. The quality of wheat depends upon the following

1. Soil
2. Quality of seeds
3. Climate

4. Manure
5. Farming techniques

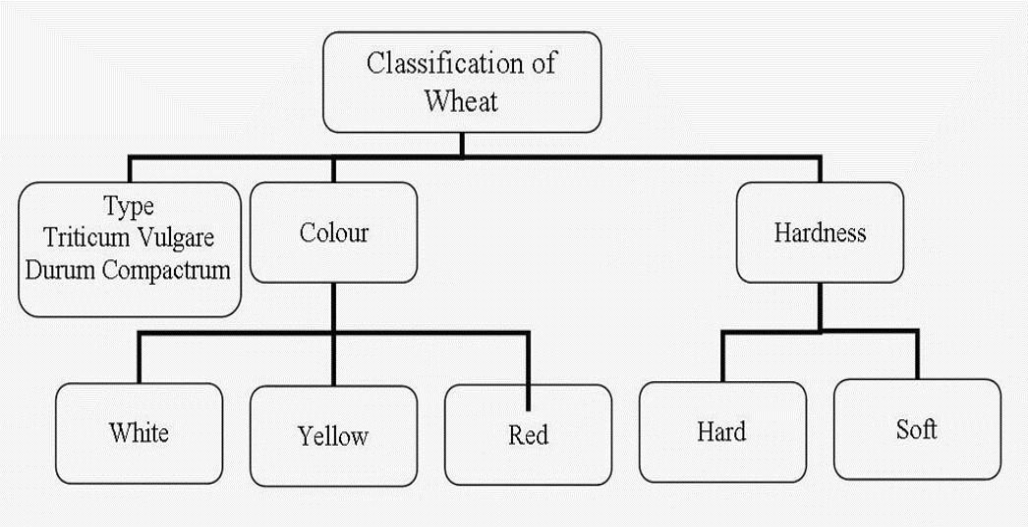

Fig. 1 I

Wheat is classified into its (i) type, (ii) colour, and (iii) hardness
According to type, there are:-

- Triticum triticum (also called hard wheat)
- Triticum compectum (also called soft, wheat)
- Triticum durum also called durum wheat)

The *Tritium sativum* wheat flour contains more proteins. This flour is used for the production of bread. The Tritium compectum wheat flour contains low protein. So it is used for the production of biscuits, cakes and pastries. The Tritium durum wheat is mainly used to prepare semolina and macroon

According to colour-which is due to environmental factors:

1. Red wheat
2. White wheat
3. Yellow

According to hardness, wheat is classified into:

- Hard wheat
- Soft wheat

Hard wheat: Bakery products are made from the hard type of wheat flour because it has the following characteristics:

1. High in protein
2. More water absorption power (WAP)
3. Good mixing capacity, that is, it is easy to mix
4. Fermentation tolerance
5. Good gas retention power
6. Falls into separate particles if shaken by hand
7. Feels slightly coarse and granular

Hence it is mainly used for yeast products (e.g. bread).
Examples of hard wheat: (i) hard red winter, (ii) hard red spring and (iii) durum

Soft what: Soft wheat flour contains the following characteristics:

1. Less protein
2. Less WAP
3. Poor mixing capacity
4. Poor fermentation tolerance
5. Tends to clump and hold together if pressed
6. Feels soft and smooth

Hence, it is mainly used to make biscuits, cakes and pastries.

Examples of soft wheat: (i) soft red winter and (ii) soft red spring.

Major Wheat Growing Countries

S.No	Countries	Type of Wheat	Type of Flour
1	England, Canada, Eastern Europe	Hard wheat	Strung flour
2	South America	Hard wheat	Medium strong flour, red winter, durum
3.	Australia	Durum hard white	Medium strong
4.	India	Red and white variety	Medium strong flour
5.	England, Europe, Australia	Soft wheat	Soft flour
6.	North America	Hard red spring, Hard red winter, Hard white	Hard or strong flour
7.	North America	Soft white, Soft red winter	Soft flour

1.5.1 STRUCTURE OF WHEAT

Wheat kernel: Wheat kernels are the seeds of the wheat plant, and they are the part of the plant that is milled into flour. Since cereal grains are in the grass family, wheat kernels can be thought of as a type of grass seed. In fact, when a field of wheat starts to grow, it looks like lawn grass. Wheat kernels have three main parts:

The endosperm: While whole wheat flour contains all three parts of the kernel, white flour is milled from the endosperm. Whole wheat flour is considered a *whole grain product* because it contains the entire wheat kernel. The *endosperm* makes up the bulk of the kernel. It is the whitest part, partly because it contains mostly starch—typically 70–75 percent starch. The starch is embedded in chunks of protein. Two important proteins in the endosperm of wheat kernels are the gluten-forming proteins, *glutenin* and *gliadin*. When flour is mixed with water, glutenin and gliadin form strands of gluten, important in the structure of baked goods. In fact, wheat is the

only common cereal grain that contains sufficient glutenin and gliadin for the formation of good-quality gluten for bread making.

T**he germ:** is the embryo of the wheat plant. Given the right conditions, the germ sprouts—germinates—and grows into a new plant Wheat germ is high in protein, fat, B vitamins, vitamin E, and minerals. These nutrients are important to the germ as it sprouts. While germ protein does not form gluten, from a nutritional standpoint it is of a high quality.

The bran: is the protective outer covering of the wheat kernel. It is usually darker in color than the endosperm, although white wheat, which has a light bran.

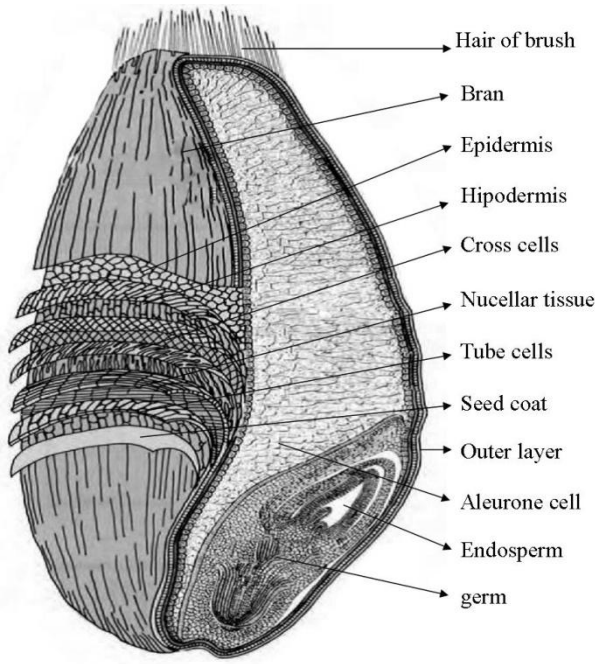

Fig. 1 J Structure of wheat

1.5.2 TYPES OF FLOUR

Bakers use two primary types of white wheat flours: hard flour or strong flour and weak flour or soft flour. We get hard flour from hard wheat. It contains 11.2-11.8% protein, 0.45-0.50% ash, 1.2% fat and 74-75% starch. The higher protein found in strong flour indicates a higher level of gluten. This type of flour is mainly used for high-structured products like yeast products like yeast products, choux pastry and puff pastries.

We get soft flour from soft wheat. This type of flour contains 8.4-8.8% protein, 0.44-0.48% of ash, 1% fat and 76-77% starch. Due to the less protein content, this flour is mainly used for low-structured products like biscuits, cakes, sponges, short and sweet paste. Apart from the above flours, there are other types of flour and they are classified according to their extraction rate. Some of them are given below.

Characteristics of good quality flour: Bakers need good quality flour for production. Good quality flour should have the following characteristics:

Colour: The flour should be creamish white in colour. Good quality flour will reflect the light when it is shown to the light. Bleaching the flour helps to get the colour.

Strength: There are two types of flour: (i) strong and (ii) weak. The strength depends upon the gluten quantity present in the flour. Strong flour is preferred for

making bread and weak flour is preferred for making cakes and confectionery products.

Tolerance: Tolerance is the ability of the flour to withstand the fermentation and/or the mixing process in excess of what is normally required to mature its gluten properly.

High absorption power: High absorption power means the ability of the flour to hold maximum amount of water. If the flour has less WAP the bread will not be of good quality and will have fewer yields.

Uniformity: If the flour is used un-uniformly, the quality of the product will differ. So constant monitoring and adjustment are required to get a satisfactory result.

Type of flours obtained from wheat: The whole wheat grain consists of various components as discussed. Each of the components is milled in various proportions to yield different type of flours from the same plant and each one has a particular usage in the bakery kitchen. Let us discuss some of these flours.

Name of flour	Description
Whole meal flour	Also called atta in India, it is the whole milled wheat kernel. The flour is cream to brown in colour as it has the bran grounded with it. It is not advisable to sift the whole wheat flour as most of the bran, an important dietary component, will be lost.
Graham flour	It is usually found in the USA and the milling concept of this flour is very interesting. The wheat kernel is separated into its various components such as endosperm, germ, and bran. The endosperm is ground finely to produce white flour with gluten, whereas germ and bran are ground till coarse. The milled flour is then mixed back to yield graham flour. In case of non availability of this flour one can mix refined flour, bran, and germ in the ratios that they naturally exist in the grain.
Brown flour	It is almost 85 percent of the grain millet, where some amount of bran has been extracted. It is nutritious as it has high percentage of germ.
Strong flour	It is milled from hard flour, in other words from high protein flour. The strong flours absorb more water than weak flours, as gluten can absorb twice their own weight or water. This flour is used form products which will have a high rise in the oven such as yeast breads, choux pastry, and puff pastry. Strong flour is also known as baker's flour.
Weak flour	Weak flour is also known as soft flour or cake flour. As the name suggests, this flour has less gluten and hence, it is used for products that need a softer texture such as cookies and cakes and sponges.
All purpose flour	The all purpose flour is a blend of flours and has medium strength. In India, all the refined flour that we get is all purpose flour.

Cake flour	Refer to weak flour.
Pastry flour	It is a very finely ground polished flour of soft wheat kernels, usually enriched and bleached.
Self-raising flour	This flour is usually of medium strength and contains baking powder in a proportion. Since the flour contains moisture, this can react with the baking powder lessening the effect of baking powder and hence, it is not advisable to buy the commercial self raising. This flour is commonly used to make afternoon cookies called scones.

Other type of flours: Flours are not only derived from wheat but also from other grains and seeds. It is very important for chefs to have knowledge of such flours as they can make different products with the range of the flours which will be healthier. Also since many people are suffering from gluten allergies, it is important for chefs to use products which are gluten free. Many types of grains are available in the market but few of the popular flours derived from them are discussed in flowing table.

Name of flour	Description
Rye flour	Rye flour does not have as much gluten as in popular flour and hence, it is sometimes mixed in proportions with flour for the production of breads. Breads which use only rye flour are more dense and chewy. This flour is majorly used in the Russian and Scandinavian breads. Rye flour dough is quite heavy and sticky.
Spelt flour	It is quite popular in European countries such as Germany, France, and Switzerland. It is made from spelt which is a species of wheat. It is good source of vitamin B.
Rice flour	It is the finely ground polished rice with a similar texture of corn starch, usually used as thickening agent. Rice flour is free of gluten and if the dough has to be made one would have to make it with hot water.
Maize flour	Popular in Mexico, this flour is made from cooked maize corn and then grounded. It is also known as masa harina. This flour has also been used in India since time immemorial and a very popular north Indian dish called makki ki roti is made from it. This flour is also free from gluten.
Corn flour	It is made by grounding the white heart or the germ of the corn kernel, one of the widely used thickening agents in Chinese cooking. This is also free of gluten and usage of this flour in products gives crispness to the product. It can also be added to strong flour to turn into weak flour. Commercial custard powder is also made with corn flour with colour and flavor added. Corn flour is not flour, but it is actually a starch.
Arrowroot	This flour is finely milled from the arrowroot plant. It has the same properties as corn flour and the uses are very similar. It is widely

	used for making glazes.
Barley flour	Made from the pearl barley, it has low gluten content with mild flavor.
Buckwheat flour	It has distinctive grayish brown colour with earthy bitter taste. It is used to make classical preparations such as Russian blinis, pancakes, and French galettes. In India it is widely eaten during fasts and is commonly known as kuttu ka atta.

Gluten-free flour: Apart from the flours discussed above, it is also very important for chefs to know about gluten-free flours, as the demand for the same are increasing constantly. Some of the gluten-free are discussed in flowing table.

Name of flour	Description
Amaranth	It is a green leafy vegetable related to spinach and beets. Tiny seeds of this plant are often ground into nutritious flour. It is light brown in colour and has a nutty aroma.
Rice flour	Refer to table
Pulse flour	These are the seeds of many edible legumes and can be ground into flours for use in gluten free breads. Chickpea flour is very commonly used in India and Mediterranean countries.
Maize flour	Refer to table
Buckwheat	Refer to table
Chestnut flour	It is a smooth shelled nut it is usually roasted and ground into flour. In India it is called Singharey ka atta and is commonly eaten during fasting.
Barley flour	Made from the pearl barley, it has low gluten content with mild flavor.
Cottonseed flour	The seeds are commonly used for making margarines or cooking oils, but these seeds can be ground into flour which is quite nutritious.
Flaxseed flour	It is an ancient seed which has been used in medicines from time immemorial. It is used whole toasted or ground into flour. It is believed to be a good cure for diabetic patients and is believed to lower cholesterol levels.
Millet	It can also grow in areas which do not get much rainwater. In India millets are commonly known as bajra.
Quinoa flour	This is one of the grains which have the highest amount of protein. It is mainly fond in china; but its popularity is catching up with the western world as well.
Soybean flour	It is high fat and high protein flour which has a strong distinctive nutty flavor.
Sunflower seed flour	It can be dried, roasted and ground into flour. It can be combined with other kinds of gluten free flour as it has a very nutty flavor.

1.5.3 COMPOSITION OF FLOUR

Constituents or composition of flour

Flour contains the following ingredients:	
Starch	70%
Moisture	14%
Protein	11.5%
Ash	0.4%
Sugar	1%
Fat or lipid	1%
Others (enzymes-alpha and beta amylases)	2.1%

Starch: Starch is not soluble in water until it is heated to about 140 F with water of six times of its weight. Then the starch cells will swell and the cell wall will burst. Now the starch becomes soluble in water. This process is called ***gelatinization*.** Starch acts as filler as it gives rigidity to bread dough. It combines with lipids and gluten to retain the gas during fermentation. During milling 6% of starch cells are crushed and damaged due3 to the roller, type of wheat, moisture, etc. The water absorption power (WAP) of the flour mainly depends upon the damaged starch. Enzymes (alpha and beta amylases) act only on damaged starch to produce sugar for the yeast during fermentation. The damaged starch should not be more than 7-9% for bread making. The damaged starch is not essential for cake or biscuit making. Hot bread directly from the over cannot be sliced immediately because the starch is not sufficiently stable and must be allowed to retrograde (slightly harden). When the bread cools down, starch cells shrink and become rigid so that the bread can be sliced easily.

Moisture: An ideal moisture content of flour is 14% the source of moisture may be tempering or the package materials or the humidity. If more moisture is in the flour it will reduce the storage life, induce insect infestation, may get fungus and bacteria and also will reduce the WAP of the flour. This will result in fewer yields during production.

Protein: Flour contains soluble and insoluble proteins, namely,

- Albumin
- Globulin
- Gliadin
- Glutenin

The soluble proteins (albumin and globulin) are useful in providing nourishment to yeast during the fermentation process for its growth and reproduction. The insoluble proteins, gliadin and glutenin form a rubbery material when water is added with flour. So when it is kneaded well, the rubbery material (texture) developed is called gluten. It gives structure to the baked products. While gliadin gives extensibility, glutenin gives strength and holds gas during baking. The quality of flour is decided by the gluten content. If the gluten content is more, then the flour will be suitable for

high structured products like bread. This bread-making flour should have the gluten from 10% to 11.5%. If the flour contains less gluten, then the flour will be suitable for lower structured products like cakes and biscuits/cookies. This flour requires a low, that is, 7-10% gluten content.

Ash: The source of ash content in flour is bran. If the flour contains more ash, it means it has more bran. Too much ash gives dark colour to the flour and also cuts the gluten. Flour with higher ash content will not retain as much gas during different stages of processing and this affects the volume and gives poor texture to the products.

Sugar: Naturally, flour contains a small quantity of sugar, namely, sucrose and maltose. It is used as yeast food to produce CO_2 (carbon dioxide gas).

Fat or Lipids: Fat or Lipids should not be more than 1% in flour. They contain the pigment carotene which gives colour to the flour. There is a higher quantity of oil/fat in the low grade flour than in the high grade ones. The fat or oil when separated from the flour is a pale yellowish liquid without taste or smell.

Enzymes: Flour contains diastatic enzymes. They are alpha (A) amylase and beta (B) amylase. These enzymes hydrolyze starch and convert it into simple sugar. During fermentation, the simple sugar is used by the yeast to produce alcohol and carbon dioxide. The gas production depends upon the amount of enzymes found in the flour. Indian flours have less alpha amylase. These enzymes are necessary for producing good quality bread.
In rain-damaged wheat, these enzymes w2ill be available in excess. The bread made out of this flour will have dark crust colour and sticky c4rumbs. If these enzymes are less, the bread will have poor volume and dull crust colour.

1.5.4 WATER ABSORPTION POWER (WAP) OF FLOUR

The absorbing power of a flour is determined by weighing out 25 grams of flour into a suitable dish and adding water from a graduated burette, then properly making up the two dough separately to a certain standard consistency, which latter always must be alike for all samples tested. The number of cc and decimals of water used as indicated by the burette are multiplied by 4, and the product expresses the percentage of water-absorbing power.

This result is next confirmed by making a sample baking, using the proper amount of yeast, salt and other ingredients, taking care to make the dough of the same consistency as before. Weigh the dough carefully and make a notation of its weight. Next proceed to work the dough in the usual, but very careful, manner into bread. Immediately, upon drawing from oven, the bread is weighed, and the loss calculated. This gives the moisture-retaining power of flour. In order to get proper results, the sample dough must be carried at a uniform temperature, the length of fermentation must be always the same, and the same hold good for the heat of oven, which should be 425° F. Unless uniform conditions prevail, the retaining power of a flour will be affected.

1.5.5 MILLING OF WHEAT

Preparation of raw wheat:

Storing: As wheat arrives in the mill it is passed through a cleaning process to remove coarse impurities and is then stored according to its quality. This is mainly determined by the hardness, protein content and gluten quality of the wheat.

Cleaning: Cleaning begins with screening to remove coarse and fine materials and the grain is separated by size, shape and weight. The finished product, whole pure wheat, is then passed into conditioning bins.

Conditioning: Conditioning takes place before milling to produce a uniform moisture content throughout the grain. Moistening helps to prevent break- up of the bran (hard outer layer) during milling and improves separation from the floury endosperm (the mass that forms the white flour of the grain).

Gristing: After conditioning, different batches of wheat are blended together (gristed) to make a mix capable of producing the required flour quality.

Milling: In India milling is done through stone grinding, but modern flourmills are with more mechanized to give pure wheat flour. The process involves the following: (Fig.1 H)

1. Vibrator screen- (Thresher) – this removes bits of straw and other coarse materials and the second screen sieves foreign materials like unwanted seeds.
2. Aspirator – Here the wheat is cleaned by suction. The stream of air sucks lighter impurities like dust and stones.
3. Disc separator – catches individual grains of wheat but rejects larger or smaller materials.
4. Scourer – In this the beaters attached to the central shaft throws the wheat violently against the surrounding drum, resulting breaking of kernel hairs.
5. Magnetic separator – pulls out any metal particles present.
6. Washer stone – Here the wheat is washed, resulting precipitation of stones, clay and lighter materials float leaving only clean wheat.
7. Tempering – In this the wheat is exposed to moisture and then dried.
8. Entoleter – In this the degraded quality kernel is removed.
9. Grinding bin – Here the first break of wheat takes place
10. Shifter – Here the flour is shifted through cloth or fine sieve, giving wheat flour.
11. Purifier – in this the coarse grains are subjected to controlled flow of air, which lifts the bran leaving behind refined grains, which are separated, again by their size and quality.
12. The down purifier – Here the final shifting is done and the grains are separates

The process is repeated over and over again. Shifters, purifiers reducing the rolls until the maximum amount of flour is separated consisting of at least 72 % of wheat.

Uses of wheat:

- Wheat flour – to prepare breads.
- Refined flour (maida) – loaf, breads and nuns, sweets.
- Semolina – Halwa. Pasta.

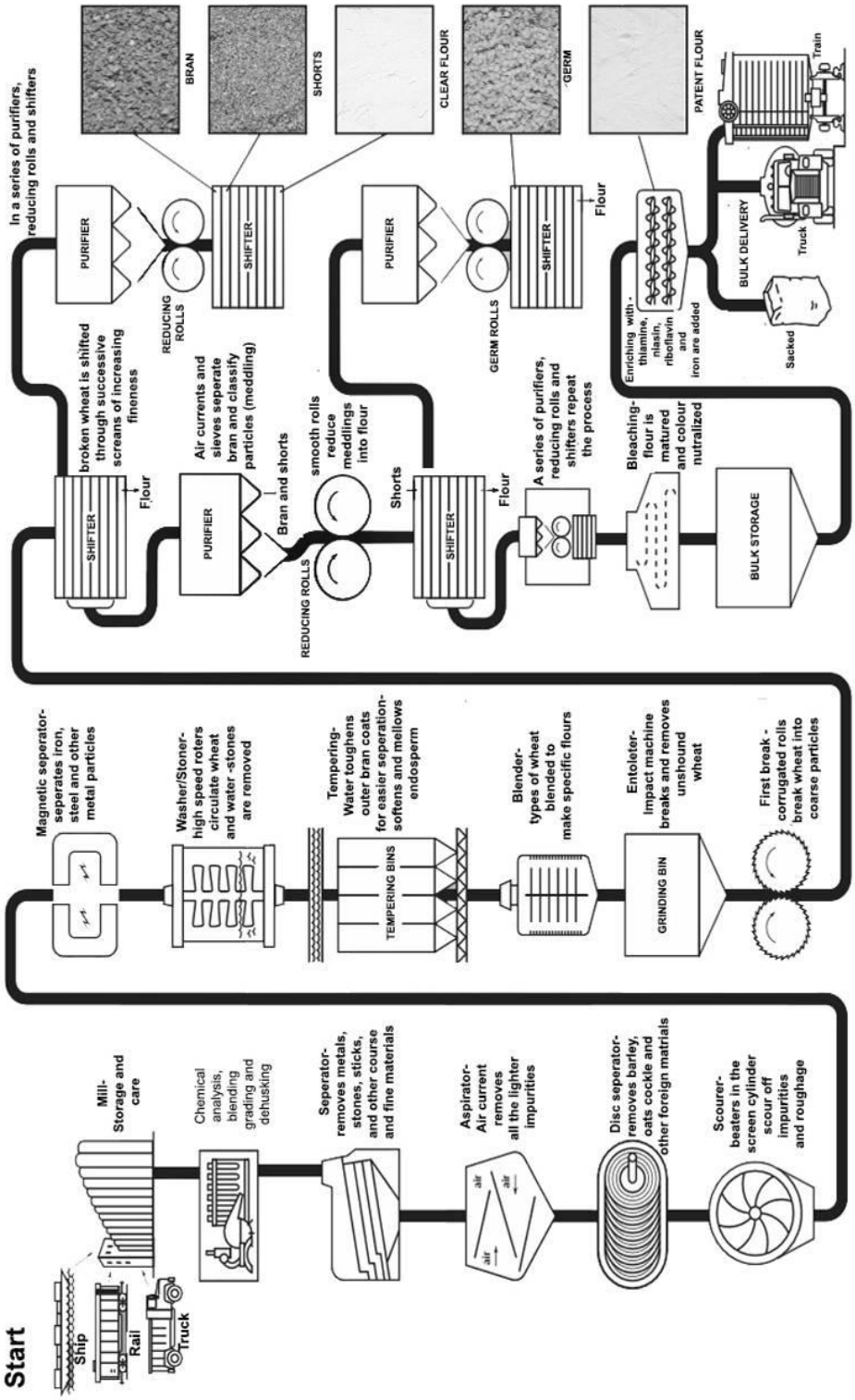

Fig.1 K Milling of wheat

- Macaroni products – noodles, pastas.

- Cracked wheat- porridge.

The milling process: Milling means the conversion of wheat into flour. There are two methods of milling:

1. Stone or home milling
2. Roller flour milling
3. Turbo milling

1. Stone milling: Stone milling is an ordinary method of milling. Here two circular thick stones with rough surfaces are used, one lying on top of the other. This rough surface helps crush the wheat. Thus the wheat is converted into flour. This is known as whole meal flour. It contains bran, germ and endosperm. The following are the qualities of the whole meal flour:

- It has more nutritive value.
- The colour of flour is dark.
- It has less shelf life.
- Small stone particles may be present in the flour.
- The bread made from this flour gives delicious flavour.

2. Roller milling: Roller milling is a commercial milling of wheat. Before milling the wheat, the following steps have to be followed:

Cleaning: The object of cleaning the wheat is to

1. Obtain pure flour and
2. Avoid damaging the milling machineries

If the foreign particles like stone, barley, oats and iron are not removed, the quality of flour will be affected and iron rods may damage the machines causing heavy loss.
Cleaning stages:

Sieving: This process will remove the larger and smaller particles like damaged wheat, stone and husk

Magnetic separator: It removes the iron and steel particles.

Aspirator: The lighter impurities are removed using air currents.

Disc separator: This is used to separate barley, oats and other foreign material.

Scrubbing: Beard on the wheat is removed by brushes.

Tempering: After cleaning, the wheat is sprayed with water and left to be soaked for sometime, a process called tempering. The time of tempering varies according to the hardness of wheat.
The following are the merits of tempering

1. The moisture content of wheat is increased.
2. The burn become elastic and the endosperm become soft, so it makes barn removal easier.

3. The endosperm is made more friable which reduces soft, so it makes barn removal easier.
4. Germ also is rendered tough and flaky for easy removal.

The milling process has two stages:

1. Break milling
2. Reduction milling

Break milling: Break milling is the first operation in the milling process. After tempering, the wheat passes through two horizontal steel break rollers. The rollers rotate in opposite directions. The surface of the roller is rough, one rollers 3/2 time faster than the other. The break milling is done in the 4^{th} and 5^{th} stages. The first set of roller just cracks the wheat grain. Then they are passed through the series of break roller. And from the last series of the process, break flour and sooji and rava or semolina are obtained. The break flour in the first three stages is also known as patent flour

Reduction milling: After the break milling process, the rest of the semolina is passed through the reduction rollers. The surface of this roller is smooth. They also rotate in opposite direction but the speed is lesser than the break rollers.

In the first stage we get some semolina germ and barn. The next reduction roller crushes the semolina into fine and the bran and flattened germs are removed. The flour, thus obtained is called straight run flour.

3. Turbo milling: Developed in 1950 is probably the greatest milling advances of the end century, because it gives us the opportunity to separate starch particles into different fractions and then blend the fractions into the desired ratio. This type of milling enable us to make custom blend flours for bread making, cake making, cookie making and other works.

Bleaching: The flour obtained after the milling process is called green flour. It contains high moisture and slightly yellowish colour due to xanthophylls. The fresh flour is not suitable for making bakery products. It has to be bleached by oxidation. Bleaching agents like chlorine, chlorine dioxide and benzyl peroxide are used to bleach the flour. The bleached flour is creamish white in colour..

Maturing: The fresh flour has poor water absorption power, poor strength and poor baking quality. It is improved by the oxidation process known as maturing. Chemicals like potassium bromated and ascorbic acid are used for maturing and to improve the above qualities.

Byproducts of wheat: There are many by product of wheat used in the kitchen in one form or the other. They may be:

Product	Description
Whole wheat	Unrefined or minimally processed whole-wheat kernels

Cracked wheat	Coarsely crushed, minimally processed wheat kernels
Bulgur	Hulled, cracked hard or soft wheat, parboiled and dried kernels
Semolina	Grounded polished wheat kernels with bran and germ removed
Couscous	Semolina pellets, often par cooked
Farina	Polished medium ground wheat cereals
Bran	Separated outer covering of wheat kernels and flaked or powdered
Germ	Separated embryo of wheat kernels, flakes

Flour is one of the structural ingredients used in pastry and bakery kitchens. There are many different kinds of flours used in the pastry kitchen and each flour has a different role to play in the final outcome of the product. Therefore it becomes important to choose the right type of flour for the right type of product. You would commonly hear chefs using words like strong flour and weak flour. These words merely indicate the amount of gluten present in the flour. There are two types of non-soluble proteins in the flour-"glutenin" and "gliadin". When the dough is kneaded these two proteins combine to produce gluten in the dough. Without gluten there will be no such thing as raised bread. Gluten provides elasticity to the dough, which in turn traps the air and gas released by yeast and forms a sponge-like texture in the baked breads. The gluten in the flour can be altered by various methods. Manipulating the dough for longer duration of time or adding some acid, such as lemon juice, will strengthen the gluten strands and time or adding some acid, such as lemon juice, will strengthen the gluten strands and addition of oils and fats will soften the gluten. Gluten can also be procured from the market as a commercial product and added to weak flours to increase their strength. It is almost impossible to knead corn flour and rice flour into dough as they have no gluten at all. Let us discuss some of the flours obtained from the wheat kernel in as they are commonly used in confectionery.

1.5.6 Differences between Semolina, Whole Wheat Flour and Refined Flour

Semolina- This is the coarsely ground endosperm (no bran, no germ) of durum wheat. Its high protein content makes it ideal for making commercial pasta, and it can also be used to make bread. Semolina flour is made with grooved steel rollers. Semolina has very high gluten content and the flour has a substantial amount of protein.

Whole wheat flour- Since roller milling separates the bran and the germ from the endosperm; the three components actually have to be reconstituted to produce whole-wheat flour. Because of the presence of bran, which reduces gluten development, baked goods made from whole-wheat flour are naturally heavier and denser than those made with white flour. Many bakers combine whole-wheat and white flour in order to gain the attributes of both.

Refined flour- Maida is a type of wheat flour from India. Finely milled without any bran, refined and bleached, it closely resembles Cake flour. Owing to this wide variety of uses, it is sometimes labeled and marketed as "all-purpose flour", though it is different from all-purpose flour as commonly understood in the US, where it is made from the endosperm (the starchy white part) of the grain. The bran is separated from the germ and endosperm which is then refined by passing through a sieve of 80 meshes per inch (31 meshes per centimeter). Although naturally yellowish due to pigments present in wheat, maida is typically bleached, either naturally due to atmospheric oxygen, or with any of a number of flour bleaching agents.

1.5.7 FLOUR TESTING

These are the several methods for testing the flour.

Chemical analysis

Moisture test	Flour should have 14% of moisture and more than this will affect the storing quality of the flour.
Ash test	It helps find the quantity of minerals found in the flour.
Protein test	Quantity and the quality of the protein can be analyzed.
Falling number	It indicates the activity of enzymes.

Physical analysis

Amylograph	For enzymic activity.
Farinograph or alveograph	Tests the strength of the flour and water absorption.
Extensographs	Tests the dough handling properties.
MacMicheal Viscosimeter	Tests the viscosity of a flour solution.

Physical examination

Colour test	Checks if the particles of endosperm are separated
Baking test	Tests the overall evaluation on the flour quality

Test for water absorption power (WAP): Take 100 gms of flour and mix 50 ml of water. Mix it well. If the dough is stiff, add 1 ml of Take 100 gms of flour and mix 50 ml of water. Mix it well. If the dough is stiff, add 1 ml of water at a time and mix until it becomes a pliable dough. After obtaining this quality, note the quantity of water added. This quantity will be the WAP of the particular flour. More protein flour has more WAP. It will increase the number of portion (yield).

Test for the quality of gluten in flour: Take some quantity of flour and mix it with enough water. Knead it well to get smooth dough. Then put this dough in water for 30 minutes at room temperature. Then take it out and wash it in the

running water till the starch is completely removed. Squeeze the dough until it gives no white streaks, and what remains is called gluten. Squeeze out to remove the excess water and this is known as wet gluten. It can be expressed as a per cent of the flour sample.

Then keep the wet gluten in a cool oven (140 C) till all the moisture is evaporated. Now it is called dry gluten. The dry gluten weight should be 1/3 of the wet gluten. For example: If the wet gluten is 30 gms, the weight of dry gluten should be 10 gms. If the dough in the oven rises, the flour will be considered to have a good quality of gluten.

pH value: pH value indicates the acidity or alkalinity. It is measured from 0 to 14.7 is neutral. When the ph is above 7, it is called alkaline. When it is below 7, it is acid. The pH value should be 5.5-6.5 for bread making and 4.5-5 for high-ratio cakes. However, some cakes are in the alkaline side.

Storage of flour: If moisture is allowed to get into the flour, it may cause it to become clumpy. In some cases, flour can attract psocids (tiny brown or black insects which live in dry foods) and cankers. The flour will itself sweat (absorb moisture), resulting in the formation of inferior products. For proper storage of the flour, the following things should be kept in mind:

1. The storage area should be well ventilated.
2. Hessian cloth or jute cloth is always preferred so that it can allow air to go in.
3. Flour bags should be piled off the floor on wooden boards to enable free circulation of air all around the piles.
4. Should be kept away from direct sunlight.
5. Should be stored away from foreign odours because it picks up these odours easily.
6. Avoid insect infestation.
7. Should be stored in dry clean bins with fitting lids.
8. Temperature of the storage area should be 19-240 C
9. The relative humidity should be 55-65%. Too low or too high relative humidity is detrimental to flour quality.
10. The containers should be clearly labeled with their content so as to avoid mistakes when selecting the correct flour for use.

CHECK YOUR PROGRESS-II

Q. 1 What are the Characteristics of hard wheat?

Q2. How WAP of flour ascertained?

Q3. How is flour bleached?

1.6 SUMMARY

Bakery products find as the second most consumable product in the world, and of these bread ranks the top one. Bakes shop is available in one form or the other in all the towns, cities and villages of the world, where some are using those indigenous machines and equipments and some are using the latest ones such as rack oven, proving chambers, dough sheeters etc. In total there are innumerous equipments and tools are used by the bakers, depending upon the uses.

Wheat is the largest produced staple crops in the world and contains the highest portion of proteins than any other cereals. There are several varieties of wheat grown and used accordingly ad food. In India the common flour made from wheat is wheat flour or atta or refined flour or all purpose or maida. It is classified basically into hard and soft wheat or strong and weak wheat. Hardness is related to the degree of adhesion between starch and protein. The hard wheat us used in the preparation of pastries cookies and biscuits, where as the softer wheat is used in the preparation of bread, rolls cakes and other soft products.

The main proteins of present in wheat vary accordingly to the variety wheat, soil and climatic condition. These include albumin, globulin, promalin and glutenin. The gluten in the dough imparts strength to the dough to hold carbon dioxide during fermentation and baking. The property of the glutenin is responsible for the elasticity of gluten. Gliadin gives the elasticity property to the dough. Therefore the quality and quantity of gliadin and glutenin is very important in bread making.
Wheat is a good source of Iron, phosphate, magnesium, manganese, copper and zinc and also lots of vitamins. It contains wheat contains significant amounts of yellowish carotenoid pigments. These primary pigments include xanthophylls, lutein and its esters, and a-carotine.

The chief criteria of high quality flour is the formation of the dough of good elasticity and extensibility, which solely depends upon the conditioning, milling, treatment and bleaching of the wheat selected, so it is necessary to test each kind of floor before starting the work.

1.7 GLOSSARY

All purpose floor- All-purpose flour, also known as refined flour or simply flour, is made from wheat grains after removing the brown covering. It is then milled, refined and bleached. It is white and powdery unlike whole wheat flour which is creamish and grainy.

Bleaching- is a food additive added to flour in order to make it appear whiter (freshly milled flour has a yellowish tint) and to oxidize the surfaces of the flour grains and help with developing of gluten. Usual flour bleaching agents are:Organic peroxides, namely benzoyl peroxide, Calcium peroxide, Nitrogen dioxide, Chlorine, Chlorine dioxide, Azodicarbonamide

Blow torch/gun- A blowtorch (USA usage), or blowlamp (British usage, or rare or archaic), is a fuel-burning tool used for applying flame and heat to various applications, usually browning the crust of a bakery product and decoration.

Bundt pan- A Bundt pan generally has fluted or grooved sides, but its most defining design element is the central tube or "chimney" which leaves a cylindrical hole through the center of the cake. The design means that more of the mixture touches the surface of the pan than in a simple round pan, helping to provide faster and more even heat distribution during cooking.

Cake flour- It is a finely milled, very low protein flour (usually 8-10% protien levels) which is used for cakes.

Conditioning-addition of water to the wheat to get desired flour

Convection oven- A convection oven (also known as a fan-assisted oven or simply a fan oven) is an oven that has fans to circulate air around food. Convection ovens distribute heat evenly around the food, removing the blanket of cooler air that surrounds food when it is first placed in an oven and allowing food to cook more evenly in less time and at a lower temperature than in a conventional oven.

Cooling racks-This is a utensil that is used for placing cooked foods onto a surface that will enable the food to be cooled on all sides after being baked, either food still in a hot pan or food removed from a baking sheet or pan and placed directly onto the rack. Typically, a cooling rack is made of stainless steel wires that are formed into a mesh squares of small crisscrossed bars or a number of straight, closely aligned parallel bars so that food to be cooled can easily be supported without falling through, yet allowing enough air to reach the bottom of the food so it does not retain too much moisture and become soggy. Some racks are a single layer while others may be multiple layers of two or three stackable tiers to support a batch of cookies, breads, cakes, or several pies at the same time. Cooling racks can be round, square, rectangular, or oval in shape. Roasting racks can also be used as a cooling rack.

Deck or cabinet- Typically a centerpiece of any artisan bread bakery, a deck oven is a crucial piece of baking equipment when seeking to attain a beautiful, crusty loaf of bread.

Dutch oven- Dutch ovens are cylindrical, heavy gauge cooking pots with tight fitting lids that can be used either on a range top or in the oven. The heavy metal or ceramic construction provides constant, even, and multi-directional radiant heat to the food being cooked inside. With a wide range of uses, Dutch ovens are truly an all-purpose piece of cookware.

Enriched flour- Enriched flour is flour with specific nutrients returned to it that have been lost while being prepared. These restored nutrients include iron and B vitamins (folic acid, riboflavin, niacin, and thiamine). Calcium may also be supplemented. The purpose of enriching flour is to replenish the nutrients in the flour

to match the nutritional status of the unrefined product. This differentiates enrichment from fortification, which is the process of introducing new nutrients to a food.

Gelatinization- Starch gelatinization is the process where starch and water are subjected to heat causing the starch granules to swell. As a result, the water is gradually absorbed in an irreversible manner. This gives the system a viscous and transparent texture. The result of the reaction is a gel, which is used in sauces, puddings, creams and other food products, providing a pleasing texture.

Glutenin- Glutenin (a type of glutelin) is the major protein within wheat flour, making up 47% of the total protein content. Wheat gluten proteins consist of two major fractions: the gliadins and the glutenins.

Gristing- Grist is grain that has been separated from its chaff in preparation for grinding. Grist can be ground into meal or flour, depending on how coarsely it is ground.

Lysine- is an α-amino acid that is used in the biosynthesis of proteins found in wheat endosperm

Rack oven - This consists of a chamber, perhaps two to three metres high, that is heated by electric elements or gas burners. The rack consists of a steel framework having casters at the bottom and supporting a vertical array of shelves.

Spatula/Turners- A **spatula** is "a broad, flat, flexible blade used to mix, spread and lift materials. A spatula also refers to a turner which is used to flip over pancakes and meat patties.

Turbo-milling-is a process of separating flour into higher protein or higher starch fractions and then the fractions are blended into desired ratio.

WAP- is the short form of water absorption power of wheat. Dough is made from wheat flour to which an amount of water, based on the initial moisture content of the flour, is added in order to reach a constant hydration level on a dry matter basis. During the kneading of this dough sample, the pressure on one side of the mixer is continuously monitored. The peak pressure recorded during kneading is used to calculate the water absorption of the flour sample at a given "consistency "(target pressure). In a subsequent test performed at the hydration level previously determined, physical properties of the wheat flour dough are determined.

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1.9 TERMINAL QUESTIONS

Short Answer type questions:

1. What is conditioning of wheat?
2. Write one or two lines on:
    a. Turner
    b. WAP
    c. Maturing
    d. Gluten
    e. Bleaching
    f. Self raising flour
    g. Gelatinization
    h. Gristing
    i. Blow torch
    j. Microplanner
3. What is the difference between hard and soft wheat?
4. What are the characteristics of a good flour?
5. Write short note on bleaching of flour
6. How flour is stored?

Long Answer type questions

1. Draw a wheat kernel and explain its parts.
2. List some major wheat-growing countries in the world.
3. Write about the different methods of wheat milling.
4. What is tempering of wheat? What are its uses?
5. What are the different constituents of flour?
6. Name the flour enzymes and explain their role in bread making.
7. What is gluten and how is it formed?
8. Write the characteristics of good quality flour.
9. What are the various tests of flour? What are the key concepts?
10. Define whole wheat flour and high-ratio flour.
11. Write briefly on storage of flour.

12. Which four would you suggest for making bread? Why?
13. Why is the bran removed during milling?
14. Write about the protein present in the flour
15. Compare the qualities of flour for bread and cakes.
16. Discuss the various kinds of bread disease.

UNIT:02
BASIC PASTRIES

STRUCTURE

2.1 INTRODUCTION

Pastry is dough of flour, water and shortening that may be savoury or sweetened. Sweetened pastries are often described as bakers' confectionery. The word "pastries" suggests many kinds of baked products made from ingredients such as flour, sugar, milk, butter, shortening, baking powder, and eggs. Small tarts and other sweet baked products are called pastries. The French word pâtisserie is also used in English (with or without the accent) for the same foods. Common pastry dishes include pies, tarts, quiches and pasties. Pastry can also refer to the pastry dough from which such baked products are made. Pastry dough is rolled out thinly and used as a base for baked products.

Pastry is differentiated from bread by having a higher fat content, which contributes to a flaky or crumbly texture. A good pastry is light and airy and fatty, but firm enough to support the weight of the filling.

2.2 OBJECTIVE

After going through this unit, you will be able to know:

- The different types of pastries and their preparation.

- The ingredients used in bread making.
- Faults in bread making
- Bread disease
- The process of bread making
- Varieties of leavening agents used
- Variety of yeast dough breads

2.3 BASIC PASTRY

Various types of pastries are used in the preparation of sweet and savory dishes in the bakery and confectionery. These include generically:

1. Short crust pastry
2. Puff pastry
3. Flaky pastry
4. Rough puff pastry
5. Danish pastry
6. Choux pastry
7. Hot water pastry

The primary ingredients used in making basic pastry are:

1. **Flour**- This is the base ingredient used in making pastry. Soft and plain high graded flour is ideal rather than strong flour. Unbleached soft flour is used for short crust pastries. For puff pastry soft or hard untreated flour without any additive can be used. As the dough develops, the elasticity and extensibility also increases which is desirable for thin layered products. Rolling and rerolling of dough causes mechanical development and the dough should be allowed to rest between sheeting process. Soft wheat flour makes the dough sticky if allowed to stand for too long.

2. **Fat or Shortening-** for short crust pastry, equal quantity of butter and flour is used or simply margarine can be used. Fat or shortening provide flavour, taste and rich texture to the finished product. These should be added cold and semi-soft so that they can be rolled easily without getting melted or formation of lumps. Hot fat or shortening will ooze out while rolling giving the product uneven shape, sogginess and less of flake formation. Especially for pastries where several layers are required, it is recommended to use fat of higher melting point.

3. **Liquid –**Water is considered the best liquid, but milk can also be used. It is recommended that the liquid must be chilled and neutral. Liquid helps in the formation of dough and gluten development. It also uniformly distributes the ingredients and improves the consistency. Lemon is also sometimes used which relaxes the puff pastry dough by breaking down the proteins to make rolling easier.

4. **Salt-** salt strengthens the gluten and improves the taste and flavour of the product. It also retards excessive fermentation and adds nutritive value to the food.

5. **Sugar-** It acts as a tenderizer by absorbing water and inhibiting flour gluten development, and delaying starch gelatinization. It incorporates air into shortening in the creaming process, thus creating tenderness and fineness. It also provides crust, colour, texture, taste and flavour when baked.

6. **Egg-** It provides taste, texture, food value and moisture to the product. They act as leavening agents and forms emulsion easily.

2.3.1 SHORT CRUST

Short crust pastry is a mixture of flour, fat, sugar and sometimes egg and milk. The flour should have low gluten content, one that is milled from soft wheat flour. The fat will reduce the extensibility of the gluten that is it makes the gluten strands shorter….hence the term ***shortening*** for the fat used in the bakery and the term ***short crust pastry***. The usual method of making short crust pastry is by the rub-in method. Chilled fat or butter is rubbed into the sieved flour so that it is finely dispersed and resembles a sandy or bread crumb like texture. The fat forms a thin layer or coating on the glutenin and gliadin molecules, without turning the fat into a continuous paste. Cold water is sprinkled over the mixture to form smooth dough. The ratio of fat to flour is normally 1:2, but the fat can be increased to equal the flour to obtain rich dough. This dough would be very difficult but not impossible to work with. Pate Sucre is a sweet version of this pastry and sugar is creamed with butter before the flour and the moisture is added. The ratio of sugar fat and flour is 1:2:4. Various sweet and savoury products are made with short crust pastry. It forms the base of several pies, tarts, flans and also products like cheese straws and turnovers. Few precautions must be taken when making short crust pastry. It is important not to work the dough too much as it will get tough due to the development of gluten. This can also happen when scrapings and trimmings are added to the dough and re-worked. The use of too much flour for dusting will also alter the ratio of the mixture and cause toughening as the extra flour proteins - *glutenin* and *gliadin* - does not have a coating of fat around it, and thus come together to form gluten.

Some faults in Short Crust Pastry

- Hard or tough pastry is due to too much liquid or too little fat. It is also probably due to over mixing.
- A soft and crumbly pastry is due to too little water for the binding, too much fat or the use of self raising flour instead of plain flour.
- A shrunken pastry is due to excess stretching during rolling.
- A soggy pastry is the result of the filling in the product being too moist.

Laminated pastry: Laminated dough is a culinary preparation consisting of many thin layers of dough separated by butter, produced by repeated folding and rolling. Such doughs may contain over eighty layers. This category of pastry includes Puff, Flaky, Rough Puff and Danish pastry.

Puff and Flaky are two of the most remarkable products of the Bake Shop. Although they are similar products, they are made differently and it is almost impossible to tell which is. Puff is referred to as the French method whereas the English refer to it as Flaky pastry. The Scots have their own version and call it Rough Puff Pastry. The flour used for laminated pastry must be of high gluten content so that it will stand up to the manipulation involved in building up the laminated structure. Butter is the preferred fat because of its flavour and melt in the mouth quality. Special pastry margarine is also available. It has a low moisture content and good creaming value…ideal for this kind of pastry. This product is easy to work with as it does not get too hard in the refrigerator. A weak acid solution such as lemon juice or cream of tartar is added to the dough, as it will confer greater extensibility to the gluten.

Puff pastry- has equal amounts of fat and flour. The dough is made with flour, salt, and the lemon juice. After allowing it to rest, the dough is rolled out into a square and the creamed block of fat is placed in the centre. The dough is then folded around the fat and it is refrigerated for a while. The dough is then rolled into a rectangle about ½ "thick. Fold the two ends to the centre and then into half (book fold). Make sure that the edges /corners are even. Refrigerate/rest the dough to relax the gluten. Do not refrigerate for too long as the fat will harden. Now turn the dough 90^0 on the table so that the length now becomes the breadth. This step must be repeated before subsequent rolling so that it helps to stretch the gluten in all directions, not just lengthwise. Failure to do this will result in the product that shrinks unevenly when they are baked. Repeat the rolling and folding a total of four times. The dough is now ready to be rolled out for the final shaping and cutting. Puff pastry, or puff dough, is one of the most difficult bakery products to make. Because it consists of over 1000 layers, many more than in Danish dough, the rolling-in procedure requires a great deal of time and care.

As with so many other products, there are nearly as many versions of puff pastry as there are bakers. Both formulas and rolling-in techniques vary. The formula provided here contains no eggs, for example, although some bakers add them. Butter is the preferred fat for rolling in because of its flavor and melt-in the- mouth quality. Special puff pastry shortening is also available. This shortening is easier to work because it is not as hard when refrigerated and because it doesn't soften and melt at warm temperatures as easily as butter does. It is also less expensive than butter. However, it can be unpleasant to eat because it tends to congeal and coat the inside of the mouth. The quantity of rolled-in fat may vary from 50 to 100% of the weight of the flour, or 8 oz to 1 lb fat per pound of flour. If the lower quantity of fat is used, the dough should be left slightly thicker when rolled out. Puff pastry that is low in fat will not rise as high and may rise unevenly. This is because there is less fat between the dough layers, so that the layers are more likely to stick together. (Fig. 2A)

Flaky pastry- also known as *blitz pastry* is a similar product as of puff pastry. The dough is similar but the amount of fat is only 2/3 that of the flour. The fat is creamed into a homogenous mass and divided into three parts. The dough is rolled out into a rectangle about ½" thick. One third of the fat is then spread onto $2/3^{rd}$ of the dough surface. The dough is then folded into three so that there are alternate layers of fat

and dough. The dough is then rested/ refrigerated to relax the gluten. The process is repeated twice more to use up all the fat and then once again without fat (blind fold). Remember to rest the dough between each rolling. The pastry is now ready for the final make up.

Flaky pastry relies on large lumps of shortening (approximately 1in /2½ cm. across) mixed into the dough, as opposed to the large rectangle of shortening in puff pastry. Flaky pastry dough is then rolled and folded in a manner similar to puff pastry. The chunks of shortening keep the rolled particles of dough in the flaky pastry separate from each other, so that when the dough is baked they become flakes. This yields a different texture from puff pastry, where rectangles of dough and fat are rolled and folded together in such a way that the result is a number of uniform sheets of pastry. (Fig. 2A and 2B)

In short Flaky pastry relies on large lumps of shortening (approximately 1in. /2½ cm. across) mixed into the dough, as opposed to the large rectangle of shortening in puff pastry.

Rough Puff- pastry is the Scottish answer to Puff and Flaky pastry. This is the quickest method of making a laminated pastry. Old books describe it as the Blitz method, the term being derived from the German ***Blitzen, m***eaning lightening. In this method, the fat is mixed into the sieved flour in pieces, the size of walnuts. Dough is made using water and a little lemon juice, without using too much pressure so that the fat does not completely blend into the dough. The dough is then rolled out like the Flaky pastry method and the process is repeated two more times. The dough is now ready for rolling cutting into the desired shape.

Khari biscuits, khaja sweet, vol-au-vents, cream horns, tart, Mille-feuille, pie, pithivier, cheese straws/twists, meat and vegetable puffs are some of the sweet and savory products made with puff, flaky and rough pastry.

Puff Pastry, Flaky Pastry and Rough Puff Pastry- a comparison

So you want a light crispy pastry with flaky lamination? You have a choice. 3 recipes with broadly identical ingredients – so what's the difference and how do you choose? It is noted that all 3 recipes here but quite often you'll only see reference to number 2. 'Flaky Pastry' and 'Puff Pastry' are used interchangeable, and given the amount of effort and similarity in method I can see why but they are different. First let us look at the recipes. Here is drawn some conclusions at the bottom…

Each recipe makes about 600g of pastry, using 300g plain white flour, a pinch of salt, 200g fat and a little cold water. The fat can be all butter for richness, or a mixture of butter and lard. The lard will make the pastry crispier but doesn't have the same impact on the flavour as butter does. Half and half is a good compromise.

You'll notice a much higher proportion of fat to flour when compared with short crust pastry, which usually uses 1:2 ratio. If you wish you can increase the proportion

of fat to flour, as much as 1:1 if you're very brave but this makes the dough quite tough to work with and enhances the risks of the pastry going wrong.

Puff Pastry

Ingredients

- 300g Plain Flour
- Pinch Salt
- Cold water
- 200g Butter (can also be made with a mix of Lard & Butter)
- 40g Melted Butter

Method

- Add flour, salt into a bowl & mix.
- Make a well in the centre and add the melted butter and enough water to bring the mixture to a soft dough.
- Flatten, wrap in cling film and refrigerate for 30 minutes.
- Take the cold butter between 2 sheets of baking parchment & bash/roll out into a square, about 1.5cm thick. The butter needs to be similar consistency as the dough - if too soft return to the fridge.
- Roll out the pastry into a rectangle, a little more than twice as long as the butter.
- Place the butter in the centre, fold the edges of the pastry into the centre over the butter and seal the edges well so no butter is exposed.
- Roll the pastry out into a neat rectangle so it is 3 times longer than it is wide, keeping the edges straight and square.
- Fold the bottom 1/3rd up to the middle, then the top 1/3rd down. Brush off any surplus flour Rotate a quarter turn and repeat the roll & fold.
- Wrap & chill for 30 minutes.
- Repeat the previous 2 steps twice, so 6 turns in total.
- Refrigerate for about 30 minutes before use.

Flaky Pastry

Ingredients

- 300g Plain Flour
- Pinch Salt
- Cold water
- 100g Butter, room temperature
- 100g Lard, room temperature

Method

- Add flour, salt & half of the fat into a bowl & mix.
- Rub the fat into the flour.
- Add enough water to bring the mixture to a soft dough.

- Roll out into a strip & using a palette knife spread 1/3rd of the remaining fat over the top 2/3rd of the surface.
- Fold the bottom (no fat) 1/3rd up to the middle, then the top 1/3rd down. Seal the edges & chill for 30 minutes.
- Repeat the previous 2 steps until all of the fat is used.
- Roll and fold an additional time (without adding any more fat).
- Refrigerate for at least 30 minutes before use.

Rough Puff Pastry

Ingredients

- 300g Plain Flour
- Pinch Salt
- Cold water
- 100g Butter, chilled & diced or frozen & grated
- 100g Lard, chilled & diced or frozen & grated

Method

- Add flour, salt & all fat into a bowl & mix.
- Do not rub the fat into the flour.
- Add enough water to bring the mixture to a stiff lumpy dough.
- Roll out into a strip and fold into 3 and give a quarter turn.
- Working quickly, repeat roll & fold step 3 more times.
- Ideally refrigerate for about 30 minutes before use.

So which one should you choose?

You need to consider the following:

Total time from start to use (after final chill):

- Puff Pastry – 2hrs 10 minutes
- Flaky Pastry – 2 hrs 20 minutes
- Rough Puff Pastry – 45 minutes

Amount of Effort:

- Puff Pastry – High
- Flaky Pastry – Medium
- Rough Puff Pastry – Low

Amount of rise:

- Puff Pastry – High
- Flaky Pastry – Medium
- Rough Puff Pastry – Medium

Risk of getting it wrong:

- Puff Pastry – Medium/High
- Flaky Pastry – Low/Medium

- Rough Puff Pastry – Low

In the majority of cases the three types of pastry are interchangeable. Rough Puff gives an excellent result for the minimal amount of effort. The rise is great for most things – sausage rolls, pies, tarts, with some good, visible lamination. You can turn this around with a similar amount of effort as normal short crust so there's little reason to look elsewhere.

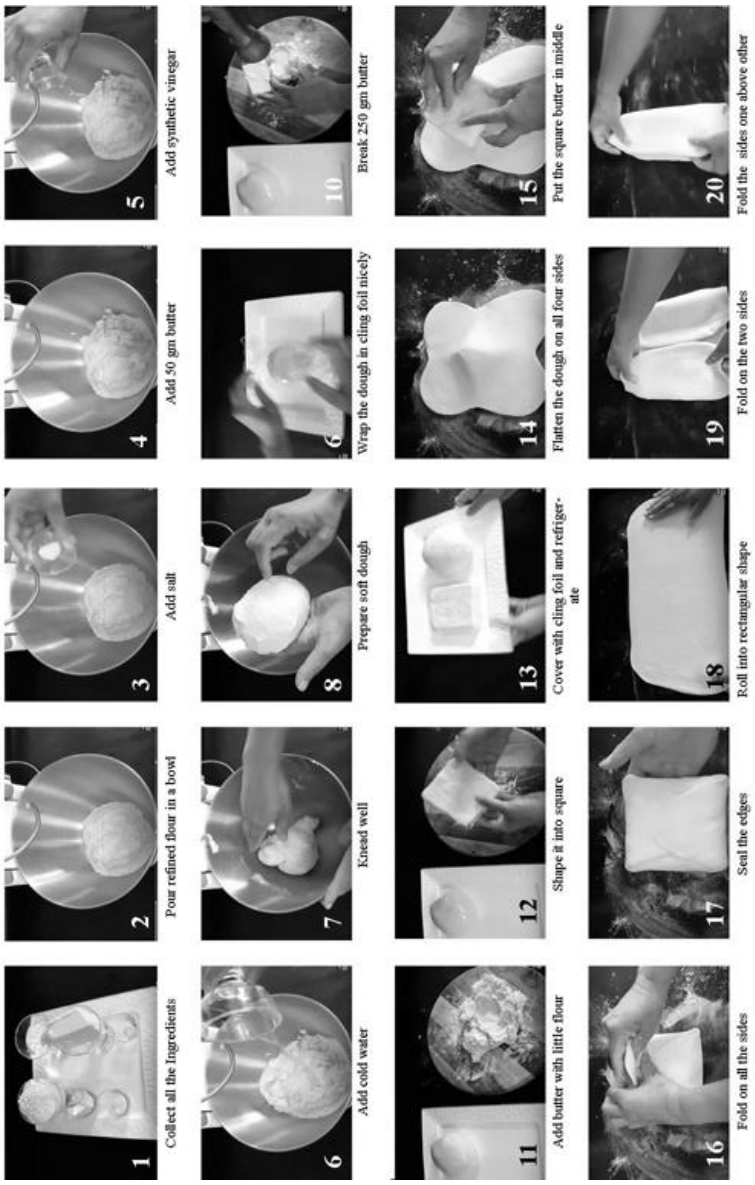

Fig. 2A Preparation of basic pastry 1

However, if you want the most impressive rise, you'll need to go down the full Puff route. Vol au vents, for example, just wouldn't reach the desired nights with rough puff.

So what about the flaky pastry? If it takes as long as full puff but doesn't quite give the same rise, is it really an option? The key thing to consider here is the 'risk' element. Particularly if your temperatures are all wrong, it's easy to lose your laminations in a full puff pastry and you'll end up with no real rise at all. The flaky pastry adds fat layers incrementally into the dough with each roll and fold making it much less likely to fail. That said one didn't find it to be any better than the rough-puff (in fact, slightly worse), so perhaps there's a reason why you'll usually only see reference to 2 laminated pastry recipes…

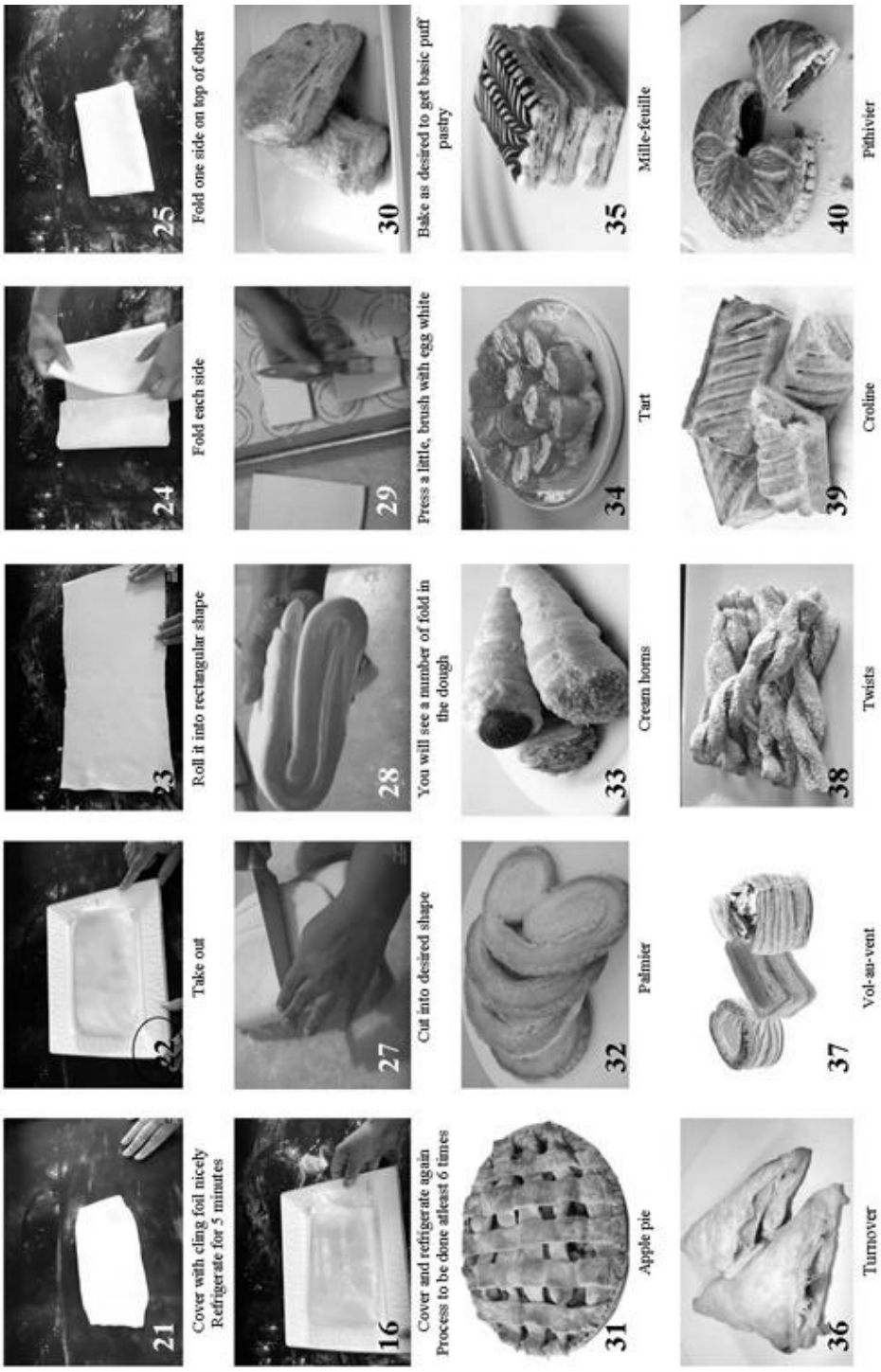

Fig. 2A Preparation of basic pastry 2

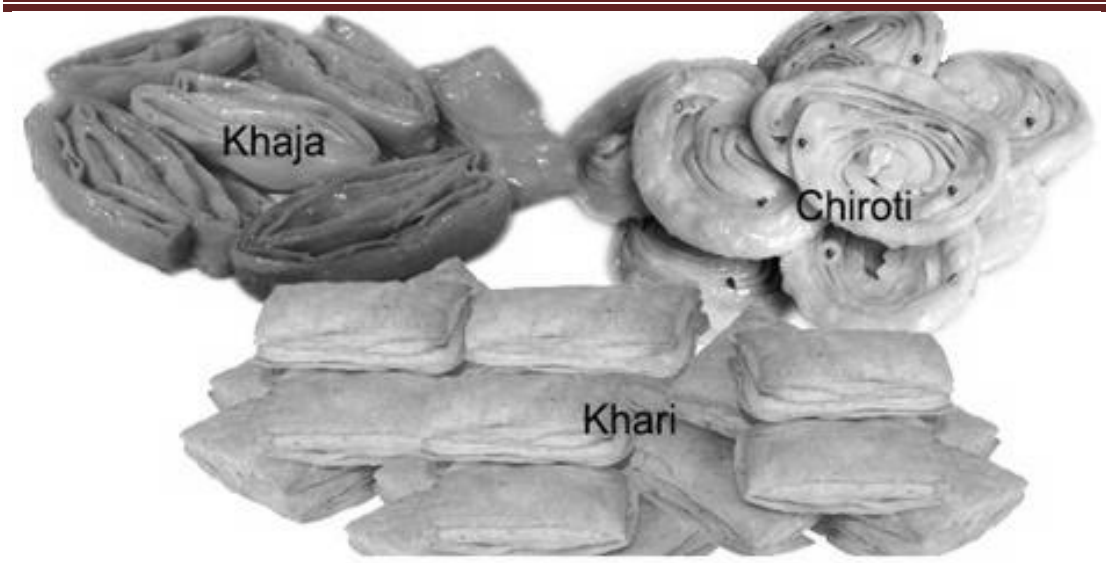

Fig. 2B Desi puff and flaky pastry

When laminated pastries are baked, the fat melts and forms oil layers between the layers of dough, preventing them from sticking to each other. As the heat penetrates into the product, the water in the dough layers changes into steam and pushes the lubricated leaves of dough apart. This produces an increase in the volume of the dough. Later, the gluten in the flour coagulates while the water is dried out so that by the time the pastry is properly cooked, it is able to retain its distended puffy volume. The temperature of the oven has an important role to play in the success of this product. The temperature must be hot enough to generate the steam required.

Baking of laminated pastry: Laminated pastry obtains its lifting power through sealing of moisture in the dough, as heat penetrates the product, the layers of shortening melt and the water in the dough vaporizes and causes the layers to expand. The shortening also helps by holding in these vapours. The gluten in the dough expands with the pressure of the steam and holds the steam in. The shortening melts and penetrates the layers of the dough, making it flaky and tender. The starch then gelatinizes and the proteins coagulate forming a rigid mass. The structure remains firm and flaky.

Oven Temperature: -

- Proper oven temperature is important. A temperature of 204^{o}C – 218^{o}C with an even steady heat is very important.
- Too low a temperature allows shortening to weep between the layers of dough resulting in poor quality and low volume.
- Too high a temperature prematurely seals the piece and results in low volume and raw centres'.

Washing: Laminated pastry pieces are generally washed with an egg wash. Care should be taken to prevent the wash from running down the sides of the pieces while

brushing the top. The eggs will coagulate with the heat of the oven, seal the sides and prevent the pastry from rising evenly. (Poor Volume)

Reasons for imperfect Pastry: -

Laminated pastry shrinks: -

- Oven too hot
- Not resting the dough before rolling out.
- Not resting products before being baked.
- Use of scrap dough.
- Dough too soft.

Laminated Lacks Volume: -

- Too many folds.
- Not enough folds.
- Use of scrap dough.
- Dull cutters.
- Cold oven.
- Shortening too soft.
- Flour too strong.

Fat Runs Out: -

- Dough not folded enough.
- Oven is too cold.
- Warm pans are used.
- Melting point of fat is too low.

Danish pastry- A Danish pastry or just Danish (especially in American English) is a multilayered, laminated sweet pastry in the Viennoiserie tradition. The concept was brought to Denmark by Austrian bakers and has since developed into a Danish specialty. Like other Viennoiserie pastries, such as croissants, they are a variant of puff pastry made of laminated yeast-leavened doughs, creating a layered texture. The fat is laminated into the dough and therefore, Danish is also considered a laminated pastry. A ferment of yeast, sugar, eggs and milk is added to the flour to make soft dough. After resting and knocking back the dough, the yeast dough is rolled out thinly, covered with thin slices of butter between the layers of dough, and then the dough is folded and rolled several times, creating 27 layers if necessary. The dough is chilled between folding to ease handling. The process of rolling, buttering, folding and chilling is repeated multiple times to create multi-layered dough that becomes airy and crispy on the outside, but also rich and buttery. The dough is then cut into three uneven sizes and a spool is made….that is….rolling the smallest into the medium and then that into the largest piece of dough. The dough is wrapped into a moist cloth and refrigerated for 15-20 minutes. It is then rolled and cut into the desired shapes. Egg wash is applied and the product is allowed the second proving and then is baked at 200^0C for 20 minutes. The pastry is brushed with sugar syrup after baking. Croissants, windmills, turnovers, napoleons, and breakfast Danish are products.

Filo pastry- or phyllo) is very thin unleavened dough used for making pastries such as baklava and börek in Middle Eastern, Greek, and Balkan cuisines. Filo-based pastries are made by layering many sheets of filo brushed with olive oil; the pastry is then baked.

Filo dough is made with flour, water, and a small amount of oil or white vinegar, though some dessert recipes also call for egg yolks. Homemade filo takes time and skill, requiring progressive rolling and stretching to a single thin and very large sheet. A very big table and a long roller are used, with continual flouring between layers to prevent tearing.

When using filo to make pastries, the thin layers are made by first rolling out the sheets of dough to the final thickness, then brushing them with olive oil, or melted butter for some desserts, and stacking them. This contrasts with puff pastry and croissant doughs, where the layers are stacked into a thick layer of dough, then folded and rolled out multiple times to produce a laminated dough containing thin layers of dough and fat.

Example-

- Baklava – An Ottoman dessert with layers of filo with chopped nuts, sweetened and held together with syrup or honey.
- Banitsa – A Bulgarian dish consisting of eggs, cheese and filo baked in the oven.
- Börek – A savory filo pie originally from the Ottoman Empire.
- Bougatsa – A type of Greek breakfast pastry.
- Bülbül yuvasi – A Turkish dessert with pistachios and syrup.
- Bundevara – A Serbian sweet pie filled with pumpkin.
- Galaktoboureko – A Greek dessert consisting of filo and semolina custard.
- South Indian – Pootharekulu.

Suet Crust Pastry- Suet Crust Pastry is a pastry that has suet in it for the fat, instead of lard, butter or shortening. To make the suet crust, mix together the suet, salt and flour and then stir in the water using a flat knife. Bring it all together to form soft dough, adding a little extra water if necessary, and roll out on a floured surface.

It is used for steamed puddings, whether savoury or sweet. The suet needs to be minced or shredded finely, or you'll get somewhat lumpy pastry. Suet Crust Pastry may be the only pastry that needs a chemical rising agent in it. In most other pastries, the rising agent is steam within the pastry, but in a steamed pudding, the external steam would stop the pastry from rising, hence baking powder is used

Example- Steamed suet pudding, British Steak pie, Suet jam Roly poly, Tipple pie, Pastry patties, Beef & beer pie etc. (Fig. 2C)

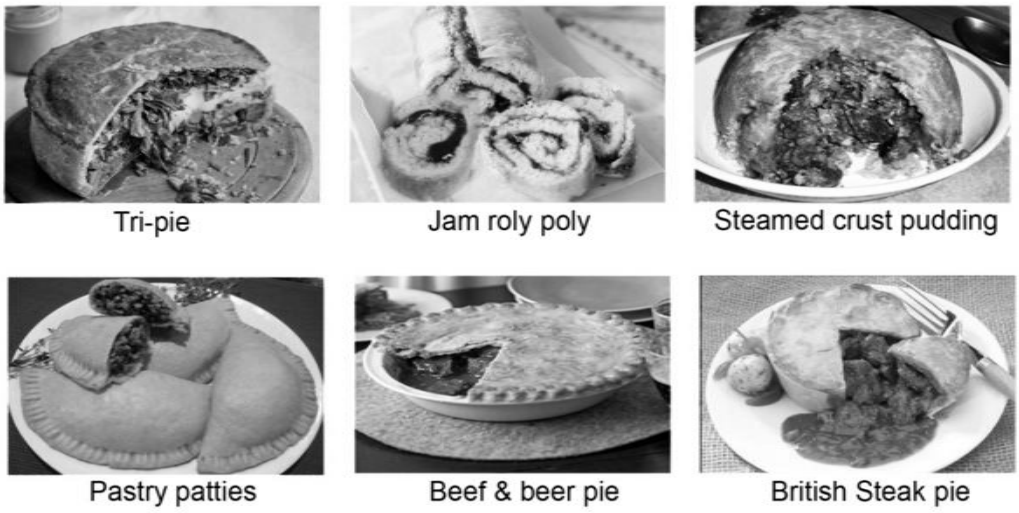

Fig.2C Suet Crust Pastry

2.3.2 CHOUX PASTRY

The French term for this pastry Pate a choux literally means cabbage paste, because the profiteroles and cream puffs made from this pastry resemble little cabbages. These are hollow shells which have a crisp and brittle texture. These are then filled with a variety of fillings both sweet and savoury – including creamed cheese, fresh cream, crème patisserie and fish and meat pate.

Water, butter and salt are boiled together and then the flour is added in to form a partly gelatinized paste. It is mixed vigorously with a wooden spoon and then cooked once more till the mixture has a shiny appearance and leaves the sides of the pan. Beaten eggs are added gradually to the paste, beating continuously to form a smooth pliable and piping consistency mass.

It is then piped into the desired shapes – rosettes, fingers or balls. Choux paste is baked at 200°C so as to achieve maximum rise. The temperature is then reduced to 15^0C to dry out the shells and to obtain the crisp and brittle texture.

During the baking, the products should not be subjected to unnecessary movements, otherwise the structure will collapse. Shells can be stored in airtight containers and used as and when required. Éclairs, Cream Puffs, Duchesses, profiteroles and cream puffs are all choux pastry based items.

Hot water pastry: This is also known as the cooked pastry and is seldom used these days. It is a lean dough made by cooking the flour, salt and a little fat in water to a paste. This paste is then used to line the sides of pie tins, using the hands to apply the mixture; the filling was then placed inside the tin and then covered with more of the

paste. After baking, the dough was often discarded and it was more like a protective layer over the filling. Welsh miners oven carried their food wrapped in this pastry to work. At lunch time, the pastry was broken open and the filling- meat or fish - was consumed. Cornish Pasties, a traditional Welsh favorite was originally made with Hot Water Pastry.

RECIPE FOR 220 GM CHOUX PASTE

- 50 g butter
- 120 ml water (or milk, or 50/50)
- ½ tsp salt
- ½ tsp sugar
- 75 g flour
- eggs

1. Cook butter, water, salt and sugar in a saucepan over low heat.
2. When the butter melts, bring the mixture to a boil; remove from the heat immediately. Drop the entire flour into the hot liquid.
3. Stir with a wooden spoon until a firm, smooth paste forms.
4. Return the saucepan to low heat to dry out the paste; continue beating until it forms a ball and pulls away cleanly from the sides of the saucepan.
5. Transfer the paste to a bowl; cool for 5 minutes.
6. One by one, add 3 eggs to the paste, beating vigorously after each addition to incorporate as much air as possible. The paste should be smooth and shiny.
7. The paste is ready to be used, when it falls from the spoon but still holds its shape. If it doesn't, add half of another beaten egg. Depending on the egg size and/or flour quality it may be necessary to use all of the egg.
8. Preheat oven to 200°C. Brush a baking tray with oil to lightly grease. Spoon 25-30 teaspoons full of the mixture onto tray, about 3cm apart. Alternatively, use a pastry bag fitted with a 1.5cm-diameter plain piping nozzle to pipe the profiteroles or any other shape as desired onto the baking tray. Brush the tops with a little of the remaining egg.
9. Bake in preheated oven for 25 minutes or until the profiteroles are puffed and golden.
10. Remove from oven and turn the oven off. Using a skewer or a small knife, pierce the base (or top) of each profiterole to release the steam.
11. Return the profiteroles to the oven and leave them for 15 minutes to dry out. Remove the profiteroles from the oven and transfer to a wire rack to cool.
12. Beignet, Chouquette, Croquembouche, Éclair, Gougère, Moorkop, Paris-Brest, Profiterole, Cream Puff Swan, State Fair Cream Puffs, Banana Split Éclairs, Cream Puff Ring etc.

Some faults in Choux Pastry:

- Use of improper ingredients.
- Basic mixture when overcooked makes it greasy and heavy
- Flour not shifted and cooked sufficiently or it is over cooked
- Eggs insufficiently beaten in the mixture
- Abnormal oven temperature
- Under baked

Blind baking: Baking blind (sometimes called pre-baking) is the process of baking a pie crust or other pastry without the filling. Blind baking a pie crust is necessary in pastries when it will be filled with an unbaked filling (such as with pudding or cream pies), or if the filling has a shorter bake time than the crust, in which case the crust is partly baked. Blind baking is also used to keep pie crust from becoming soggy due to a wet filling.

Characteristics of Perfect Pastries

- It should have pleasant aroma and evenly golden brown in colour.
- It should not be crumbly, but soft and easy to cut nicely.
- Flakes should be separated and should have smooth and neat edges.
- It should not have any blisters on the surface, but should be smooth in texture.
- It should not have extra filling flowing out.
- It should not contain extra fat and should not be soggy.

General guidelines for making perfect pastry

1 Collect all equipment needed and weigh up the ingredients before starting the pastry.
2 All ingredients and utensils should be kept as cool as possible. Your hands can be cooled by allowing cold water to run over the wrists.
3 The pastry should be handled as little and lightly as possible.
4 Shift the flour and other dry ingredients well so that air is incorporated in it.
5 Add only sufficient water to mix evenly to a pliable dough. Too much water will make the pastry hard. Streakiness in the pastry can be avoided if all the water needed is added at once.
6 Knead lightly and quickly with the fingertips drawing the edges of dough towards the centre, turning the pastry on a lightly floured board.
7 Roll out with short sharp strokes of the rolling pin away from you. Turn the pastry not the rolling pin.
8 Roll in one direction only.
9 Never stretch the dough while rolling or it will shrink while baking.
10 Some rich pastries are improved if allowed to cool in the fridge and relax between rolling.
11 You can make pastry before needed and keep it in the fridge, wrapped in cling film, until needed.
12 Bake the rolled and blind pastry quickly in a hot oven before adding any filling.

13 Glaze pastry before baking to give it sheen and shine.
14 Always pre-heat the oven and do not open it frequently.
15 Most pastry freezes well, baked or unbaked, except Hot Water Pastry and Suet Pastry. Making a double batch and freezing half can save a lot of your time.

PASTRY CREAMS: Pastry cream or custard cream, topping or crème patisserie as called in French is one of the most common creams used in cakes and pastry products. This cream can also be baked and hence is used in both hot and cold desserts. Pastry cream is a thick custard that can be used as a filling for any number of cakes, tarts or pastries. It is made with milk, eggs, sugar, cornstarch (or a mixture of flour and cornstarch) and flavoring. Vanilla is the most popular flavor for pastry cream, but the cream can be flavored with any number of different things, from extracts to liqueurs to chocolates to fruit purees.

Pastry cream is made by bringing the milk almost to a boil, then tempering a mixture of eggs, sugar and cornstarch with the hot milk. The mixture is returned to the stovetop and cooked, stirring constantly, over a low heat until it has thickened. Butter is added on top to avoid the skin formation. Vanilla beans can be infused into the milk at the beginning of the cooking process, or extract can be stirred in at the end. The use of cornstarch (or flour) is what sets pastry cream apart from other custard sauces, giving it is very thick consistency that makes it so versatile.

Enrobing or coating: It is a process that involves covering a confection or snack with chocolate or chocolate coatings mixed with or without butter after the cooling at room temperature. The main ingredients used in the process include sugar, fat, milk or milk powder, and chocolate in addition to flavours, colours and emulsifiers. Lecithin is commonly added to control viscosity. Traditionally, this process was slow and involved manually dipping the pieces into melted chocolate by hand, but nowadays enrobing can be carried out with chocolate or compound coatings (compound coating is a replacement product made from a combination of cocoa, vegetable fat, and sweeteners). An advantage of compound coatings is that they may set faster and no tempering (the process in which chocolate masses are thermally treated to produce a small fraction of homogeneously dispersed, highly stable fat crystals of the correct type and size) is needed.

Whipped cream: It is heavy cream that has been beaten until it is light and fluffy. It may be beaten with (in order from easiest to hardest) a mixer, a whisk or a fork. Whipped cream is often sweetened (usually with confectioner's sugar, which dissolves easily in the cream and does not leave a grainy texture) and it is sometimes flavored with vanilla. Whipped cream that has been flavored with vanilla is often called *Chantilly cream* or *crème Chantilly*. It is a very rich, foamy dairy product that adds lots of flavor to a wide range of foods and drinks, such as a frosting for cakes, a spread for "cookie sandwiches" and scones or a topping for hot chocolate and other sweet drinks.

Bavarian cream: Bavarian cream, crème bavaroise or simply bavaroise is a dessert consisting of milk thickened with eggs and folded with gelatin or isinglass and whipped cream. The mixture sets up in a cold mold and is unmolded for serving.

Pastry fillings: There are different kinds of fillings used for pastry, they may be:

1 **Fruit and nuts-** Many kinds of fruits like fresh, dried, frozen, fruit puree or concasse, or canned ones can be used. It is important to drain out excess water from the fruits before filling. Nuts as whole or chopped may be also used. Eg. Apple Pie, Peach Pie, Blueberry Pie, Cherry Pie, Pecan Pie, Walnut Pie, Hazelnut Pie etc.

2 **Custard- This include:** Basic custard- milk, sugar and eggs are cooked to form smooth gel. To make it more shiny and stable some shortenings and emulsifiers can also be used. True custard- is prepared from fresh milk, sugar, whole eggs and salt. All the ingredients are beaten and poured directly in the crust. Eg. Custard Pie, Lime Pie.

3 **Cream**s- Cream fillings are usually used something along the lines of custard or a pudding. They consist of milk, flour and eggs. Flour may in the form of cornstarch or instant tapioca flour. Eg. Ice Cream Pie, Lemon-meringue Pie, and Pumpkin Pie etc.

4 **Chiffon pie filling**- it consists of cream, sugar, egg, or starch, gelatin, lime juice and grated lime rind. All folded into a meringue or foamed mixture. Instead of lime juice grapefruit/grape/pineapple juice may be added.

5 **Meats**- Meat fillings are the most traditional options for pies. There are great varieties of meat fillings, some are cream and include vegetables, and some are spicy and are mostly meat. There are chicken fillings, pork fillings, steak fillings and fillings that are a combination of meats. Eg. Shepherd's Pie, Steak and Kidney Pie, Pork Pi, Bacon and Egg Pie etc.

6 **Vegetables**- A healthier alternative to the meat fillings are vegetable fillings. Very similar to quiches, vegetable pies tend to consist of vegetables and some sort of cream or egg. Eg. Eggplant Torte, Sweet Potato Pie and Spinach Pie etc.

7 **Miscellaneous fillings**- apart from the above one can also add various indigenous fillings like crumbs of cakes or sponges, biscuits mixed with thick cream or meringue.

Washes and Glazes: Pastry chefs use an egg wash primarily for shine, though the egg yolk will contribute a golden color to the finished baked product. For a clear shine, an egg white alone can be used. Milk, on the other hand, is used to encourage browning. Other ingredients that are used may be Cream, Egg White + Coarse Sugar, Whole Egg + Cream, Whole Egg Wash, Egg Yolk Wash and Butter.

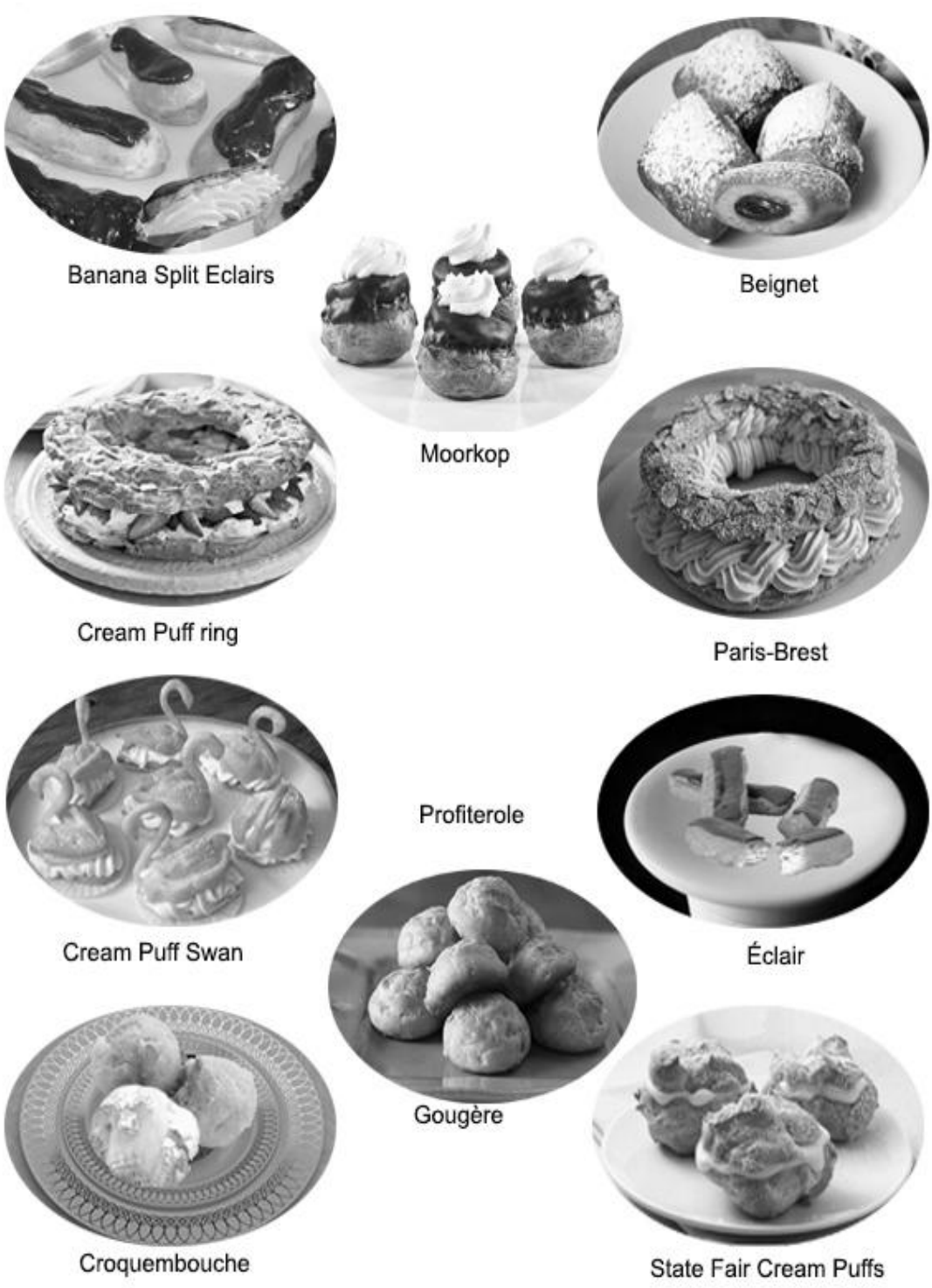

Fig. 2D Examples of Choux pastry

2.4 BREAD MAKING INGREDIENTS

YEAST: Yeast is the heart of the bread-making process. It's the essential ingredient that makes the dough rise and gives home-baked bread its wonderful taste and aroma. Other ingredients are added to complete the reactions that result in a perfectly baked loaf of hot, crusty homemade bread. There are innumerable varieties of yeast. Of these, only a few are suited to bread-making such as Saccharomyces cerevisiae, which means "sugar eating yeast". Strains of such yeast are isolated and then nurtured under simulated conditions. It is a biologically raising agent and its function is to make the dough rise in volume. It is during the rising and proving that carbon dioxide (CO2) is emitted and forms bubbles which not only cause the dough to rise, but make the baked bread porous, improves the grain, compressed and sold fresh or dried and sold in granular form. Yeast conditions the dough (gluten) so that it attains sufficient mellowness to stretch under the pressure of CO2 gas and form the structure of the products. The small quantity of alcohol produced evaporates in the heat of the oven.

Types of yeast:
There are two types of yeast: (i) fresh yeast and (ii) dry yeast.

A. Fresh Yeast: Fresh yeast is also known as compressed yeast. It is a moist mixture of yeast plants and starch. It should be kept in the refrigerator and should be maintained at 40-45^0 F. It has a pleasant aroma like ripe apples and is inactive at cool temperature, yellowish cream in colour and when broken, it shows clean fracture without crumbling. It produces gas rapidly when added to dough. Bakers prefer fresh yeast because it is cheaper and reliable. It can be stored for 2-4 weeks as it contains high moisture content. Fresh yeast is divided into two:

- Cream yeast- Cream yeast is not available in Indian markets. This yeast is available in the suspension form and is transported by motor and tube. It can be stored only for 7-10 days as it contains very high moisture content.
- Compressed yeast- is essentially cream yeast with most of the liquid removed. It is a soft solid, beige in color, crumbly in appearance, and arguably best known in the consumer form as small, foil-wrapped cubes of cake yeast.

B. Dry Yeast- contains very less moisture and has a good shelf life. It is grayish brown in colour and granular in form with a distinctive smell.

- Active dry yeast- It is a mixture of yeast with corn flour or corn meal pressed into cakes and dried. It is available in granular or and multiply. It with some growth medium. Under most conditions, active dry yeast must first be proofed or rehydrated is suitable for the sponge and dough methods. It can be stored for a long time (4-6 months) due to less moisture content.
- Instant dry yeast- is the form of yeast most commonly available to noncommercial bakers. It consists of coarse oblong granules powder form. It continues to live but in an inactive stage. When it gets warmth and moisture it begins to develop of yeast, with live yeast cells encapsulated in a thick jacket of dry, dead cells. It can be stored at room temperature for a year, or frozen for

more than a decade, which means that it has better keeping qualities than other forms, but it is generally considered more sensitive than other forms to thermal shock when actually used in recipes.

- Rapid-rise yeast: is a variety of dried yeast (usually a form of instant yeast) that is of a smaller granular size, thus it dissolves faster in dough, and it provides greater carbon dioxide output to allow faster rising. This yeast is not generally used in bakery as most baking experts believe it reduces the flavor potential of the finished product.
- Deactivated yeast is dead yeast which has no leavening value and is not interchangeable with other yeast types. Typically used for pizza and pan bread doughs, it is used at a rate of 0.1% of the flour weight, though manufacturer specifications may vary. It is a powerful reducing agent used to increase the extensibility of a dough.

Yeast Culture: A culture would be started by leaving a rye dough to stand at 24–27^{o}C for several hours, which is likely to induce the grain microorganisms to start a lactic acid fermentation. An alternative is to add sour milk to the dough followed by resting the dough for a few hours. A mixture of pure organic acids can be added to simulate the flavour of proper sour dough. If the culture is to provide both the yeast and the flavour of sour dough then either it must acquire a wild yeast or a starter culture that includes yeast must be added. In some cases the sour dough culture is only used to give the sour dough taste while conventional yeast is added. If a started culture is used the culture is activated by mixing it with rye flour and water and leaving it to stand in a warm place until the culture is fully active. The active culture is then kept going by feeding it flour and water. When the culture is fully active the culture is mixed in with flour, water, salt and any fat. The resulting dough is kneaded carefully to avoid too much toughening. The dough is then fermented say for half to one hour, knocked back, scaled, proved and baked.

Some sour dough bread is made by using commercial yeast but with a proportion of genuine sour dough. Ordinary baker's yeast is at a disadvantage in rye sour dough because the low pH that is essential for rye bread is not the optimum pH for the yeast. Conventional improvers are not used in rye bread but additives are sometimes used to increase the water absorption of the dough. Examples are polysaccharide gums such as guar and locust bean gum as well as pre-gelatinized potato flour, rice starch or maize starch.

Flour: Wheat is the most common type of flour used in bread baking. It includes all-purpose flour, bread flour and whole wheat flour. Wheat is rich in gluten, a protein that gives dough its elasticity and strength. When yeast and flour are mixed with liquid and then kneaded or beaten, the gluten forms and stretches to create a network that traps the carbon dioxide bubbles produced by the yeast.

Recipes with whole wheat flour have less gluten and make denser loaves. That's why these recipes generally require some all-purpose flour which increases the gluten and makes lighter, taller loaves.

Functions of Flour:

a. **Provides structure-** Flour is the principle ingredient for toughening or structure building in baked goods. Structure allows products to hold new, larger size air cavities they expand and leaven. It prevents products from collapsing once they are cooled and removed from the pan. Besides its importance in baked goods, flour provides "structure" like thickening, to pastry creams and certain pie fillings. *Gluten* and starch are responsible for much of the structure-building properties of flour. When water is added to flour, the protein bonds expand resulting formation of *Gluten* from the two proteins in flour, *glutenin* and *gliadin*. Apart from gluten, starch also contribute to flour structure, either to form its own structure or to interact with gluten. Any of these structure builders, gluten, starch, or gums, is most important to a particular baked product depends on the type of flour and the formula used. Take yeast-raised baked goods, for example. Gluten and starch share the role of structure building in these products. Gluten certainly is most important for developing structure in unbaked dough, but starch is arguably more important to the structure of the final baked product. When flour is added to moisture, gluten strands expand resulting in the expansion (*gelatinization)* of starch and gums present; this is the starch and the gum that finally provides the required structure of baked products. Flours with lesser gluten and moisture will rise less, as in case of cakes, where as flours with very little or no gluten and less moisture expand to minimum, as example of pie crust and crisp cookies.

b. **Absorbs liquids -** Ingredients like flour that absorb liquids are also called driers. Starches, proteins, and gums are the three main components in flour that absorb moisture (water) and oil, helping to bind ingredients together. The absorption value of flour is an important quality factor in bread baking. Water absorption power (WAP) is defined as the amount of water absorbed by flour when forming bread dough. High absorption values are desirable in bread baking because the added moisture slows staling. Higher water absorption also means that less flour is needed to make a loaf of bread, decreasing the food cost. Water absorption values of most bread flours range around 50–65 percent, meaning that 1 pound (450 grams) of flour absorbs over 0.5 pound (225 grams) of water. While several factors affect the absorption value of flour, doughs that absorb more water typically have higher protein content.

c. **Contributes flavor -** Clean and full bodied wheat flour has mild and nutty flavour which is generally considered desirable for bakery products. Each type of flour has distinctive flavour of its own and is used accordingly, for example, with its higher protein and ash content, to have a stronger flavor than fancy patent flour, like cake flour. Expect whole wheat flour to have the strongest flavor of all. Wheat flours having relatively mild and slightly nutty flavor that. Each has a different flavor, however. Expect clear flour,

d. **Contributes color -** Flours vary in color. For example, regular whole wheat

has a nut-brown color, whole white wheat flour has a golden color, durum has a pale yellow color, unbleached white flour a creamy color, and cake flour a stark white color. These colors carry over to the color of baked goods. Flour also contributes protein, small amounts of sugar, and starches for *Maillard browning*—the breakdown of sugars and proteins—to a dark color on crusts. High-protein flours typically undergo more *Maillard browning* than low-protein flours.

e. **Adds nutritional value -** Essentially all flours and grain products contribute complex carbohydrates (starch), vitamins, minerals, and protein. However, the protein in wheat is low in *lysine*, an essential amino acid. This means that wheat protein is not as nutritionally "complete" as egg or milk protein and is best supplemented with other protein sources for good health. White flour is a poor source of fiber, but whole wheat flour and whole white wheat flour, being whole grain products, are good sources of insoluble dietary fiber from the bran, important in the diet.

Liquids: Liquid or "wet" ingredients are a necessity in making any baking recipe a success. Each liquid functions in a different way, depending on the item that is baked, but alteration or using substitution can also be appreciated. The following liquids are used by bakeries for their products:

Water: Water is the most vital liquid ingredient in many baked goods, particularly bread. The right amount of water helps dissolve the yeast in bread and encourages it to become active, and it combines with flour and the other dry ingredients to form a smooth, workable dough. In that way, water acts as a binding agent for the bread. In other baked goods, water helps provide needed moisture without affecting the final flavor of the product.

Milk and Cream: Milk and cream, like water, moisten dough and batters. Unlike water, they add a slight flavor to the final baked goods and increase its richness. Depending upon the fat content of the milk or cream--skim, 1 percent, 2 percent, whole, half and half, or heavy whipping--it's possible to impart varying degrees of richness to the dough or batter you're making with it. Milk and cream also create a fuller, moister texture in baked goods and help them brown on the surface.

Yogurt and Sour Cream: Yogurt and sour cream make the dough moist but impart a sharper and tarter flavor than milk or cream. They can also work as binding agents in quick bread or muffin batters, cutting off some of the sweetness from added sugar while adding structure and helping the crumb in the product develop well. Buttermilk can be used instead of milk to make a loaf that is moister and has an almost cake-like texture.

Coconut milk can be used 50:50 with water to add flavor to sweet breads. Fruit juices can be added to the dough for fruit-flavored breads to increase their flavor.

Vegetable juices and the liquids left over from cooking vegetables can be used to add flavor and extra nutritional value to breads. This is particularly useful when making savory breads. Keep in mind that vegetables contain liquid juices so this will alter the liquid balance when you add them to a bread recipe.

Beers, ales, ciders and liqueurs can also be added to bread recipes. Beers and ales work well with dark, heavy flours because the added sugars stimulate the yeast by providing more food. Beers and ales also give breads a stronger flavor.

Tips for using liquid ingredients: Tap water is chemically treated and may slow down the rising. Hard water is alkaline which weakens the gluten and makes a loaf with less volume. Soft water is slightly acid which makes the yeast more active. If your breads are not rising very well, boil the water and let it cool to room temperature or use bottled spring water.

For yeast breads, only warm liquids should be added to dry ingredients in a recipe because a too-cool liquid will slow or stop yeast action and a too-hot liquid will destroy the yeast and prevent it from rising.

Ideal temperature ranges are 100°F-110°F, when yeast is dissolved directly in water; 120°F-130°F when undissolved yeast is added to dry ingredients.

If a dough ends up too dry, you can sprinkle it with water during the kneading

Sweetener: Sugar, Brown sugar and jams add flavor and rich brown color to bread's crust. Liquid sugars, such as corn syrup, honey, molasses or maple syrup, sweeten baked goods and give them a pleasant flavor. Vanilla extract and other liquid flavorings can help enhance and adjust this sweet flavor.

Salt: Salt is an important ingredient in bread baking because it acts as preservative, as it acts on microorganisms, extracts the liquid from them and then kills them, acts as anti-raising agent- regulates the leavening processes in breads by controlling the action of yeast. It slows down all the chemical reactions that are happening in the dough, including calming fermentation activity to a steadier level. It improves the water absorption power (WAP). It also makes the dough a little stronger strengthening effect on the gluten protein in the dough and adds flavor to baked goods and mask the off-flavours. It also potentiates the flavor of other ingredients, including butter and flour. Without salt, bread rises faster and air pockets enlarge where the gluten has broken, allowing holes to form. Bread made without salt will taste bland. If you choose to eliminate salt, decrease the proofing time so that the large air pockets don't have time to develop. Salt should not be eliminated from recipes using automatic bread-making machines.

Eggs: Eggs are a binding agent that helps finished baked goods stick together and rise well. They also enhance food value, color, flavor and texture and produce a moister final product. They also help make the crumb fine and the crust tender. Eggs add richness and protein. The yolks of eggs add fat to recipes, resulting in greater

flavor. Some recipes call for eggs to be used as a wash, which adds color. Because of these varied properties, it can be difficult to substitute other ingredients for eggs in a recipe.

Fat and Oil: Butter, margarine, shortening or oil add flavor and make bread tender and moist. Fat slows moisture loss, helping bread stay fresh longer. Fat is heated with liquid when using Yeast. Do not substitute oil for margarine/shortening unless the recipe calls for it. Oil is sometimes used as a substitute for butter in recipes, although it does not have the same flavor and doesn't always function in the same way. For quick breads, muffins and other recipes in which the oil isn't meant to impact the final flavor, bakers should choose canola oil or vegetable oil as ingredients. Oil adds structure and moistness to a baked goods and boosts its flavor.

2.5 METHODS OF BREAD MAKING

The principles of bread making are:

1. Straight dough method.
2. Modified straight dough method
3. No-time dough method or Chorleywood method
4. Delayed salt method.
5. Sponge and dough method.
6. Ferment and dough method.

1. STRAIGHT DOUGH METHOD

- All the ingredients are mixed together, and the dough is fermented for a predetermined time.
- The fermentation time of the straight dough depends on the strength of the flour. Strong flour requires more fermentation time to mature adequately.
- Flours which require 2 to 3 hours for maturing should be used for making bread by straight method. Flours that take very long period for maturing should not be used because during prolonged fermentation periods it is very difficult to control the temperature of the dough and rise in temperature will cause acid taste and flavour in bread.

2. Modified straight dough method

- For sweet doughs, the straight dough method is modified to ensure even distribution of the fat and sugar.
- Soften the yeast in part of the liquid, using a separate container.
- Combine the fat, sugar, salt, milk solids, and flavorings and mix until well combined.
- Add the eggs gradually, as fast as they are absorbed.
- Add the liquid and mix briefly.
- Add the flour and yeast. Mix to a smooth dough.

3. No time dough method or Chorleywood method

- Dough is fermented in the usual manner. It is just allowed a brief period (about 30 mins) for it to recover from the strains of mixing.
- Since dough is not fermented the two functions of fermentation (i.e. production of gas and conditioning of gluten) are achieved to some extent by increasing the quantity of yeast (2 to 3 times of original quantity) and by making the dough little slacker and warmer.
- Although it is possible to make fairly acceptable bread (during emergency) by using this method the product has poor keeping quality. Due to the absence of fermentation the gluten and starch are not conditioned sufficiently to retain the moisture.

4. Salt delayed method

- This is a slight variation of straight method, where all the ingredients are mixed except salt and fat.
- As a salt has a controlling effect on enzymatic action on yeast, the speed of fermentation of a salt less dough will be faster, and a reduction in total fermentation time will be faster.
- The salt is added at a knock back stage. The method of adding salt at the later stage may be according to the convenience of individual baker. It may be sifted on the dough and mixed or it may be creamed with fat and salt.
- Whatever way is chosen for mixing the salt, only three forth (of actual mixing time) mixing should be given initially and one fourth mixing at the time of adding salt.
- Due to absence of salt, the fermentation speed is enhanced and gluten is matured in a reasonably shorter time.

5. Sponge and dough method

- Strong flour takes too long for conditioning and should not be used for making bread by straight dough method. For such flours sponge and dough method is more suitable where the problem of controlling the dough temperature time is not so acute.
- Flour, proportionate amount of water, yeast and sugar are mixed together. Longer fermenting sponges may also contain some amount of as well. Mix all the ingredients evenly.
- This sponge is fermented for a pre determined time. The ferment is carried out longest for almost 16 to 17 hours and minimum for an hour.
- Advantages
- Scheduling flexibility. Sponges can usually be held longer than finished dough.
- Increased flavor, developed by the long fermentation of the sponge
- Less yeast is needed, because it multiplies during the sponge fermentation.

6. Ferment and dough method

- This is a variation of sponge and dough method.
- Very often a bread formula may contain milk, eggs, substantial quantity of fat and sugar.
- All these formula ingredients will have a retarding effect on yeast activity.
- If all the formula yeast, part of flour, yeast food and sufficient water are mixed together, the yeast gets initially an environment which is conducive to vigorous activity and at the end of fermentation time it is in a fit condition to take on extra load of fermentation in presence of milk, eggs, excessive fat etc.
- Fermentation time of ferment depends on the formulation of the desired product but very often it becomes a matter of individual preference.
- A ferment containing milk should be guarded against over fermentation as it will develop more than desired quantity of lactic acid which in turn will affect the flavor, taste and texture of the product.

STEPS IN BREAD MAKING

1. **Scaling Ingredients:** All ingredients must be weighed accurately. Water, milk and eggs may be measured by volume. They are scaled at 1 pint per pound, or 1 kg per lt. However if quantities are large it is more accurate to weight these liquids. Special care must be taken when measuring spices and other ingredients used in very small quantities. This is particularly important in salt, which affects the rate of fermentation.

2. **Mixing:** Mixing yeast dough's has three main purposes:
   i. To combine all ingredients into a uniform, smooth dough.
   ii. To distribute the yeast evenly throughout the dough.
   iii. To develop the gluten.

3. **Fermentation:** Fermentation is the process by which yeast acts on the sugars and starches in the dough to produce carbon dioxide gas and alcohol.Gluten becomes smoother and more elastic during fermentation so that it can stretch further and hold more gas. An Under fermented dough will not develop proper volume and the texture will be coarse. The dough that ferments too long or at too high temperature will becomes sticky, hard to work and slightly sour. An under fermented dough is called a young dough and an over fermented dough is called old dough.

   Doughs with weak gluten, such as rye doughs and rich doughs, are usually under fermented, or "taken to the bench young". Yeast action continues until the yeast cells are killed when the temperature of the dough reaches 140ºF (60º C) in the oven. It is important to be aware that fermentation continues during the next steps in yeast dough production-Punching, Scaling, Rounding, Benching and Make-up or Molding. Failure to allow for this time may result in over fermented doughs. Doughs that are to be made into rolls and loaves requiring a great deal of makeup time should be slightly under

fermented to prevent the dough from being too old by the time makeup is completed.

4. **Punching or knock-back**: Punching is hitting the dough with your fist. It is a method of deflating the dough that expels carbon dioxide, redistributes the yeast for further growth, relaxes the gluten, and equalizes the temperature throughout the dough. Additional fermentation and punching may or may not be necessary, depending on the product.

5. **Secondary fermentation:** This second rise helps with structure and flavor development especially at this altitude.

6. **Scaling:** Using a baker's scale, divide the dough into pieces of the same weight, according to the product being made. During scaling, allowance is made for weight loss due to evaporation of moisture in the oven. This weight loss is approximately 10 to 13% of the weight of the dough. Actual baking loss depends on baking time, size of the unit, and whether it is baked in a pan or free standing. Scaling should be done rapidly and efficiently to avoid over fermenting the dough.

7. **Rounding and shaping:** After scaling, the pieces of dough are shaped into smooth, round balls. This procedure forms a kind of skin by stretching the gluten on the outside of the dough into a smooth layer. Rounding simplifies the later shaping of the dough and also helps retain gases produced by the yeast.

8. **Benching:** Rounded portions of dough are allowed to rest for few minutes. This relaxes the gluten to make shaping the dough easier. Also, fermentation continues during this time. In large operations, the rounded dough is placed in special proofers for this rest. Smaller operations place the dough in boxes that are stacked on one another to keep the dough covered, or the dough may simply be placed on the work bench and covered-hence the term benching.

9. **Makeup and panning:** The dough is shaped in to loaves or rolls and then placed in pans or on baking sheets. In large or commercial bakeries this is done by machines, but the baker in a small operation does most of the makeup by hand. Proper makeup or molding is of critical importance to the finished, baked product. All gas bubbles should be expelled during molding. Bubbles left in the dough will result in large air holes in the baked products. For both pan breads and hearth breads, the seam must be centered on the bottom to avoid splitting during baking. For units baked in pans, the pan size must be matched to the weight of the dough. Too little or too much dough will result in a poorly shaped loaf.

10. **Final Proofing:** Proofing is a continuation of the process of yeast fermentation, which increases the volume of the shaped dough. Bakers use two different terms so they can distinguish between fermentation of the

mixed dough and proofing of the makeup product before baking. Proofing temperatures are generally higher than fermentation temperatures. Under proofing results in poor volume and dense texture. Over proofing results in coarse texture and some loss of flavor.

11. **Scoring:** Scoring is slashing the dough with a very sharp blade or a knife to allow it to expand during baking. The purpose is primarily to control the direction in which the bread will expand during "oven spring." In other words it is intentionally creating a weak spot on the surface of the loaf prevents the loaf from bursting at weak spots created during shaping. Scoring should be done in one direction only.

12. **Baking:** Here are some changes in the product while baking, they are as follows:Oven spring, which is the rapid rising in the oven due to production and expansion of trapped gases as the result of the oven heat. The yeast is very active at first but it killed when the temperature inside the dough reaches 140ºF (60ºC).Coagulation of proteins and gelatinization of starches. In other words, the product becomes firm and holds its shape.Formation and browning of the crust.

13. **Cooling:** After baking, bread must be removed from pans and cooled and alcohol created during fermentation gets evaporated. The gluten strands need to cool and reconnect. Small rolls spaced out and baked on sheets may be left on them, because they will get adequate air circulation. If soft crusts are desired, breads may be brushed with melted shortening before cooling. Do not cool in a draft, because the crust may crack.

14. **Slicing:** Slicing of bread is done when it has cooled down and the structure has settled. It almost takes around 4 hours for the bread to cool and handy. Slicing is done with the help of sharp bread knife, or it may be done by bread slicer. Warm or freshly baked bread will never cut properly.

15. **Storing:** Breads to be served within 8 hours may be left on racks. For longer storage, wrap cooled breads in moisture proof bags to retard stailing. Breads must be thoroughly cool before wrapping, or moisture will collect inside the bags. Wrapping and freezing maintains quality for longer periods. Refrigeration, on the other hand increase stailing. Hard-crust breads should not be wrapped because the crusts will soften and become leathery.

2.6 BREAD IMPROVERS

We refer to flour as being either strong or weak. The strength of flour varies according to its strength and also according to factors such as starch content, sugar content, the ***water absorption power*** (WAP) of the flour and even the color. These aspects will affect the final outcome. In order to make good bread, it is not always possible to use the right type of flour as the availability may vary. It becomes necessary therefore to add something to the dough in order to bring the product to a

pre determined standard. This addition should be with discretion on knowledge, otherwise, the quality of the bread instead of improving, may actually worsen.

Bread improvers are substances, which when added to dough, enable the baker to produce an improved loaf with better keeping qualities, finer textures, softer crumb, and added bloom and enhanced flavor.

The functions of improvers are:

- Shorten dough resting time
- Increase bread volume
- Increase gas retention
- Speed up proofing time
- Improve crumb texture
- Improve shelf life

There are three main types of bread improvers:

1. Mineral additives
2. Yeast foods
3. Enriching agents

Mineral Additives: Mineral bread improvers are used during the milling of wheat flour. They are commonly used by the baker during production as well. They will include:

1. **Calcium propionate**- it controls the rope and mold disease. It is used 3-5 gm per kg of flour.

2. **Calcium peroxide-**It makes the skin of dough dry, so it can be used in automatic bread plant for moulding as the dough does not get sticky.

3. **Perusulphates** – used by the miller at the rate of ¼ to ½ oz per 280 lbs (one sack). The perusulphates used are potassium and ammonium. Flour treated with perusulphates will take on more water and an increased yield is obtained.

4. **Glycerol Mono Stearate** - The mono glycerol ester of stearic acid, which has remarkable emulsifying power, is used as an emulsion stabilizer and as a crumb softener in bread.

5. **Potassium iodate**- it improves the extensibility of the gluten

6. **Potassium Bromate –** It is used by the miller at the rate of 1 lb per sack (280 lbs). Bromate increases the stability on the gluten to extend. Bromate has an astringent action on gluten thereby increasing the use of water in the dough. It also increases the gas retaining properties of the gluten, thus improving loaf volume.

7. **Lecithin**- It helps to increase the fermentation tolerance, producing better dough machinability, and gas retention power and dough stabilization. It

also gives uniform crust colour, tender crust, uniform grain, smooth texture and anti-stailing quality to yeast products.

8. **Phosphates –** Acid calcium phosphates and ammonium phosphates both have a tightening action on gluten and since phosphates are a necessary constituent of yeast food, they are both fermented stimulants. Acid calcium phosphate (ACP) is used at the rate of 1 lb per sack (280lbs) which can be increased to 2 lbs per sack to inhibit the development of ***rope***. A phosphate is added at the rate of 8 oz per sack.

9. **Ascorbic acid-** It is an oxidizing agent and improves the stability of the dough.

10. **Lime Water –** Lime water was used to retard the fermentation of the dough in hot weather climates. In addition, it has astringent action on the gluten. As lime is alkaline, it reduces the acidity of the dough and thus slows the rate of the fermentation. It is used at the rate of 1 quart per sack.

11. **Organic acid –** Organic acids are natural constituents of fermented dough. They are added to get the dough better conditioned. Lactic acid can be added at the rate of 8 oz per sack. Sussinic acid is added at the rate of 2-4 oz per sack.

YEAST FOODS: Yeast foods indirectly affect the bread in a number of ways by their effect on fermentation. Malt not only provides food directly to the yeast but manufactures further supplies as and when needed whilst simultaneously mellowing and softening the gluten of the flour.

There are two types of malt:

- Diastatic
- Non Diastatic.

Diastatic malt adds to the flavor, it increases the sugar content in the dough and provides diastatic sugar for the fermentation process. Diastatic enzymes also contain Proteolytic enzymes which modify gluten. ***Non Diastatic malt*** serves the dual purpose of providing sugar as well as adding to the flavor. Flour contains natural sugar. Principally, this is sucrose in varying amounts. Normally, it is 2.5 –3%. This amount is not sufficient for satisfactory fermentation. There must be sufficient sugar present for the production of gas that will give the loaf the required volume and to allow for the caramelization of the crust during baking. As sugar contains no nitrogen, they cannot be considered complete foods for yeast, but they produce material from which CO_2 can be produced. Demerara sugar and even treacle can be used in brown breads as they are excellent for imparting flavor and retaining color.

Enriching Agents: Enrichment is a way of increasing nutritional value of the bread along with improvements in volume, texture and the keeping quality of the bread

1. **Fats** - Fats have a physical rather than a chemical effect on dough. As fat is a shortening agent, it reduces toughness, thus making the

product more mellow. It is particularly valuable for use with strong flour with a tough and harsh gluten content. Fats can be used in small quantities to give optimum effect. Fat also increases food value. They add to the moistness in bread thereby retarding staling. They also impart flavor to the bread.

2. **Milk and Milk Products** - Whole milk added to dough has the effect of adding fat as well as sugar, besides calcium salts and casein.

3. **Eggs** – The incorporation of eggs in a bread dough results in many improvements. Egg adds to the increased volume, better texture and better oven spring. It is economical to use as it contributes immensely to improved quality and volume of the product.

VARIOUS GLAZES AND TOPPINGS FOR BREADS

GLAZE/TOPPING	USE
Egg wash glaze	This gives a darker colour, shines to the roll, and also adds a nutrition value. It is advisable to use the egg yolk only; but the whole egg can be used. Beat the egg with a little amount of water and strain it to get smooth flowing egg liquid so that it can be applied with a soft brush or with a piece of cloth.
Salt water glaze	This gives a rustic whitish appearance to the bread. Prior to baking the saline water is brushed on top of the bread. Care should be taken as this could make the bread salty.
Starch glazes	The breads are sometimes glazed with corn starch slurry. This also provides shine to the bread.
Honey glazes	Honey is boiled prior to applying as a glaze, for it is a viscous substance and boiling will allow it to set into a glaze that will stick to the surface of the bread. This glaze is applied after the bread is taken out of the oven. Ensure that the bread is still hot, when this applied. It is mostly done for sweet breads such as gingerbreads, zofp, etc.
Seeds as toppings	Various seeds such as cumin fennel, poppy, sesame, nigella, etc. are sprinkled on top of the bread to improve the look of the bread and add nutritive value and assortment of the rolls on the buffet or in a bread basket. Care should be taken to sprinkle the seed only after the wash or glaze has been applied to ensure the sticking of the seed. The amount of seed to be used will depend upon the intensity of the flavor of the since or the seed.

Nuts as toppings	Various nuts can be sprinkled on breads prior to baking. Following the same principles as in the case of seeds, one must also ensure that the nuts are chopped evenly to be able to be used as topping.
Herbs as toppings	Various chopped herbs can be used as toppings. It is advisable to use dry herbs as fresh herbs will anyways loose their colour when baked in oven. One can create different types of crusts by combining herbs, seeds and nuts to create unique toppings.
Vegetables as toppings	This is used in specific breads such as Italian focaccias. The bread is sprinkled with assortment of grilled or sautéed vegetables such as onions, bell peppers, olives, etc. and are spread along with olive oil and rock salt on top before baking. This should not be confused with the dough and not used as topping.
Flour as topping	Many type of bread are dusted with large amounts of flour prior to baking. It is important to first glaze the bread with plain water as this will allow the flour to stick to the bread. In case bread has to e scored, it is always done after the dusting of flour has been done.
Cereals as toppings	Many cereals, such as oats, bream, germ, bulgur etc. also are used as toppings after applying the water wash. In these cases the top surface of the bread is rolled onto the topping so that the entire surface gets coated. This is done right after the shaping and the bread is allowed to prove with the topping, which disperses evenly when the bread is proved and is ready for baking.

2.6 FAULTS AND REMEDIES

SL.NO	FAULTS	CAUSES
SHAPE		
1	Poor volume	Too much salt Alkaline water used Too little yeast and poor quality yeast Under proofing Dough too chilled Too little liquid Under fermentation of dough Dough too small for the pan Excess of salt, sugar and fat

		Weak / poor quality flour Flour contains high bran Too tight dough Under or over mixing Oven too hot
2	Too much volume	Too little salt Over fermentation Too much yeast Excess of dough weight for the pan Loose molding Too much dough scaled Too slack a dough To low oven temperature Over-proofed
3	Poor shape	Too much liquid Loose molding To low oven temperature Under or over mixing Flour too weak Too little yeast and poor quality yeast Improper molding or makeup Improper fermentation or proofing Too much oven steam
4	Irregular shape	Over ripened dough Rough handling of the dough Use of alkaline water Excess of dough for the pan size Improper fermentation or proofing Over loading in the oven Too strong or too weak flour Too slack or stiff dough Improper mixing Loose molding
TEXTURE AND CRUMB		
1	Too dense or close-grained	Too much salt Too little liquid Too little yeast Under fermented Under proofed
2	Holes and tunnels	Too salt Very hot oven Too weak or strong flour Too slack dough Too much yeast Uneven mixing of ingredients High amount of chemicals used Too much dusting flour

		Improper knock-back, scaling, molding etc. Too little salt Very hard and granular fat
3	Too coarse or open	Too much yeast Too much liquid Incorrect mixing time Improper fermentation Over proofed Pan too large
4	Streaked crumb	Improper mixing procedure Poor molding or make-up techniques Too much flour used for dusting
5	Poor texture or crumbly	Flour too weak Too little salt Dough too slack Less quantity of yeast Improper molding Fermentation time too long or too short Over/under proofed Improper knock back given Too much improvers used Too much dusting flour used Excess of fat or water Slicing hot bread Use of alkaline water Baking temperature too low
6	Gray crumb	Fermentation time or temperature too high
CRUST		
1	Too dark	Too much sugar, salt or milk Under fermented dough Lack of humidity in oven Under-fermented or over mixed dough Oven temperature too long Dough temperature too low Too much diastatic activity in the dough Baking time too long Too much steam in oven
2	Too pale	Under baking Too much yeast Under mixing of dough Low diastatic capacity of the flour Too slack a dough Too much dusting flour used Hot proofing chamber Fermentation temperature high Over proofing
3	Too thick	Too little sugar or fat

		Less diastatic activity of flour Improper/over fermentation Poor quality or too strong flour Baked too long or at wrong temperature Too little steam
4	Blister on crust	Too much liquid Skinning of dough before baking Improper fermentation Improper shaping of loaf Over proofing Uneven baking temperature
5	Top crust shelling	Too stiff dough Under proofing Too high baking temperature Low diastatic activity of flour Under-fermented dough Insufficient sugar
6	Leathery crust	Insufficient cooling before packing Uneven fermentation Too strong flour used Excessive humidity during proofing and baking
7	Hard crust	Excess of water used Use of less fat Improper fermentation Too strong flour used Low temperature of oven Baking time long Excess of dusting flour Excess of sugar
8	Split or burst crust	Over mixing Under fermented dough Improper molding Uneven heat in oven Oven too hot Insufficient steam
FLAVOR		
1	Flat taste	Too little salt
2	Poor flavor	Inferior, spoiled, or rancid ingredients Poor bake shop sanitation Under or over fermented
STORAGE AND PACKING		
1	Poor keeping quality	Insufficient salt, sugar or fat Poor quality of flour Insufficient fermentation Over proofing Too high dough temperature Too stiff dough

		Too slack dough Improper molding bread not cooled before packed Over chilling of bread Slicing hot bread Improper ventilation in store room Improper cutting style Poor storage condition Humid store room Improper sanitation in store room

Finishing touches for bread

Try one of the following finishing touches to "dress" up bread that is risen and ready to bake.	
For Bread With A:	Do This:
Crisp crust	Brush loaf gently with cold water before baking.
Shiny bronzed crust	Brush loaf gently with 1 egg beaten with 1 tablespoon water before baking.
Shiny crust	Brush loaf gently with 1 egg white beaten with 2 teaspoons water before baking.
Golden crust	Brush loaf gently with 1 egg yolk beaten with 2 teaspoons water before baking.
Soft, tender, bronzed crust	Brush loaf gently with milk before or after baking.
Softer, richer flavored crust	Brush loaf gently with a little melted butter before or after baking.
Slashed top	Just before putting the loaf in the oven, slash an oval loaf diagonally three or four times approximately 1/4-inch deep with a serrated knife. Slash a round loaf twice one way and twice again at right angles across the first cuts.
Sprinklings	Brush loaf gently with 1 egg white beaten with 2 teaspoons water before baking. Sprinkle on one or more of the following: Kosher or course sea salt; herbal salt substitute; sesame, sunflower, or poppy seeds; minced garlic or onion; grated hard cheese; or chopped nuts.

Staling and spoilage of bread: Bread is a perishable commodity, which is at its best when consumed 'fresh'. Unfortunately, bread remains 'fresh' for only a few hours after it leaves the oven. During storage it is subjected to a number of changes which lead to the loss of its natural freshness. The factors that govern the rate of freshness loss in bread during storage are mainly divided into two groups; those attributed to microbial attack, and those that are result of a series of slow chemical or physical changes which lead to the progressive firming up of the crumb, commonly referred to as 'staling'.

Some of the changes which occur in bread as a result of staling are:

- Increase of crumb firmness
- Increase in crumbliness of the crumb
- Deterioration in flavour and aroma
- Loss of crust crispiness

ANTI-STALING INGREDIENTS:

1. **Emulsifiers.** For the past several years bakers used emulsifiers called bread softeners to produce bread that will remain soft for a longer period of time. It is added to the dough during mixing. Some of the more common ones are monoglycrides, calcium steroyl lactylate, and sodium steroyl lactylate. The softening action takes place after the bread is baked. Also, Potato bread will resist staling because potatoes act as anti-staling ingredients to some degree. Some anti-staling ingredients also perform as dough conditioners or dough strengtheners.

2. **Enzymes.** Enzyme manufacturers are hard at work on generic engineering and protein engineering producing enzymes to extend the shelf life of bread many fold. In a paper presented at the 1999 American Society of Baking's Annual Convention, it was stated that some of these enzymes are available now. However, since every baker wants to have one better, enzyme manufacturers will continue to work on developing better ones. It was also stated that there is a lag time of between 2 and 3 years between the time a specific enzyme is identified and actually having it available for the baker to use. Advantages of Using Enzymes instead of Chemicals. Since enzymes are produced from natural ingredients, they will find greater acceptance by the housewife than when chemicals are used.

3. **Mold and Mold Inhibitors.** Sanitation plays a very important role in preventing mold in bread. Mold spores do not survive baking temperatures. The interior of the loaf, when it comes out of the oven is about 210 to 212 degrees F. which will destroy any mold spores which may be present in the dough. Therefore, bread and other bakery products can only be contaminated after they leave the oven.

Microbiological Spoilage: Although the ideal temperature of bread for delaying the process of staling is 110^0F, there are chances of microbial growth as they may find adaptable moisture and temperature. The most common microbial spoilage occurs by two agents: Moulds and bacteria and the least common of all types of microbial spoilage in bread are that caused by certain types of yeast.

Mould spoilage: Mould spoilage of bread is due to post-processing contamination. Bread loaves fresh out of the oven are free of moulds or mould spores due to their

thermal inactivation during the baking process. Bread becomes contaminated after baking from the mould spores present in the atmosphere surrounding loaves during cooling, slicing, packaging and storage. They usually form. Mould infestation can be identified by bluish green/ green or pinky coloured velvety spots on bread producing musty odour.

Prevention of mould infestation: To prevent formation of moulds in breads, it is extremely important to follow strict hygiene and sanitation in the bakery, like:

- Proper ventilation and circulation of air.
- Area should be absolutely dry and moisture free.
- Area should be well illuminated.
- Handling bread hygienically.
- Keep on stock rotation every 24 hours. Overstocking may lead to spoilage.
- Maintaining proper room temperature.
- Follow HACCP plan.

Bacterial Spoilage: Rope is a germ disease caused by bacteria (*bacillus mesentericus or bacillus pulmilus*). The germs are most likely to develop during hot weather in bread that is not sufficiently fermented or not well baked. This disease breaks down the cells of the bread and leaves a sticky, pasty mass. When the crumb is pressed together, and pulled apart, it will stretch into long, sticky, web-like strands. The product will have the odor of over-ripe cantaloupe, very repelling. The bacteria may be present in the ingredients, especially flour and yeast. Unlike mold, rope spores are not destroyed by baking temperatures.
Symptom of roppines:

- Repelling odour, something like over-ripe cantaloupe.
- Soury and bitterly taste
- Sticky and web-like crumb
- Reddish brown coloured crust.

Prevention of Rope disease:

- Regulate the acidity of the bread-add vinegar or acetic acid or reduce the pH
- Proper ventilation and circulation of air.
- Area should be absolutely dry and moisture free.
- Area should be well illuminated.
- Handling bread hygienically.
- Keep on stock rotation every 24 hours. Overstocking may lead to spoilage.
- Maintaining proper room temperature.
- Follow HACCP plan.

2.7 YEAST

After flour, yeast is the most important ingredient for yeast products. It is a living microorganism which cannot be seen by naked eyes and is a form of plant life. Yeast was discovered by Louis Pasteur in 1859. In olden days most of the bakers used barn method of bread making. A liquid media was made with hope decoction, boiled potatoes, sugar, flour etc. in which wild yeast was cultured. It was necessary to use prolonged fermentation. Due to prolonged fermentation periods, bread had that peculiar fermentation flavor which is still remembered by the people

nostalgically. However times have changed, baker's yeast is easily available and bakers botheration about uncertainties of fermentation have been eliminated.

Yeast belongs to the fungi family. It is a very small single cell micro-organism. Like all other fungi it doesn't have the power to produce food by photosynthesis. Instead it ferments carbohydrates (sugars) to produce carbon dioxide and alcohol which gives bread its texture, colour and aroma. There are several types of yeasts but the important ones used by the baking industry are those belonging to the genus *Saccharomyces cerevisiae*, which means "sugar eating yeast".

Yeast grows and multiplies at blood temperature. There are innumerable varieties of yeast, of these, only a few are suited to bread-making. Strains of such yeast are isolated and then nurtured under simulated conditions. This yeast can then be compressed and sold fresh or dried and sold in granular form.

The function of yeast is to make the dough rise. It is during the rising and proving that carbon dioxide is emitted and forms bubbles which not only cause the dough to rise but make the baked bread porous. The small quantity of alcohol produced evaporates in the heat of the oven. The second function of yeast, equally vital to producing quality bread, is to assist the ripening or mellowing of the gluten in the dough, so that when the item is baked, the gluten is in a condition, which gives evenly to the expanding gases and at the same time retains them (gases).

To obtain the best results from yeast, the dough should be well-kneaded so that it spreads well. The bowl, liquid and flour should be warm. Fresh yeast should be stored at 40°F/4°C in a refrigerator. Do not store it in the deep freezer. Dry yeast can be frozen in cans or else stored in a cool place. Yeast should be creamy in color, moist and should crumble easily. A slimy brown color or strong odour is signs of yeast gone bad.

Yeast acts well at temperatures between 75°F-800F/22^{0}C-26°C and is destroyed at 140°F/60^{0}C. It should never be mixed with dry salt or sugar or dispensed in a strong solution of either, which will kill the yeast. As a living organism, it can never be dissolved in liquid.

Yeast Fermentation: The process of reproduction of yeast cells is called fermentation. At favourable temperature and moisture and food (sugars present in carbohydrate of flour) the yeast begins to reproduce and multiply vigorously producing ethyl alcohol and Carbon dioxide. The production of both these helps the dough to rise. When baked both the gasses evaporate with the steam. This process is called *alcoholic fermentation*.

$$C_6H_{12}O_6 + O_2 \quad + \quad \text{Yeast} \longrightarrow C_2H_5OH + CO_2 + \text{Energy}$$

Yeast activation and the initiation of fermentation are triggered by hydration, from either water or some other liquid, and the presence of a food source. Yeast feeds on sugar derived from the complex starch molecules from flour, a complex

carbohydrate. The starch molecules are broken apart into simpler sugar molecules from enzymes in the flour when hydrated. Flour tastes like sawdust because its sugar components are too complex to differentiate on the tongue. The enzyme is a catalyst, which breaks apart the threads, freeing them so they become accessible to yeast and bacteria. Yeast lacks amylase and cannot break down starch into sugar. Since flour's endowment of sugars can only feed yeast cells for a short period of time, flour millers add malted wheat or barley, grains that have been allowed to sprout and develop enzymes that break down starches into sugars, or enzymes extracted or purified from microscopic molds ('fungal amylase'). See also "Diastatic malt". Yeast also feeds on added sugar. As little as 1 or 2 teaspoons of sugar / sweetener give the yeast a boost and make the dough rise.

The yeast breaks down these simple sugars, such as glucose and to a lesser extent, fructose, into smaller and simpler molecules with every step, for energy (food), from which it grows and multiplies (budding known as mitosis), and exudes a liquid that releases carbon dioxide and ethyl alcohol into existing air bubbles in the dough. Fermentation typically ends with the bread baking stage.

Factors affecting fermentation - Slower fermentation is best for the development of flavor and gluten strength.

1. Temperature of the dough; optimal fermentation temperature is 78 - 82 degrees F
2. Temperature of the room: optimal temperature being 75 - 80 degrees F. (When the temperature exceeds 85 degrees F, off flavors result.) Dough can still rise in cooler environments, but much more slowly.
3. Fermentation time; allows for the development of distinctive flavor and texture, depending on type of pre-ferment
4. Amount of yeast; the more yeast the faster the fermentation. Too much can add an undesirable yeasty flavor.
5. Type of yeast; instant active dry yeast contains fast acting yeast
6. Amount of salt; typical Baker's Percent is 1.8 to 2.5
7. Amount of sugar; small quantities (up to 5 Baker's Percent) increases yeast activity. Above 10 Baker's Percent, slows yeast activity
8. Type of sugar; sucrose, glucose and fructose are fermented rapidly; maltose is fermented slowly; lactose is not fermented at all
9. PH of dough; optimal pH is acidic 4 to 6. Above, fermentation slows. As yeast ferments, it produces acids to lower the pH to that range
10. Presence of antimicrobial agents; most spices, have antimicrobial activity, such as cinnamon and can slow fermentation. Be careful how much is added to the dough directly

BACTERIAL FERMENTATION: Bacterial fermentation from Lactobacilli is another type of fermentation that affects bread, especially with sourdough or wild-yeast pre-ferments. These are rod-shaped bacteria that assist the process of fermentation and produce flavoring acids, such as lactic and acetic acids, plus too many to name, along with CO2 as by-products of metabolism (fermentation). They are held in by an elastic gluten network developed in the bread dough, formed by

mixing, kneading and/or rising moistened wheat flour, which leavens or causes the bread to rise. The alcohol expands as a gas during the early stages of baking, adding significantly to oven spring and also adds to the bread's flavor. Both the carbon dioxide and alcohol evaporate during baking, leaving behind a well risen loaf, with flavor from the alcohol.

2.7.1 VARIETY OF YEAST

Variety and composition: There are two types of baker's yeast available in the market according to their maturity and the main differences being the moisture contents. Though each version has certain advantages over the others, the choice of which form to use is largely a question of the requirements of the recipe at hand and the training of the cook preparing it. In general, with occasional allowances for liquid content and temperature, the different forms of commercial yeast are considered interchangeable.

A. Fresh yeast- -Cream yeast
-Compressed yeast

B. Dried yeast- - Active dry yeast
- Instant yeast
- Rapid-rise yeast
- Deactivated yeast

1. **Cream yeast -** is the closest form to the yeast slurries of the 19th century, in essence being a suspension of yeast cells in liquid, siphoned off from the growth medium. Its primary use is in industrial bakeries with special high-volume dispensing and mixing equipment and it is not readily available to small bakeries or home cooks.

2. **Compressed yeast** - is, in essence, cream yeast with most of the liquid removed. It is a soft solid, beige in color, and best known in the consumer form as small, foil-wrapped cubes of cake yeast. It is also available in larger-block form for bulk usage. It is highly perishable; though formerly widely available for the consumer market, it has become less common in supermarkets in some countries due to its poor keeping properties, having been superseded in some such markets by active dry and instant yeast. It is still widely available for commercial use, and is somewhat more tolerant of low temperatures than other forms of commercial yeast; however, even there, instant yeast has made significant market inroads.

3. **Active dry yeast -** is the form of yeast most commonly available to non-commercial bakers in the United States. It consists of coarse oblong granules of yeast, with live yeast cells encapsulated in a thick jacket of dry, dead cells with some growth medium. Under most conditions, active dry yeast must first be proofed or rehydrated. It can be stored at room temperature for a year, or frozen for more than a decade, which means that it has better keeping qualities than other forms, but it is generally considered more sensitive than other forms to thermal shock when actually used in recipes.

4. **Instant yeast** - appears similar to active dry yeast, but has smaller granules with substantially higher percentages of live cells per comparable unit volumes. It is more perishable than active dry yeast but also does not require rehydration, and can usually be added directly to all but the driest doughs. In general, instant yeast has a small amount of ascorbic acid added as a preservative. Some producers provide two or more forms of instant yeast in their product portfolio; for example, LeSaffre's "SAF Instant Gold" is designed specifically for doughs with high sugar contents, and such yeasts are more generally known as osmo-tolerant yeasts.

5. **Rapid-rise yeast** is a variety of dried yeast (usually a form of instant yeast) that is of a smaller granular size, thus it dissolves faster in dough, and it provides greater carbon dioxide output to allow faster rising. There is considerable debate as to the value of such a product; while most baking experts believe it reduces the flavor potential of the finished product, Cook's Illustrated magazine, among others, feels that, at least for direct-rise recipes, it makes little difference. Rapid-rise yeast is often marketed specifically for use in bread machines.

6. **Deactivated yeast** is dead yeast which has no leavening value and is not interchangeable with other yeast types. Typically used for pizza and pan bread doughs, it is used at a rate of 0.1% of the flour weight, though manufacturer specifications may vary. It is a powerful reducing agent used to increase the extensibility of dough.

CONSTITUENTS OF YEAST

Constituent	Fresh Yeast (%)	Dry Yeast (%)
Protein	14	46
Carbohydrate	10.20	36
Fats	0.46	1.50
Mineral matter	2.34	8.10
posture	73	9.00
Enzymes	Present	Present
Vitamins	Present	Present

The composition/constituent varies with the type of yeast and the conditions under which it is grown. Yeast contains a relatively high level and better quality protein. The principal carbohydrate of the yeast is glycogen and secondly hemicelluloses. The mineral content of the yeast consists of oxides of phosphorus, potassium, magnesium, calcium, silicon, sodium and sulphur with traces of chlorine and iron. Vitamins B and C also are present in the yeast.

Characteristics of Good Fresh Yeast:

1. Compressed yeast, when in fresh condition, should have a pleasant aroma like ripe apples.

2. The colour will be slight yellowish or cream.
3. It should be firm springy and moist to touch
4. When broken, it should be sharp and have clean fracture without crumbling.

Note: Poor yeast qualities are off odour like over-ripened apple, brownish colour. They crumble when broken and are dry hot to touch

2.8 VARIETY OF YEAST DOUGH PRODUCTS

Bread making is a skill that is learned best with a reliable recipe and lots of practice. It can lead to wonderful homemade breads and rolls instead of store bought ones. Many people who make bread as a hobby enjoy the pleasant aromas provided by a freshly baked loaf of bread.

There are two basic yeast doughs, batter and kneaded. Batter breads are really a shortcut way to make breads - they require no kneading. Kneaded breads require more time and energy than batter breads. However, both types of yeast dough must rise before shaping and baking; this allows the yeast to activate.

Batter breads - The flour is beaten into the dough with an electric mixer instead of being kneaded. The dough is stickier because less flour is used. It spreads in a pan instead of shaped into loaves or rolls. Batter bread is coarser in shape and texture than bread prepared with kneaded dough. It has a higher ratio of liquid to flour and other dry ingredients; beating the batter a few minutes develops the gluten, though not as much as a kneaded bread. The dough rises only once, in the bread pan. Batter breads generally do not rise as high as kneaded breads.

Kneaded breads - A smoother-textured bread results from kneading yeast dough by hand, with an electric mixer or food processor. The dough is allowed to rise before shaping; shape is symmetrical and well-proportioned with a rounded, smooth top. Finally, the bread is baked. Breads prepared in electric bread machines are also kneaded breads. Kneaded breads offer many options for bakers, especially in regards to shaping. Color of crust is an even golden brown, slightly darker on top than on sides and bottom, crust is tender, smooth, crisp, and free from cracks, Size is large but not airy in proportion to weight, inside color is creamy white and free from streak, texture is tender, soft, slightly moist, not crumbly or doughy, Flavor is pleasing with a mild yeast overtone. Examples of kneaded breads include loaf breads, baguettes, pan rolls and crescent rolls.

Methods of preparation of yeast dough products:

1. Straight dough mixing method

The simplest and most common way of mixing yeast dough is called straight dough mixing method. In this method all the ingredients are mixed together at the same time. When the ingredients are mixed, either by hand or by mixer, the yeast starts to develop immediately. Though the process is not difficult, but one has to follow the following steps:

i. Scaling- precise measurement of the ingredients is very important as it affects the final product.
ii. Yeast hydration- soaking process of the yeast, so that it is activated and starts to work.
iii. Pickup- this is the first stage of mixing. Start with low speed to combine yeast and water, oil, if used to be added next, followed by dry ingredients. Shortenings, if used, added at last. After everything has been added increase the speed to make the dough.
iv. Gluten development- kneading the dough caused the gluten strands to stretch and expand. The network of elastic strands that form during gluten development is important because it enables dough to hold in the gas bubbles that are formed by the yeast without breaking through the dough. The gas bubbles cause the dough to rise. Well kneaded dough must be shiny and elastic.
v. Bulk fermentation- yeast on subjected to favorable temperature, food and moisture starts to grow by multiplication- a process is fermentation, which causes the dough to rise until double or triple in size. Breads made from under-fermented dough will not rise and have yeasty, sour taste. Surface of the dough should be oiled so that the moisture should not evaporate and make the dough dry. The container in which the dough is to be placed should also be oiled so that the final product may not stick to it. Cover the dough with plastic wrap or a clean damp cloth and keep it in warm place until rising has been completed.
vi. Folding- the risen dough is again folded on a floured work surface, so that the gas is evenly distributed and excess can be released. The dough is then scaled into pieces for size consistency and baked.

2. Modifying the basic method

Rather than adding all the ingredients at once, the modified straight dough method add ingredients in steps so that better distribution of fat and sugar occurs. This process is useful in enriched yeast dough

Enriched yeast dough-In this type milk is used instead of water as in the basic straight mixing method. This type of dough is softer and stickier than regular lean dough. The steps of its preparation are as follows:

Hydrate yeast. Add flour. Add liquids (milk, cream, eggs, oils or melted butter) and sweetener (honey, maple syrup, sugar). Mix the dough until all the flour is evenly moistened. Add additional butter (room temperature or soft) gradually (if the formula calls for it) until evenly blended. Continue to mix and knead the dough until it is properly developed.

3. Sponge mixing method

The sponge method combines one-third to one-half of the formula's total liquid with all the yeast and enough flour to make very loose dough. This dough is called *sponge.* A sponge is mixed in the same bowl you will use to prepare the entire batch of dough. When the sponge has doubled in size, the remaining ingredients are added

to the sponge and mixed to make dough. Breads made with sponge have richer, deeper flavour and improved texture.

Pre-ferment- a pre-ferment is called dough starter, is similar to sponge. Some or all yeast is mixed with water and some flour to create a pre-ferment. This is allowed to ferment for a specific time and is then added to the dough before its final mixing. The pre-ferment increases the fermentation timed, which increases the strength of the gluten in the dough. This adds depth and complexity to the flavour while extending the shelf life of the bread.

There are several types of pre-ferments. Each with different flavour and is used for different breads. For example:

i. **Poolish-** combining equal quantity of water and flour (by weight) with some yeast (poolish) and then allowed to ferment. The amount of yeast varies depending upon how long the polish will be allowed to ferment. To contribute maximum flavor, a poolish is made with only a small quantity of yeast and given a long fermentation at room temperature. The polish is added to the rest of the ingredients during mixing. The poolish bubbles up and increase in volume, and when it is at its peak, it starts to fall back slightly and the top surface appears wrinkled. The poolish given a slow fermentation may hold its peak quality for several hours. After this period, the acidity will increase and the quality will deteriorate. If a shorter fermentation is needed, use more yeast. In this case, however, the starter will be at its peak of quality for a shorter time before it starts to deteriorate.

ii. **Biga-** it is an Italian pre-ferment similar to poolish, but biga is stiffer because it contains less water. Stiffer doughs ferment more slowly than wet ones; a biga is generally made with more yeast. A typical biga contains 100% flour, 50 to 60% water, and about 1 to1.5% fresh yeast.

iii. **Sour dough-** it is tangy and sour flavored dough made from wild yeast. The difference between sour dough and most other pre-ferments is that sour dough starter can be kept alive for a long time, sometimes hundreds of years.

iv. **Pate fermentee or scrap dough-** a French term meaning "old dough", is a piece of dough saved and added to a new batch along with the flour, yeast, and liquid, wrap the pate fermentee airtight and can be saved for 48 hrs to 3 months. Saving a piece of fermented dough, preferably in the retarder so it doesn't over ferment, is an easy and common way to get the benefits of using a pre-ferment without having to make one separately. Of course, it is also possible to make a batch of bread dough just to use as a pre-ferment. Because scrap dough is actually bread dough, it differs from other ferments in that it contains salt as well as flour, water, and yeast.

v. **Levain-levure-** This is the general French term for yeast pre-ferment. It is usually stiff like a biga, but the term is sometimes used for thin pre-ferments like the poolish as well. The word *levure* means "yeast." Do not confuse

levain-levure with the word *levain* alone. *Levain* means sourdough starter, and *pain au levain* means sourdough bread.

vi. **Rolled-in dough-** fat can be used to add flavour to any kind of yeast dough. When fat is rolled in or folded into dough, it adds flakiness. Buttery yeast pastries, such as the classic Danish and croissant, get their feature flakiness from folding the dough into many thin layers with butter layers in between. The process of rolling in and folding in fat creates layers of dough called *rolled- in yeast* dough because it is made up alternating layers of dough and fat. The fat layers produce steam in the oven, creating lightness by puffing up the thin dough layers. The dough is rolled into triangle, layered with chilled butter, and folded to third, like a letter. The process is then repeated. The added handling of rolling and folding means that one should not knead the dough as much as regular yeast dough. Over handling laminated yeast dough can ruin the finished product, making it tough and chewy. The final dough is then refrigerated which has shelf life of about 20 days.

When pure pre-ferments like the poolish and biga are used in bread, they are usually the only source of leavening. On the other hand, scrap dough is usually used in smaller quantities- that is, as a smaller proportion of the finished bread dough—and may not be strong enough to ferment the bread on its own. Yeast may be added in addition to the scrap dough when the final bread dough is mixed. In other words, such bread dough is straight dough to which scrap dough is added. This method, in which both a preferment and a fresh addition of yeast are used to provide leavening, is sometimes called mixed fermentation.

Yeast-bread garnish – yeast- bread garnishes are ingredients that stay separate from the dough's structure while maintain a distinctive flavour. Some garnishes are mixed into the dough before the dough rises. For example, black olives and cranberries are added to the bread dough before the dough rises. Blueberries and chocolate chips are garnishes added to pastries before dough rises. Other garnishes are added after the dough as risen, as with filled croissants. The dough is folded or rolled around the garnish. Garnishes add crunch and flavour to dough, but they can also add extra weight. More yeast may be required, depending on the quantity of filing that will be added. It is important to consult for the precise ratio of garnish to the flour in the recipe.

2.7.2 LEAN YEAST BREADS

Lean dough (also called hard dough) is the most basic type of yeast dough low in fat and sugar. Only the bare essentials – flour, yeast, salt and water – are used to make it. Spices, herbs, dried nuts, and fruit may be added, but very little (if any) sugar and fat is included. Hard crust breads and rolls such as French and Italian breads and pizza crusts. Pizza crust, hard rolls, Italian-style bread, and the slender French baguette, with its chewy texture and hard crust, are classic examples of products made with lean dough. Whole-wheat, rye, pumpernickel, and sourdough breads are also variations of lean dough. The coarse flour used in these breads makes for a denser texture. Other white and whole wheat breads and dinner rolls. These are very

lower in fat and sugar and sometimes contain eggs and milk solids and as because they are richer, they have a softer crust.

Lean dough can be difficult to handle because little or no fat is used. Commercial bakeries sometimes use chemical dough conditioners such as chlorine dioxide to produce a more stable dough, increase loaf volume, and prevent the loss of leavening.

A pizza crust is made from a lean dough that is stretched or rolled until it is thin. There are several options for shaping the dough once it is properly fermented. You may simply stretch it out by pulling on the edges of the dough. Or you use a rolling pin to stretch it out. The most entertaining approach calls for the sough to be draped over your fist and repeatedly spun off your fists and into the air. Each time you toss and catch the dough, it stretches a bit more.

Soft Dough: The soft slices of Pullman bread, which is typically used for sandwiches, are made with soft dough (also called medium dough). It is lean dough with sugar and fat added. The amounts of fat and sugar vary from 6 percent to 9 percent. Pullman slices get their square shape from the covered loaf pans in which the loves are baked. You can also use soft dough to make soft rolls that you can shape into knots or cloverleaf balls. Fat and sugar help make soft dough tender when it's baked and give it a soft crust.

2.7.3 RICH YEAST BREADS

Rich doughs are yeast based doughs that contains butter, cream, some kind of fat or eggs. Rich dough produces bread that is soft with a tender cake-like texture. When lean dough is enriched with butter, oil, sugar, eggs or milk products, it becomes enriched dough (also called sweet rich dough); enriched dough has fat and sugar amounts up to 25 percent, making the dough sweet and rich. The addition of fat and other ingredients changes the texture of the dough, making it softer and a bit more difficult to handle. It also slows down the yeast activity and requires more time for the dough to ferment.

Eggs and butter not only tenderizes, but they also create soft crust and a golden color. The percentage of eggs is important because too many eggs will result in heavy dough. The finished product should have a cakelike texture.
Sponge method of preparation is used, so most of the fermentation can take place before fat and sugar is added. These doughs are generally under-fermented. When sugar is 12% or great, osmo-tolerant yeast is the preferred yeast, as regular yeast becomes fairly inactive when sugar quantities are high. If osmo-tolerant yeast is unavailable, multiply the yeast quantity by 1.3 to get the amount of regular instant yeast to substitute.

Makeup and Baking of Sweet Dough Products
There are a number of techniques applicable to rich dough products.

- **Egg wash:** Many sweet, unlaminated types of dough and nearly all laminated doughs are egg washed before baking.

- **Proofing:** keep the proofing temperature at 80°F (27°C) or lower so as to not melt the butter in the dough.
- **Baking:** some steam is beneficial at the beginning of baking; but too much steam can damage the egg wash coating.

Laminated Doughs

- Croissant dough resembles a puff pastry dough with the addition of yeast.
- Danish dough, brioche style, is a richer dough containing eggs. It is also referred to as brioche feuilletée or flaky brioche.
- Laminated doughs require much less mixing than sweet, non-laminated doughs because the gluten continues to develop during the rolling-in process.

Basic Stages in Production of Laminated Doughs

- Preparing the dough.
- Selecting and preparing the fat for lamination.
- Enclosing the fat inside the dough.
- Rolling and folding the dough to develop the proper layers.

Butter is the preferred fat because it melts at body temperature, produces a better flavor and color and it has better eating qualities. Butter is more difficult to work with than specially formulated roll-in fats because it is hard when cold and very soft when a little too warm.

Enriched dough is used around the world to create some of the best loved yeast breads, cakes and rolls, including the following:-

- **Cinnamon Buns:** Sugar and cinnamon are spread on sweet dough that is rolled and then sliced before baking to make cinnamon buns. Raisins are sometimes added to the dough. Drizzled with icing and served warm, these comforting confections have become an American Standard.

- **Hot cross buns:** A signature cross made of icing tops a hot cross bun. These sweet yeast buns originated in England and were traditionally served on Good Friday. They are popular for Easter breakfast too.

- **Braided Easter egg Bread:** Sweet bread is brained around colored Easter Eggs for this holiday bread.

- **Pan de muertos:** Mexican holiday bread, pan de muertos, bread of the dead) is sweet bread, flavored with orange zest, orange juice and anise seeds, that is traditionally baked around the Day of the Dead. The bread is often decorated with bone-shaped pieces of dough.

- **Brioche:** A rich French bread, Brioche often has a knotted top and is made in individual molds with a fluted base. It can also be made into round loaves or rolls. Brioche dough is used as a crust to wrap cheese, sausage, and other food.

- **Challah:** A sweet and airy bread made with lots of eggs, Challah is a Jewish bread that is usually braided. Traditionally served on the Sabbath and holidays, this bread is a treat on any occasion.

- **Stollen:** The Traditional Christmas bread of Germany, stollen is a sweet, loaf shaped yeast bread that is filled with dried fruit and topped with icing and cherries.

- **Kuchen:** Another German original, the popular Kuchen, a sweet, yeast-raised cake filled with fruit or cheese, has spread throughout Europe and the United States. Kuchen can be served for breakfast, teatime, or desert.

- **Kugelhopf:** A light yeast cake filled with candied fruit, nuts and raisins, kugelhopf is usually baked in a fluted ring mold. A tradition of Austria, kugelhopf is also associated with Poland, Alsace and Germany.

2.7.4 QUICK BREADS

Quick bread is any bread leavened with leavening agents other than yeast or eggs or it is flour mixture made with fast acting leavening agents. An advantage of quick breads is their ability to be prepared quickly and reliably, without requiring the time-consuming skilled labor and the climate control needed for traditional yeast breads. The other leavening agents include chemical agents which are sodium bicarbonate, and potassium bi carbonate.

Quick breads include many cakes, brownies and cookies—as well as banana bread, beer bread, biscuits, cornbread, muffins, pancakes, scones, and soda bread. Typical ingredients include:

- **Flour –**foundation of quick breads- provides structure
- **Eggs –**provide added volume and structure; a natural leaveners
- **Fat –**keep baked products moist and tender; aids in creaming/mixing
- **Sugar -**improve flavor and color; also aids in creaming
- **Salt –**strengthens gluten and enhances flavor
- **Leavening agent –**allow quick breads to leaven, or rise
- **Liquid –**adds moisture; allows dry ingredients to be blended into a batter or dough; helps produce gluten

QUICK BREADS ARE PRODUCED BY ONE OF THREE METHODS:

- **Biscuit method or pastry method:** Cut the fat into dry ingredients (flour, Sugar, salt, leavening agent) then add liquid. It is used for mixing pie pastry.

- **Blending method or muffin method:** combine liquid, sugar, liquid fat and eggs then add dry ingredients. This method is not as suitable for formulas high in fat, unlike the creaming method described next. Consequently, quick breads mixed by this method are not as rich and cakelike as muffins and other products mixed by the creaming method. They tend to be a little drier, more

like breads than cake. This method is used for muffins, pancakes, waffles, and many loaf type or sheet-type quick breads.

- **Creaming Method:** Mix sugar and shortening, then add eggs, and finally add the dry and liquid ingredients alternately. The creaming method is especially useful for products with high fat and sugar content because it helps mix the ingredients more uniformly. This method is sometimes applied to muffins and loaf breads.

Types of quick breads:

1. Dough-thicker in consistency; they can be rolled and cut into shapes prior to baking. Examples: biscuits and scones

2. Batters-either a pour batter or drop batter
    - Pour batters vary in consistency. Examples: pancakes or waffles
    - Drop batters are so thick they need to be scraped or dropped from a portion or ice cream scoop to the cookware. Examples: muffins and loaf breads

Loaf breads are made from a drop batter or a very thick pour batter. Baking powder is the chemical leavening agent used. The baked product should:

- Have a uniform texture
- Have a crust that is lightly browned, but not thick
- Be moist and tender, not tough and dry
- Have rounded tops with a split down the center

Time spent mixing loaf bread batter is crucial. Under mixing will result in a lumpy batter with dry pockets of flour. Over mixing will overdevelop the gluten resulting in a tough product with tunnels. Mix lightly and only long enough to blend all the ingredients. Flavouring agents that can be added are- nuts, berries, banana and pumpkin, etc.

2.9.4 ARTISAN BREADS

An artisan baker is craftsperson's who is trained to the highest ability to mix, ferment, and shape and bake a hand crafted loaf of bread. They incorporate the science behind the chemical reactions of the ingredients and use them to create the most optimal environment for the bread to develop. Basically, artisanal bread is a bread made by a craftsperson using largely traditional techniques i.e. homemade, handmade, made in small quantities and lacking in preservatives. It is usually assumed that such a bread is largely made by hand, however many artisanal bakeries use mixers, hydraulic dividers, and molders so the amount of hands on craftsmanship is greatly diminished.

How to tell True Artisan Bread from one that is called Artisan? Begin by looking at the ingredients. True Artisan Breads usually only include flour, water salt and yeast. Sour based dough's may not even include yeast in the ingredients. Flavored Artisan breads may list other ingredients like olives, tomatoes, garlic, and herbs. True

Artisan Breads will have their own unique, irregular shape, there is no cookie cutter process used when it comes to making and baking True Artisan Breads. Controlling the fermentation and the action of natural bacteria can produce amazing artisan breads that have flavor profiles from a light delicate flavor to a deep, strong, rustic flavor.

Traditional production methods: Bread has been made for centuries without the use of any machinery except, of course, ovens, and until recently those ovens were wood-fired. Today's artisan bakers try to duplicate as much as possible these traditional methods. As already noted, at least part of the production should be by hand, even if mixers are used to make the dough. Bakers also seek out flours similar to those used for old-fashioned European breads, most notably flours with slightly lower protein content and higher ash. Also, because the fermentation process is so important for flavor, doughs are usually fermented for longer times at lower temperatures, often without the use of proof boxes. Hearth ovens or deck ovens are invariably used, and some bakeries have even installed wood-fired hearth ovens for their breads.

Use of pre-ferments and sourdough starters A *pre-ferment* is a fermented dough or batter that is used to provide leavening for a larger batch of dough. The discussion of the sponge mixing method in the previous chapter introduced the subject of pre-ferments. As we learned, one advantage of using a sponge is that it creates more flavor by means of a long, slow fermentation. A sourdough starter is similar to a yeast preferment, except it uses wild yeast instead of commercial yeast.

No chemical additives or preservatives: The classic artisan bread is crisp-crusted bread that contains nothing but flour, water, and salt, and it is leavened either by wild yeast (sourdough) or commercial yeast. Other ingredients may be added for some specialty breads, including dough ingredients such as milk, eggs, and butter, and add-ins such as herbs, spices, nuts, dried fruit, and olives. But all ingredients should be recognizable by the consumer as familiar food items.

Pre-ferments and sourdough starters: There are two basic types of pre-ferments: *yeast pre-ferments*, sometimes called *yeast starters*, and *sourdough pre-ferments*, usually called *sourdough starters* or *natural starters*. Sourdough starters are similar to yeast pre-ferments except that they are made with wild yeasts and bacteria (*Lactobacillus)*. As a result, they are handled somewhat differently. These starters are "sour" because of the acidity created in the dough during the long fermentation. This acidity affects not only the flavor of the bread but also the texture and leavening. The starches and proteins are modified by the acids, resulting in a moister crumb and better keeping qualities. They are called as natural starters because before commercially prepared yeast was available, bread was started by mixing flour and water and letting this mixture stand until wild yeasts began to ferment it. This starter was then used to leaven bread. A portion of the starter was saved, mixed with more flour and water, and set aside to leaven the next day's bread. This process is still used today.

Autolyse: Autolyse is a method whereby the flour and water (of a bread recipe) are first mixed together, and then rested for a period of time. This helps make exceptionally extensible dough. The rest period of this unleavened dough is around 15-30 minutes, after which the leavened sponge and salt are added to complete the mixing/kneading process. During the autolyse period, the flour is hydrated with no competition from the other dry ingredients. Flour proteins and damaged starch have ample time to hydrate, oxidation happens, enzymes become active (protease enzymes improve the extensibility of dough), and gluten is allowed to relax before kneading. Autolyse reduces the total mixing time and increases the extensibility of the dough. This improves the gluten structure in the bread, making strong, extensible, less-sticky finished dough, easier to handle and to mold into loaves. It also improves the texture of the baked bread. Because of the improved gluten structure, mixing time is reduced, meaning less air is mixed into the dough, improving the dough's color and flavor. This is because the oxygen in the air has a bleaching effect.

The loaves with autolyse period are bigger, lighter, has strong, open crumb and better keeping qualities. Autolyse process is better used in machine mixing rather than hand kneading, as hand kneading is a slow process that does not build up tension in the dough. The autolyse method is very favorable for baguette production.

Fermentation: After the finished dough is made, the next step in the production of yeast breads is fermentation. The basics of this stage of production are explained in topic 2.8, but additional information is also needed by the artisan. One of the advantages of using pre-ferments is the improvement in flavor and texture caused by the extended fermentation time. This holds true for the fermentation of the finished bread dough as well. Most production breads are fermented in proof boxes at a temperature of about 80°F (27°C). A lower temperature is preferable for artisan breads. Before the development of proof boxes, doughs were simply fermented at room temperature. Attempting to duplicate these conditions, artisan bakers may use fermentation temperatures in the range of 72° to 75°F (22° to 24°C). At these slightly cooler temperatures, dough's made with yeast pre-ferment may take two to three hours to ferment until double in bulk.

Sourdoughs ferment more slowly and may take eight hours to ferment at these cooler temperatures. Some bakers make sourdoughs at the end of the workday and allow them to ferment overnight. The following morning, they then make up, proof, and bake the loaves. It is possible to ferment any of these doughs-yeast pre-ferment doughs and sourdoughs-at a still lower temperature of about 68°F (20°C).

Keep in mind, however, that the fermentation period will be longer. More acidity will develop because the acid-forming bacteria will be more active than the yeast. This increased acidity may or may not be desirable, depending on the product. You may want to experiment with the results of various fermentation temperatures and times.

Baking: Earlier artisan breads were usually baked as hearth breads. That is, they are baked directly on the deck or floor of deck or hearth ovens. If you must bake them in

rack ovens, it is best to use perforated pans rather than solid pans, because the perforated pans allow for better heat circulation and more even browning of the crust. Most lean hearth breads are best baked in a hot oven preheated to 425° to 450°F (218° to 232°C) until the crust takes on a rich, deep brown color. Lower range of the hearth was for larger loafs and the hotter temperature for smaller products. Shiny brown crust resembled richer flavour while pale golden resembled blander flavour.

Steam should be used for at least the first 15 minutes of baking. Injecting moisture into the oven delays the formation of the crust so the bread can expand fully. Thus the crust will be thin and crisp rather than thick and hard. The moisture also affects the starches on the surface of the bread, aiding in creating a more attractively browned crust.

2.8 SUMMARY

- Pastries are generically classified into seven types according to their preparation methods, like Short crust pastry, Puff pastry, Flaky pastry, Rough puff pastry, Danish pastry, Choux pastry, Hot water pastry
- The primary ingredients used in making pastry are: Flour, Fat or shortening, Liquid, Salt, Sugar and Egg.
- Short crust pastries are a mixture of flour, fat, sugar and sometimes egg and milk. The flour should have low gluten content, one that is milled from soft wheat flour. The fat will reduce the extensibility of the gluten that is it makes the gluten strands shorter.
- Laminated dough is a culinary preparation consisting of many thin layers of dough separated by butter, produced by repeated folding and rolling. Such doughs may contain over eighty layers.
- Rough Puff- pastry is the quickest method of making a laminated pastry. In this method, the fat is mixed into the sieved flour in pieces, the size of walnuts. A dough is made using water and a little lemon juice, without using too much pressure so that the fat does not completely blend into the dough. The dough is then rolled out like the Flaky pastry method and the process is repeated two more times.
- Danish pastry is a multilayered, laminated sweet pastry developed into a Danish specialty. They are a variant of puff pastry made of laminated yeast-leavened doughs, creating a layered texture
- Filo pastry- or phyllo) is very thin unleavened dough used for making pastries such as baklava and börek in Middle Eastern, Greek, and Balkan cuisines. Filo-based pastries are made by layering many sheets of filo brushed with olive oil; the pastry is then baked.
- Suet Crust Pastry- Suet Crust Pastry is a pastry that has suet in it for the fat, instead of lard, butter or shortening.
- Choux pastry is a light pastry dough used to make profiteroles, croquembouches, éclairs,dumplings, churros etc. It contains only butter, water, flour and eggs. Instead of a raising agent, it employs high moisture content to create steam during cooking to puff the pastry.

- Baking blind is the process of baking a pie crust or other pastry without the filling.
- Pastry cream or custard cream, topping or crème patisserie as called in French is one of the most common creams used in cakes and pastry products. This cream can also be baked and hence is used in both hot and cold desserts.
- Whipped cream is heavy cream that has been beaten until it is light and fluffy. It may be beaten with (in order from easiest to hardest) a mixer, a whisk or a fork. Whipped cream is often sweetened (usually with confectioner's sugar, which dissolves easily in the cream and does not leave a grainy texture) and it is sometimes flavored with vanilla.
- Bavarian cream or bavaroise is a dessert consisting of milk thickened with eggs and folded with gelatin or isinglass and whipped cream.
- Fresh yeast is also known as compressed yeast. It is a moist mixture of yeast plants and starch. It should be kept in the refrigerator and should be maintained at $40\text{-}45^0$ F.
- Different bread making methods are: Straight dough method, Modified straight dough method, No-time dough method or Chorleywood method, Delayed salt method, Sponge and dough method and Ferment and dough method.
- Breads are spoiled by moulds and bacteria
- The process of reproduction of yeast cells is called fermentation. At favourable temperature and moisture and food (sugars present in carbohydrate of flour) the yeast begins to reproduce and multiply vigorously producing ethyl alcohol and Carbon dioxide.
- Bacterial fermentation from Lactobacilli is another type of fermentation that affects bread, especially with sourdough or wild-yeast pre-ferments. These are rod-shaped bacteria that assist the process of fermentation and produce flavoring acids, such as lactic and acetic acids, plus too many to name, along with CO2 as by-products of metabolism (fermentation). They are held in by an elastic gluten network developed in the bread dough, formed by mixing.
- Poolish- combining equal quantity of water and flour (by weight) with some yeast (poolish) and then allowed to ferment.
- Lean dough (also called hard dough) is the most basic type of yeast dough low in fat and sugar.
- Quick bread is any bread leavened with leavening agents other than yeast or eggs or it is flour mixture made with fast acting leavening agents.

2.9 GLOSSARY

Benching: Rounded portions of dough are allowed to rest for few minutes.

Biga: it is an Italian pre-ferment similar to poolish, but biga is stiffer because it contains less water.

Blitz pastry: other name of puff pastry.

Brioche: A rich French bread, Brioche often has a knotted top and is made in individual molds with a fluted base.

Enriching agents: is a way of increasing nutritional value of the bread along with improvements in volume, texture and the keeping quality of the bread

Enrobing: other name of coating.

Fillings: any edible sweet or sour ingredient placed in between baked layers.

Filo: thin unleavened dough

Fold in: Combining two ingredients with spatula or wooden spoon in slicing and folding manner.

Kuchen: a sweet, yeast-raised cake filled with fruit or cheese, has spread throughout Europe and the United States.

Kugelhopf: A light yeast cake filled with candied fruit, nuts and raisins, usually baked in a fluted ring mold.

Lamination: means folding on one top of the other.

Poolish: combining equal quantity of water and flour (by weight) with some yeast (poolish) and then allowed to ferment.

Pre heat: heating the oven to the desired temperature before placing the product.

Proofing: is a continuation of the process of yeast fermentation, which increases the volume of the shaped dough.

Short crust: the fat mixed with flour reduces the gluten strands forming short crust.

Shortening: fat, oil or butter.

Washing: brushing the top layer of the product with egg or milk or butter before placing in the oven.

Yeast culture: reproduction of yeast

Yeast Fermentation: The process of reproduction of yeast cells

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2.11 TERMINAL QUESTIONS

Short answer type questions:

1 What is the importance of fat or shortening in making pastries?

2 What do you mean by Short crust, explain how it is formed?

3 Write short note on :

   a. Puff pastry
   b. Flaky pastry
   c. Rough pastry
   d. Suet crust pastry
   e. Danish pastry
   f. Blind baking

4 Write a detailed note on Filo pastry.

5 Differentiate between straight dough method and Chorleywood method in bread making.

6 How will you culture yeast?

7 What are the characteristics of perfect pastry?

8 Explain microbial spoilage of bread.

9 Write a note on pastry fillings.

10 Explain autolysis in bakery.

Long answer type questions:

2 Discuss in details the basic ingredients used for making basic pastry.

3 Discuss the reasons for imperfect pastry.

4 Explain in detail the guidelines for making perfect pastry.

5 What is yeast? How is it helpful in baking industry?

6 Discuss in details about the different ingredients used in bread making.

7 Discuss elaborately the steps in bread making.

8 Elucidate elaborately about Bread spoilage.

9 What are the factors that affect fermentation of dough?

10 Write a detailed note on baker's yeast.

11 Explain quick breads.

UNIT: 03
CAKE MAKING

STRUCTURE

3.1 INTRODUCTION

We all enjoy a bit of cake during celebratory events like birthdays and weddings or even at home when we feel like a bit of sweet, decadent indulgence but has anyone wondered how this came to be? The history of cake is rich with rituals and symbolisms from different cultures and countries, all coming together to shape the cakes we know today.

According to food historians, the first culture to show evidence of baking skills and interest were the ancient Egyptians. They were probably fed up with game meat and wanted to try something new. However, they were more bread-like and instead of sugar, they were sweetened in honey. The word cake is of Viking origin, from the norse word "kaka".

Cakes symbolize the importance of the person you bought it for, since in the old days, ingredients like refined sugar, nuts and dried food were expensive. Although they are not as expensive today, the message still holds through. It is a way to show someone you care.

Cakes have their part to play in ancient beliefs and superstitions, some which still carries on to modern times. In olden times, people used cakes as offerings to their gods and spirits around the world. The Chinese celebrate Harvest Moon festival and have moon cakes to honour their moon goddess. This tradition continues up to today. Russians have sun cakes called blini which are thin pancakes to pay their respect to a deity called Maslenitsa. Ancient Celts rolled cakes down a hill during the Beltane festival held on the first day of spring to imitate solar movement. With such a rich history and connection of humans with cake, it is no wonder that they remain such an important part of our lives.

Why are cakes round? Although these days we have a variety of shapes from heart-shaped to cartoon characters, animals, castles and even R-rated shapes if you are so inclined, cakes are traditionally round. This symbolizes the cyclical nature of life, the sun and the moon, which is probably the reason why we have cakes during important events; highlighting that we are embarking on a new journey in our life-span. Ancient breads were also round, typically fashioned into round balls and baked in shallow pans. In the 17th century, cake hoops made from metal or wood were increasingly used.

When did cakes become easier to make? The invention of baking soda and baking powder during the Industrial Revolution increased the popularity of baking cakes due to the ease provided to the masses. Ovens were beginning to have more temperature controlled settings which meant people could leave their cakes to bake without labouring and watching over them constantly. Railroads also made ingredients readily available and cheaper.

So there you have it; a few interesting facts about the cakes we take so much for granted. Like everything else evolving with time, cakes have their moments in history too. Next time you enjoy your cake, think of all the human inventions needed over time, necessary to allow you this little luxury.

3.2 OBJECTIVE

In this unit the learner will be able to learn and understand the following:

- The different process of cake making.
- The different ingredients used in cake making.
- Precautions taken while cake making.
- Faults and remedies in cake making.
- Balancing cake formula.
- Specialty cakes.
- Knowledge about chocolate.
- Chocolate work.

3.3 INGREDIENTS

The ingredients used to make shortened (butter) and un-shortened (foam) cakes differ. However, the goal is always to the same: to create great cake recipes through a delicate balance of its ingredients - making sure they have the strength to hold the

recipe together, but still create a tender, moist and flavorful cake. Most cakes are created from liquid batters with high fat and sugar contents. The baker's job is to combine all the ingredients to create a structure that will support these rich ingredients yet keep the cake as light and delicate as possible. As with other baked goods, it is impossible to taste a cake until it is fully cooked and too late to alter the formula.

Therefore, it is extremely important to study any formula before beginning and to follow it with particular care and attention to detail.

Cake making ingredients are classified as

- Essential ingredients: Flour, sugar, shortening, milk and eggs.
- Optional ingredients: Baking powder, flavourings and essences, fruits, nuts, cocoa powder, chocolate, cake improvers, syrups etc.

Ingredients are also classified according to the function which they perform in cake making.

- **Structure builders**: Flour, eggs, milk and shortenings.
- **Tenderizers:** fat, sugar, baking powder and egg yolks.
- **Dryers:** Flour, starches and dry milk powder
- **Toughners:** Flour, dry milk powder and egg whites.
- **Favorers:** Butter, eggs, vanilla or other flavorings, liquid and salt.
- **Moisteners:** milk or water, liquor, egg, syrups and sugar.

1 **Flour:** Vast majority of cakes - with the exception of cheesecakes, foam cakes and gluten-free cakes - contain wheat flour as very backbone of their composition. It establishes the crumb structure in cakes and is used to bind all of the other ingredients together during the cake making process. Wheat flour contains two very important proteins, *glutenin* and *gliadin,* when mixed with moisture and stirred, create its structural network. This protein content for cake making in flour should be 7 to 9 percent. Under low ph conditions, starch gelatinizes faster and thus affects a faster setting of cake structure when baked. The bad part about gluten is that too much - from too much mixing or using the wrong type of flour - creates a tough, dry and flavorless cake. It's gluten from the wheat flour that gives dough its strength and elasticity - qualities we want in yeast breads, but not in cakes. Cakes made from strong flour will peak in the center and will be tough and dry to eat. In case of too weak flour, the cakes may flatten out or even sink.

To help prevent this, you'll see cake recipes especially high-ratio ones, typically made with chlorinated soft wheat flours, such as bleached cake flour, a potentially containing low-gluten forming proteins. (High ratio cakes are where the sugar is higher than the flour level, by weight.) Other lower gluten flour types include Southern bleached all-purpose and pastry flour. Soft wheat flours are generally low in water absorption and do not require harsh mixing or a long mix time.

Chlorination of cake flour provides two great benefits. First is bleaching, which gives a bright whiter crumb color to cakes but second and more

importantly it lowers the gelatinization temperature of the starch within the cake flour. This makes it possible for the cake to set faster and therefore reduces the loss of leavening during baking. Bleaching also gives the cake flour the ability to carry more sugar and fat (as well as water), without their tenderizing (collapsing) effects, balancing the recipe.

2 **Sweeteners- Caster sugar, Icing sugar, Brown sugars:** We typically think of sugar's role in a cake recipe to add sweetness, but it also plays other important roles depending upon whether it is in the crystalline (granulated white, caster or brown) or liquid form (honey or corn syrup). All sugar acts as a tenderizer by preventing the wheat flour proteins from forming an excessive amount of gluten and slows down the coagulation of the egg white and milk proteins, as well, it also contribute to structure of the cake when baked. It does this because sugar is hygroscopic, another word for its ability to absorb or attract moisture from the air, and dissolve readily in it (honey and some liquid sugars are more hygroscopic than crystalline sugar). By doing so, sugar essentially absorbs available water in the recipe, until saturated, leaving the rest for the wheat's available gluten forming proteins. Gluten is formed when the wheat flour protein's are moistened and agitated or mixed; the higher the flour's gluten-forming potential, the more available water or liquid and the more mixing (agitation) that takes place and the less tenderizers, such as sugar and fat, (and the warmer the ingredients), the more gluten is formed. Also because of its hygroscopic nature, it helps with a recipe's moisture retention and thus increases its shelf life by slowing the staling process.

Most commonly used crystalline sugar or sucrose plays an important role by incorporating air into the batter for leavening when beaten with butter or margarine or solid shortening, called "creaming" (only when the fat is at an optimal temperature). Sugar plays an important role with the lubrication of other ingredients in the recipe, when *caramelized*, golden brown coloured crust is formed. Increasing sugar in a cake recipe will raise the gelatinization temperature of the starches in the wheat flour and thus will increase expansion time, so care must be taken in its ratio to the other ingredients; too much can cause a cake's structure to fail or the cake may be so tenderized that it crumbles when cut rather than staying in slices (a warm cake will also cause crumbling). When the sugar is reduced too much, the gluten structure is so strong that the cake develops some long cells or tunnels. Overall volume may even increase, but the cake would be tough.

Other types of sugars used in the cakes include dextrose, caster, icing and brown sugar. Also syrups such as invert sugar, corn syrup, glucose, molasses, honey, sorbitol or refiner's syrups are used in part with powdered sugar for their special characteristics. When using these sweetener varieties you must be aware that some do not have the same sweetness as granulated sugar (sucrose) and do contain various levels of water. Sugars of any kind when used in cakes tend to soften the batter and make it thinner, and they need to be included as liquids. Coarse grained sugar, also known as superfine sugar is used to help

create the finest texture and maximum volume in a cake. Too large grain will have cutting action on fat which will prevent entrapping of air cells during creaming operation. Too fine grain will also not produce desirable aeration. Sugar can stand in for fat and is often added to commercial low-fat products or recipes.

3 **Fats and shortenings:** There are four types of fat and shortening available; Butter, lard, hydrogenated fat and margarine. The primary function of solid fat, also known as plastic fat, solid shortening, stick butter or margarine, is to incorporate innumerable air bubbles into its malleable mass for volume. This is done through creaming, or beating the fat with crystalline sugar, also known as white granulated or brown sugar (white granulated sugar combined with molasses). But, it can only be done successfully if the right ingredients, ratios, mixing times and temperature (70^0F-75^0F), and using the proper tools are followed. Too hard fat will not cream up well wile too soft fats will not be able to retain the aeration.

Fats have a tenderizing action on the flour proteins and thus expanding the air cells and helping to lift the cake's batter during baking, resulting in eventual cake tenderness. They are also known as shorteners; they also shorten the length of the gluten strands when the flour is stirred with that moisture. Fats also tenderize by readily coating the flour proteins like a raincoat, during mixing, preventing moisture from reaching them, helping to reduce their gluten forming potential and improving the shelf life. Fat is also a good tenderizer because it slows down the coagulation of the egg with the flour and milk proteins that set the structure of the cake when baked. Fat-Some fats, such as butter or hydrogenated fat impart taste and flavor to a cake, whereas margarine does not have as fine a texture and taste. Shortening does not contribute flavor, unless you use the "butter flavored" type.

4 **Eggs:** Eggs perform a multitude of important functions in a cake recipe, depending on the part used. Foamed eggs provide leavening, especially separated and beaten whites. Whole eggs and whites contribute to structure of the cakes. Egg yolk is also a rich source of emulsifying agents Lecithin and, thus, is a tenderizer thus facilitating the incorporation of air during creaming or whipping process and inhibits wheat starch gelatinization. Egg yolks also add color (due to the presence of Luthein), nutrition, and flavor and help to retain moisture in the finished cake. Eggs also act as binding agents and thus improve sustainability. On the other hand, whites can have a drying effect, but they contribute slightly more protein than yolks do, although with far fewer nutrients and without the fat and cholesterol.

5 **Leaveners:** A leaven, often called a leavening agent (and also known as a raising agent), is any one of a number of substances used in doughs and batters that cause a foaming action (gas bubbles) that lightens and softens. It starts with

the creation of millions of tiny air bubbles from various mixing methods, trapped in the structural framework of the cake's batter by the gluten strands. Air incorporation comes from beating eggs, creaming butter and sugar together, from folding ingredients together, and from any agitation. Cakes are then leavened when the air bubbles in their batters expand when heated from water vapor or steam from liquids. The type of leavener to be used is based upon the kind of cake required for, according to volume, taste, flavour, colour, structure and consistency.

Leaveners can be of three kinds- chemical leaveners, biological leaveners and mechanical aeration.

CHEMICAL LEAVENERS-

Baking Powder –made from Cream of tartar and sodium bicarbonate and starch, is a leavening agent, which causes your batter to rise. It is available in two forms: single acting baking powder- which acts instantly and the cakes has to be baked immediately as soon as it is mixed. Double acting powders- In this some of the gas is released when it is mixed to the batter at room temperature and the final gas is released in the oven when it faces high temperature. Too much baking powder results in a bitter tasting product, while too little results in a tough cake with little volume.

Baking Soda-Baking soda is pure *sodium bicarbonate,* and needs to be paired with an acidic ingredient like honey, chocolate, or yogurt so that carbon dioxide is released due to reaction. This carbon dioxide expands in volume in the oven causing the product to rise. It is used in the production of rich red colour speciality cakes, but use of too much will result in a soapy, coarse cake. Since it reacts immediately, so it is recommended for recipes which call for soda immediately or else the product will fall flat.

A chemical leavening agent provides a source of gas to the recipe called carbon dioxide. When moistened (baking soda and double acting baking powder) and/or heated (double acting baking powder), it expands the millions of air bubbles previously created in a batter or dough from mixing or any agitation made to the cake's ingredients, trapped in the structural framework by the gluten strands. If the batter is over mixed, becomes too warm or not baked promptly, the gas will escape and the final recipe will have poor texture and low volume. One of the biggest failures of a cake recipe is using baking powder or baking soda that has been weakened from being moistened previously in the cabinet or refrigerator from humidity. Another failure can be caused by pre-wetting a chemical leavened batter because they start to release carbon dioxide bubbles immediately (double acting baking powder will again leaven when heated). Refrigeration will slow their release, but not stop it. Also, when a batter is placed in an oven that has not been preheated, baking powder fails to act until the oven reaches over 120 degrees F. Using the wrong flour can also affect leavening.

BIOLOGICAL LEAVENERS- These include Saccharomyces cerevisiae producing carbon dioxide found in: baker's yeast, beer (unpasteurised—live yeast) ginger beer,

and Kefir and sourdough starter. Clostridium perfringens producing hydrogen found in salt-rising bread.

Compressed yeast is also called cake yeast, because of its use in cake making. Yeast cakes have texture that is closer to a Brioche or a sweet roll instead of a sponge cake. Some also call for trimming off the browned crust and just using the soft interior. Yeast raised dough is supported by the protein structure of gluten while cakes made with baking powder and baking soda are supported by a starch structure. Recipes like yeast cakes, coffee cakes etc. using yeast usually also call for bread (strong) flour which has a higher protein content (12%) than all purpose (regular) flour (8%). Cake recipes using baking soda or baking powder usually call for cake flour which has less protein (3%) than that of normal flour.

Mechanical aeration- while creaming fat and sugar or fat and flour or beating egg with or without sugar. When ingredients are beaten or whisked together using hand, spatula, whisk or the appropriate attachments on a machine/blender and no baking powder used it is considered to be mechanically aerated. Sponge goods are good example as the egg and sugar are whisked to a peak and then the flour is folded in, no other form of aeration is used. The surface area will strive to remain at a minimum thus offering a resistance which drives the mixture behind the beating equipment as it penetrates still further into the mix. It is during this fractional moment of time before the beater strikes again that air bubbles are drawn into the mixing until at last it is thoroughly aerated.

Cake contains moisture and when it is heated, the moisture turns into steam which causes into raised volume of the product.

6 **Dairy and liquids:** Milk is usually the main liquid dairy used in cake recipes. It hydrates the dry ingredients, dissolves the sugar and salt, provides steam for leavening and allows for the baking powder and/or baking soda to react and produce carbon dioxide gas. Milk contains proteins (caseins) that set or coagulate from the oven's heat and help form the structure of the cake, as do flour and eggs. It enriches the cake nutritionally and improves flavor and taste of cakes. Lactose sugar present in milk improves the crust colour and moisture retention capacity of cakes. Water vapour also leavens the cakes thereby acting as a tenderizer.

Other dairy products, such as buttermilk, sour cream or cream cheese add more moisture and flavor to a cake; consequently those made with them keep well. The acid in the buttermilk and sour cream help tenderize the gluten in the recipe, producing a finer crumb. Sour cream and cream cheese add richness to a recipe, which makes them moist and almost springy. Shelf life of cakes is determined by the amount of moisture retained in the cake which eventually depends upon the amount of water used.

Other liquids than are used or can be used include rum, wine, fruit juices, sherbets etc.

7 **Flavorings and essences:** These are the ingredients that add distinction and character to baked goods. Flavour can come from wet ingredients or dry ingredients, for example, we use a sprinkle of cocoa powder to give an added depth of chocolate. Flavorings and essences come in different forms: ground spices, extracts (especially pure vanilla extract), citrus zest (peel), citrus oil and even liqueurs. Essence in general term that can mean an oil, extract or concentrated substance made from an animal or vegetable. Oils are generally available in the pure form, containing no alcohol or water. It must be used sparingly. Extracts are diluted oils; usually containing about 20% pure oil and the rest are additives. Alcohol is frequently used as an additive. Flavourings and essences can broadly be divided into artificial (or synthetic) flavourings and natural flavourings e.g. pure vanilla essence, orange, pineapple, strawberry etc. the role of an essence is to impart flavour and it is always added to the batter just before baking, so as to retain the flavour in the batter.

Flower Essences: Baking with flower essences can add a subtle, perfumed flavour to cake sponges, cookies and frostings. Violet, lavender and rose essences are some of the most popular flower essence flavours.

Fruit Essences : Using a fruit essence rather than fruit itself can give a more intense flavour. It also means fruit doesn't have to be added to the sponge which can alter both the texture and colour. Strawberry, raspberry, and blueberry are all delicious berry essences, while orange and lemon bring a sharper citrus flavour. Banana essence gives a powerful synthetic banana flavour, so add little by little so as not to overdo it.

Candy Essences: Candy oils come in a wide range of flavors, such as orange, lime or lemon flavors, tangerine, cherry, etc.

Nut Essences: For a delicious nutty flavour, a splash or two of nut essence can transform your cakes and cookies. Almond and hazelnut work especially well when paired with other ingredients in your cake such as fruit and chocolate. If you have a nut allergy, avoid nut essences as you would any nut ingredients.

Bean essences: Vanilla bean paste is a much thicker mixture of vanilla beans, sugar and water and can be used sparingly as an alternative to vanilla extract. Other essences commonly used in baking include coffee, rum, brandy and coconut.

8 **Salt:** Salt or sodium chloride is an important ingredient in cake making. It is generally added at the later state while baking cakes. Without salt the cake will taste flat. Usually only a pinch of salt is added, but the amount of salt added may differ according to the amount of flour/ salted butter used. It should be such that the salty flavor should not be discernible. Depending upon the method of combining ingredients, salt can also have a strengthening effect

if it's combined with egg whites. If whipped egg whites to which salt has been added are "folded in," they're better able to hold their volume. Although salt is not considered to be an aid in leavening, it can contribute slightly to the volume of some recipes. It gives a balance to the sweetness and other flavors during baking, moistens the cake (as it is hygroscopic in nature) and also improves the crust colour of cakes by lowering the caramelization temperature of sugar.

9 **Emulsifiers:** Convenience, fast aeration, uniform performance, stable production, and stability in the end product are all key factors when considering the perfect cake emulsifier for industrial cake production. Oil and water are immiscible since the interaction results in high energy at the common surface. Through the physical action of mixing one can break up the oil into fine droplets which may be dispersed/ distributed into the water phase to form a dispersion which may be called an emulsion. An emulsion is an unstable multiphase system containing at least two immiscible liquid phases. When the physical mixing action is stopped the oil droplets will coalesce and the oil and water will again separate into 2 different layers. To stabilize an emulsion, the droplets of the disperse phase must be as small as possible and as widely distributed as possible in the continuous phase. Further the viscosity of the continuous phase must be high to retard coalescence. Ultimately to prevent such coalescing of oil droplets and subsequent layer separation, certain chemicals may be used which are known as emulsifiers. In other words emulsions act as a hook between water phase and oil phase and prevent them from separating. This activity keeps the water evenly distributed in the cake batter with considerably reduced rate of evaporation and thus increasing shelf life. It also helps the fat to get distributed evenly in the batter, thus the air cells are also evenly distributed which leaven the cake and give good volume.

Emulsifiers are made up of molecules that have a non-polar (fatty acid) end which carries no charge and has an affinity for oil and a polar (glycerol) end which carries a charge and has an affinity for water. Such a molecule can situate itself at the interface between oil and water. The polar end will immerse itself in the aqueous phase and the non-polar end will immerse itself in the lipid phase and prevent coalescence of the oil droplets. This helps the two phases to stay intimately mixed and form a stable emulsion.

As cake baking has become a more precise industrial activity, baking emulsifiers have become a very important class of ingredients in the manufacture of cakes and other sweet goods. Good example of emulsifiers are: DATEM (emulsifier E 472e), Lecithin, SSL and CSL (sodium and calcium stearoyl lactylates).

10 **Dry fruits and nuts:** These are of specific organoleptic characteristics (flavour, taste and consistency) and are used depending upon the choice. Traditionally dried fruits and nuts are used as they generally do not add

moisture to the cakes. Commonly used fruits and nuts are raisins, currants, sultanas, hazel nuts, walnuts, figs, mixed peel and glace cherries.

11 **Spices:** Spice is easily one of the best cake flavors around. Common spices used in baking include ground cinnamon, ground mixed spice, ground ginger and nutmeg. It's worth having jars of these to hand and buying others as needed. Few marked specialty spiced cakes may be: buttermilk spice cake, spice Bundt cake, carrot cake, gingerbread spice cake, pumpkin cake etc.

12 **Chocolate:** It's worth having some plain chocolate in your store cupboard for making chocolate cakes; for breaking up to use as chocolate chips and for making rich chocolate cake toppings. In most recipes a plain chocolate of around 40 per cent cocoa solids is adequate unless otherwise stated. Chocolates provide colour, texture, moisture, flavour and taste to cakes.

13 **Cocoa:** Another key ingredient for chocolate cake recipes, cocoa provides an intense chocolate flavour. It has the benefit of not needing to be melted and is completely stable. A couple of tablespoons are often used in place of flour in addition to melted chocolate to give depth to the recipe. It is also used when making chocolate butter cream for icing and filling cakes.

There are other ingredients that frequently feature in recipes which you might also like to have at the ready if you bake regularly. These include:

1 **Black treacle -** This is often used in rich fruit cakes and other full-flavoured bakes.

2 **Candied peel-** Made from sugared citrus fruits, candied peel is frequently used in Christmas cakes, panettone and Florentine biscuits.

3 **Desiccated coconut-** If you like coconut-flavoured cakes or cakes spread with jam and dipped in coconut then keep a packet of unsweetened desiccated coconut to hand.

4 **Dried fruit-** If you're a fruit cake fan, it's good to have a bag of currants, sultanas and raisins in the cupboard. There are plenty of other dried fruits available so buy them as you need them or select your favorites to modify a recipe.

5 **Glacé cherries** -You can buy either the bright red glacé cherries which are dyed or the deeper red un-dyed cherries for use in fruit cakes, particularly Christmas cake.

6 **Golden syrup-** Sticky and sweet, golden syrup makes a moist sticky cake and, like black treacle, keeps for a long time in the cupboard.

7 **Ground almonds-** Ground almonds are often used in place of flour or as well as flour in cake recipes. They produce a moist cake and are suitable as a gluten-free option.

8 **Honey-** Honey is often used in addition to sugar and creates a moist and fragrant cake.

9 **Jam-** Smooth apricot jam is a must if you like to make celebration cakes as it's used to stick marzipan on to fruit cake. Strawberry or raspberry jams are also good as a filling for a Victoria sandwich.

10 **Lemons, limes, oranges-** A little bit of zest can liven up a plain sponge mix. Some recipes also require the juice to make a sugar syrup for drizzling.

11 **Nuts-** Mixed chopped nuts, walnut halves, hazelnuts, flaked almonds and pecans are among the nuts you might want to have on hand. Again, choose the ones you like the best. Often one type of nut can be substituted for another in recipes. Store nuts in airtight containers as they might get rancid in contact to air.

12 **Polenta-** Polenta is another flour substitute - cakes made with this ingredient tend to be denser, pleasantly textured and have a vibrant yellow colour.

13 **Sunflower oil-** Sunflower oil has many culinary uses and it's ideal for baking as it has a mild flavour which allows the other ingredients in a cake to shine through.

14 **Food Colours-** This is an important constituent of cake as every cake is associated with a certain type of colour. Addition of colour it gives the food an attractive and appetizing appearance. Dyes of various colours (most commonly blue, green, red and yellow) are used to the cakes. Food colorings are available in small to big bottles in liquid form and in wide variety of colors.

3.4 CLASSIFICATION OF CAKES

Classification of cakes: There are many different types of cakes and many different ways of dividing them into various categories, but professional bakers categorize cakes by ingredients and mixing method. (Home bakers tend to categorize cakes by flavoring-i.e., chocolate cakes, fruit cakes, and so on-which is helpful when you're trying to decide what to eat, but not as helpful when you're trying to understand how best to make a cake.) Depending on how the batter is prepared, you will find that the final texture (and color, if it is a yellow or white cake) varies. Below is a comprehensive but by no means exhaustive list of the basic types of cakes: (Fig. 3A)

A. **Shortened (Fat or oil) cakes:** These contain some kind of fat—often butter, but sometimes oil—and baking powder to leaven them or make them rise. If the fat is butter, the ingredients are usually combined using the creaming method, which means that the soft butter and sugar are beaten together in an electric mixer to partially dissolve the sugar and to incorporate some air. Then the dry and wet ingredients are added in alternating doses. This results in a light and airy crumb, though not quite as light as that of a sponge cake. The best butter cakes have a moist buttery richness tempered by lightness. Included in this category are:

- **Pound Cakes:** This is the simplest type of butter cake. A classic pound cake is made with a pound each of butter, sugar, eggs, and flour. This produces a dense yet tender texture. Pound cakes are heavier than the types of butter cakes used for constructing layer cakes. They're easy to prepare, with the only trick being that the butter must be quite soft when you begin. These cakes are usually very lightly flavored and served plain or topped with a simple glaze or water icing. A pound cake is usually baked in a loaf or Bundt pan. Many coffee cakes, sour cream cakes, and fruit crumb cakes are variations of pound cake.
- **Butter (and oil) layer cakes:** Many different types of cake can be arranged in layers. However, classic American layer cakes are usually butter or oil cakes. The birthday cake you ate as a child was probably of this type. These cakes are lighter than traditional pound cake, but more moist and flavorful than European-style sponge layer cakes. Cakes in this category include: devil's food cake (the classic chocolate layer cake), golden cakes (made with egg yolks, which add richness and a golden color), and white cakes (made with egg whites, which create a lighter, whiter-colored cake).

B. **Sponge and Foam Cakes:** These are notable more for what they are missing than for what they contain: They usually do not include fat, such as butter or oil, and they do not incorporate leaveners, like baking powder. Instead, volume is created by **whipping the eggs** or egg whites. The air whipped into the eggs expands during baking, causing these cakes to rise on their own without baking powder. However, the success of this method depends on not deflating the eggs after whipping them. To this end, dry ingredients are usually sifted over and gently folded in, and fat is often avoided, as it would weigh down the foamy batter. This method produces extremely light, airy cakes with a spongy texture but generally less flavor and moisture than butter and oil cakes. The basic types of sponge and foam cakes are:

- **Angel Food Cake**: This type is made with egg whites alone and no yolks. The whites are whipped with sugar until very firm before the flour is gently folded in, resulting in a snowy-white, airy, and delicate cake that marries beautifully with fruit. Most angel food cakes have a spongy, chewy quality derived from their relatively high sugar content and the absence of egg yolks. Baked in ungreased two-piece tube pans, angel food cakes are cooled by being inverted, since this type of cake would

collapse if cooled right-side-up in the pan or if removed from the pan while still warm.

- **Genoese:** This type of sponge cake is made with whole eggs rather than just egg whites, which gives it a richer flavor than angel food cake. The eggs are combined with sugar and gently heated over simmering water, then whipped (heating the eggs allows them to be whipped to a greater volume). Genoese lacks much assertive flavor of its own, but it is often used to construct layered or rolled cakes when a lighter texture than a butter cake is desired. To add flavor and moisture, Genoese cake layers are always moistened with flavored syrup, and they are often sliced into thin horizontal layers and stacked with rich fillings such as butter cream. These layer cakes, common in the coffeehouses of Europe, are called "European-style" to distinguish them from American-style butter layer cakes, which generally have fewer, thicker layers.

- **Biscuit** (always pronounced the French way as *bees-kwee*): This type of sponge cake contains both egg whites and yolks, but, unlike in Genoese, the whites and yolks are whipped separately and then folded back together. This creates a light batter that's drier than a Genoese but holds its shape better after mixing. For this reason, it's often used for piped shapes such as ladyfingers. If baked in a tube pan like an angel food cake, it makes a very chewy sponge cake that was popular in the early 20th century but has since fallen out of favor. However, it's still known in a slightly different form as the classic Passover sponge cake, in which the flour is replaced by matzoh cake meal and potato starch.

- **Chiffon Cake:** This fairly recent American creation was invented by a salesman who sold the recipe to General Mills, which spread the recipe through marketing materials in the 1940s and 1950s. A classic chiffon cake is kind of a cross between an oil cake and a sponge cake. It includes baking powder and vegetable oil, but the eggs are separated and the whites are beaten to soft peaks before being folded into the batter. This creates a cake with a tender crumb and rich flavor like an oil cake, but with a lighter texture that's more like a sponge cake. Chiffon cakes can be baked in tube pans like angel food cakes or layered with fillings and frostings.

C. Low- or No-Flour Cakes

Cakes made without flour (or with very little) generally have a creamy or silky texture. They can be baked or unbaked:

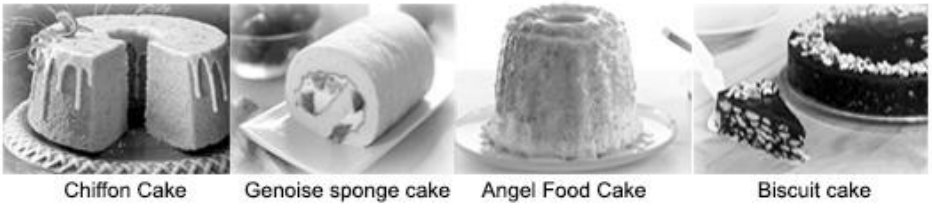
- **Baked Flourless Cakes:** These include **baked cheesecakes** and **flourless chocolate cakes**. For easy removal, they're often made in a spring form pan, though some can also be made in regular round layer cake pans. Often the filled pan is placed in a larger pan that's half-filled with water to insulate the delicate, creamy cake from the oven's strong bottom heat, which might give

the baked cake a porous rather than silky texture. This is called baking the cake in a **water bath**.

- **Unbaked Flourless Cakes:** These types of cakes are typically molded in a dessert ring or spring form pan then simply chilled before unmolding. They include **unbaked cheesecakes** and **mousse cakes.** They often have a crust or bottom layer that's baked before the mousse is added. Sometimes other layers, such as Genoese or biscuit, are alternated with the mousse.

Butter (and oil) layer cake Pound cakes Butter (and oil) layer cake

Butter (or oil) cakes



Chiffon Cake Genoise sponge cake Angel Food Cake Biscuit cake

Sponge and Foam Cakes

Baked Flourless Cake Unbaked Flourless Cake

Low- or No-Flour Cakes

Fig. 3A Classification of cakes

3.5 CAKE MAKING METHODS

Cake making methods can be divided into two main categories:

A. Shortened cakes – In shortened category there are 4 methods of mixing

- Creaming method or sugar batter method
- Two stage method or blending method
- Flour batter method
- Sugar batter method

B. Egg foam method

- Sponge method
- Angel food method
- Chiffon method

The three main goals of cake making are:

- To combine ingredients into a smooth uniform batter.
- To form and incorporate air cells in the batter.
- To develop a proper texture in the finished product.

A. **SHORTENED CAKES** – In short end category there are 4 methods of mixing

1. **Creaming Method:** This is the conventional method used for many cookie doughs, butter cakes, and pound cakes. It was for a long time the standard method for mixing high-fat (butter) cakes. Butter cakes are highly prized for their flavor; shortening adds no flavor to cakes. Butter also influences texture because it melts in the mouth, while shortening does not. However, many bakers may prefer to substitute shortening for all or part of the butter in these formulas. Shortening has the advantage of being less expensive and easier to mix. In creaming recipes, use regular shortening, not emulsified shortening. Regular shortening has better creaming abilities. Examples- cookies, marble cake, choco chips brownies, cup cake etc.

   Method- The creaming method starts out with softened, solid fat (such as butter or margarine). All fats used should be at room temperature. Very hard shortenings will not cream up well while too soft shortenings will not be able to retain aeration. The fat is then mixed with granulated or brown or powdered sugar which is added gradually. Granular fats should be avoided which have poor whipping quality. The creaming comes into play as the fat is mashed against the sides with the sand-like sugar crystals working against it, softening it even more while forcing air into it. Creaming should be done at a low to medium speed. A high speed may melt the fat, causing a loss of air bubbles. Creaming for too long creates a coarse texture in the finished cake. When adequate aeration is achieved, the mixture becomes very light, fluffy and brighter in appearance. Eggs are added gradually. Eggs should be at room temperature. Before adding the eggs they should be whipped to the

stiff consistency and small amount of flour is added to it so that the mixture doesn't curdle. If the batter is curdled, there is a loss of aeration which results in low volume and poor texture of cakes. The air cells of the whipped eggs either diffuse into the air cells already present or increase the number of air cells in the cream and the liquid part of the egg is evenly distributed in the mixture giving it a smooth , velvety appearance. Liquids such as liquid sugars, water, milk, fruit juices, fruit pulp, etc along with essences and colour can be added at this stge. This is done in order to have sufficient moisture in the mix to prevent toughening of gluten while mixing flour. Next stage is to incorporate flour in the mixture. Flour should be sifted with other ingredients such as baking powder or soda etc in order to ensure its thorough dispersal. It has to be mixed with minimum possible of mixing action.

2. **Two Stage Method:** This is a simple, foolproof way of mixing a cake base, using very few steps in the process. This method was developed for use with modern high ratio shortening. High ratio cakes contain a large % of sugar more than 100% based on the weight of the flour. Also they are made with more liquids than creaming method cakes. This method is often used to make cakes in high volumes bakeries. This method is typically used when a recipe contains a higher portion of sugar than flour by weight. Emulsified shortening, such as the high-ratio variety, is used because the amount of liquid ingredients is also proportionally larger than, for example, in the foaming or creaming methods. This type of batter is always leavened with a chemical agent (baking soda and/or baking powder) rather than relying solely on the air incorporated with a whip. Whole eggs, granulated sugar, cake flour, and baking powder are placed in a mixer and stirred at low speed to form a paste. Emulsified shortening is added and the mixture is whipped at high speed for two minutes. Milk or water is then added along with a flavoring, such as vanilla extract. The batter is whipped at high speed one minute longer. Example- Yellow cake

   Method- Scale all the ingredients. Have all the ingredients at room temperature. Sift the flour, baking powder, soda, salt etc in the mixing bowl and add the shortening and mix. Sift the remaining dry ingredients into the bowl and add part of water or milk. Mix slowly. Scrape down the sides from time to time to ensure even mixing. Combine the remaining liquids and lightly beaten eggs and add this mixture to the batter in 3 parts. Continue to mix to form produce a smooth and homogenous batter. The finished batter is normally quite liquid. The mixture is now ready for panning and baking.

3. **Flour Batter Method:** The following procedure is used only for a few specialty items. It produces a fine-textured cake, but there may be some toughening due to the development of gluten. Flour-batter cakes include those made with either emulsified shortening or butter or both. Fat and an equal weight of flour are creamed together till it becomes light and fluffy.

Method- In the flout batter method, the flour is added as two separate portions firstly mixed with the creamed ingredients with a second portion added later to the batter. The flour and fat are mixed together, while the eggs and sugar are whisked together in a separate bowl. The fat is usually creamed with a similar amount of flour, for example: 400g flour to 450g fat to obtain a suitable creamy mixture until the flour particles are thoroughly coated with fat. Once the eggs and sugar are sufficiently whisked to form foam they are added in small portions to the flour and fat mix. Once these two portions are combined together in a cohesive batter any additional flour is added. The mixed batter should be deposited into cake pans and baked without delay. It must be kept in mind that once the leavening agents have been added to the batter, they begin to react and evolve carbon dioxide gas

4. **Sugar Batter Method:** The sugar batter is based on the emulsion of oil in water with air bubbles being trapped in the fat phase while other ingredients are dissolved in the water phase.

   Method- The fat and sugar are creamed depending on the temperature and creaming quality of the fat at medium speed to produce a fluffy and light in coloured mixture. During this stage, small air cells are formed which are entrapped into the creamed mixture. This mixture takes on volume and becomes lighter in consistency. The exact time for proper creaming at this stage is will depend on several factors like temperature of the fat and the speed of the mixing machine - High speed will create friction and tends to destroy the number of air cells that are formed and incorporated during the early stages of mixing. The liquid egg is added in 4-5 portions with creaming in between each addition to prevent any curdling occurring and producing a batter that is smooth and has a velvety appearance and texture. In the final stages of the creaming method of mixing sifted flour and any additional water, milk or essence is then gently added to the batter.

B. EGG FOAM METHOD

The egg foam method is the method we use to make Genoese, French macaroons, sponge cake, and angel food cake, among others. Batters made using this method are generally very low in fat, often having no extra fat added, except the fat in the egg yolks, if whole eggs are called for. Egg-foam cakes have a springy texture and are tougher than shortened cakes. This makes them valuable for many kinds of desserts that require much handling to assemble. The egg foam method relies on the leavening power of eggs and steam to create the lift necessary to make a delicate angel food cake or Genoese. The method mostly starts by whipping of eggs (egg whites for Sponge cakes and whole eggs for Genoese) and sugar until they turn light. Sift dry ingredients i.e. flour over the egg mixture and gently but thoroughly fold together all the ingredients. Don't dump the flour or you will break a lot of your bubbles and have a flat cake.

Method- The method mostly starts by whipping of eggs and sugar until they turn light. Sift dry ingredients i.e. flour over the egg mixture and gently but thoroughly

fold together all the ingredients. Don't dump the flour or you will break a lot of your bubbles and have a flat cake. Foam cake methods use beaten eggs to give the cake volume.

1. **Sponge Method:** Sponge cakes are made from the three ingredients no baker can do without—eggs, sugar, and flour—although some sponges also contain butter. Classically made sponge cakes (Genoese in French) do not contain baking powder or baking soda; their volume and light texture come solely from the air whipped into the eggs. Sponge contains equal parts eggs, sugar, and flour. The weight of the eggs is always used as the basis for determining the quantity of the remaining ingredients. Whole eggs, entirely or in part, may be replaced with egg yolks or egg whites. More egg yolks will result in a denser sponge with finer pores. Increasing the amount of egg whites produces a lighter sponge with a larger pore structure. Increasing the yolk content in an already heavy sponge cake can have a detrimental effect. Granulated sugar or, even better, the finer grade castor sugar, should always be used in a sponge cake to ensure that the sugar dissolves easily. The flour used in a sponge cake must have a good ratio between starch and protein. Some gluten (a high percentage of which is found in bread flour, for instance), is necessary to bind and hold the structure, but too high a percentage makes the batter rubbery and hard to work with and results in a tough and chewy sponge. A flour with too much starch, such as cake flour, will produce a light and tender sponge, but the structure will collapse partially when baked. Flour for sponge cakes should always be sifted. If you use unsweetened cocoa powder or any other dry ingredient, sift it in with the flour. When adding the flour to the batter, not to break the air bubbles that you just whipped in. Fold in the flour with a rubber spatula or your hand and turn the mixing bowl slowly with your other hand at the same time to combine the ingredients evenly. Never stir the flour into the batter or add it with the mixer. Butter can be added to a sponge in an amount up to two-thirds the weight of the sugar. The butter should be melted but not hot. It is always added last, after the flour has been completely incorporated. Chopped nuts or chopped candied fruit may be added to a sponge cake without changing the formula; provided it is a fairly heavy sponge (the pieces will settle on the bottom in a very light sponge batter).

   Method- Scale all the ingredients accurately. Combine the eggs and sugar in a clean bowl. Immediately set the bowl over hot water until the mixture warms up to 430C (for greater volume). If any liquid is included add it now at this stage only. Fold in sifted flour be careful not to deflate the volume.Immediately pan and bake the batter. Delay will cause loss of volume. Genoese is a variation of fatless sponge. Sponge method is of six types:

   a. **Cold-Foaming Method**- In the cold-foaming method, the eggs and sugar are placed directly in the mixer bowl and whipped at high speed until creamy and light in color and the foam has reached its maximum volume. The butter can be added as well, but is generally left out

since this method is typically used when the sponge will be soaked with a liqueur or flavoring, as in tiramisu or trifle, for example. Because part of the sugar melts in the oven rather than over the water bath as in the warm method, there are larger air bubbles in the finished sponge.

b. **Warm-Foaming Method**- In the warm method, eggs and sugar are placed in a mixer bowl and stirred over immersing water (so that the eggs do not cook) to about 110°F (43°C) or until the sugar has dissolved completely. The mixture is removed from the heat and whipped at high speed until creamy and light in color and the foam has reached its maximum volume. Sifted flour is folded in, followed by the melted butter, if used. The main objective in the foaming method is to create a batter with the maximum amount of air.

c. **Egg-Foaming Method**-In this method, the eggs are first separated; the yolks are whipped with part of the sugar to a light and fluffy consistency, and the whites and the remaining sugar are whipped to soft peaks. The yolks are gradually folded into the whites, followed by the sifted flour, part of which is replaced with finely ground nuts or almond paste, followed by any other ingredients, and, last, the melted butter, if used. Because this method produces a somewhat lighter sponge than the other two foaming methods, the sponge tends to shrink away from the sides of the pan more than is desirable. For this reason, it is best not to grease the sides of the cake pan. Instead, cut the baked sponge free using a sharp, thin knife.

d. **Emulsifier-** method sponge-Another method and probably the most common in the baking industry today, is the emulsifier method; it is quick, convenient, and almost foolproof. The emulsifier is basically a whipping agent that contains a molecule that preserves the emulsion of lipids (fat) and water. By keeping the ingredients suspended and preventing separation, emulsifiers allow the batter to hold the air that has been whipped in without falling. In the emulsifier-method sponge, all ingredients, including the flour, are whipped together with the emulsifier for a specified time. The emulsifier method uses baking powder and does not rely on air as a leavening agent, so the sponge does not need to be baked immediately and can wait for its turn for the oven,

e. **Ladyfinger Sponge**- Another sponge variation is the ladyfinger sponge, also known as a piped sponge, which is used not only for cookies but also for several classic desserts, including tiramisu, charlotte Russe, and gateau Malakoff. In this method, more air is whipped into the batter so that it can be piped in to various shapes without running. Ladyfinger sponges are meant to be very dry after baking, but they easily absorb moisture from fillings or syrup.

f. **Othello Sponge**-Othello sponge is comparable to the ladyfinger sponge, and the two are easily interchangeable. The Othello sponge has a lighter structure due to less flour and more egg white. The batter should immediately be piped out and baked as soon as it is finished, as the mixture becomes tough if left to stand too long.

2. **Angel Food Method:** This type of cake contains neither fat nor chemical leaveners. It relies solely on stabilized egg white foam for leavening. The foaming power of the egg whites results from a combined effort of various proteins to increase the thickness (viscosity) of the albumen and produce a fine mesh of foam (tiny bubbles) that will hold together for a time if properly combined with the sugar. Angel food batters have much higher sugar content than any other sponge or butter cake. Although sugar has a mixed influence in the whipping stage, where it acts to delay the foaming of the whites, it stabilizes the foam once it is whipped, especially in the oven, where sugar is necessary to prevent a total collapse. Sugar does this by forming hydrogen bonds and delaying evaporation. Mixing and baking an angel food cake successfully is a delicate procedure. Scale all the ingredients accurately. The egg whites may be slightly warmed in order to achieve better volume. Sift the flour with half the sugar. This helps the flour to mix more evenly with the egg whites. Beat the egg whites along with salt and cream of tartar until soft peak. Gradually add the sugar that was not mixed with flour. Beat until the egg whites form soft peaks. Do not beat until stiff. Fold in flour sugar mixture lightly and then bake it.

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3. **Chiffon Method:** A chiffon cake is a very light cake made with vegetable oil, eggs, sugar, flour, baking powder, and flavorings. It is a combination of both butter and foam type (sponge type) cakes. Instead of the traditional cake ingredient butter or paste (such as shortening), vegetable oil is used; Chiffon cakes and angel food cakes are both based on egg-white foams, but here the similarities in the mixing methods end. In angel food cakes, a dry flour-sugar mixture is folded into the egg whites. In chiffon cakes, a batter containing flour, egg yolks, vegetable oil, and water is folded into the whites. Egg whites for chiffon cakes should be whipped until they are a little firmer than those for angel food cakes, but do not whip them until they are dry. Chiffon cakes contain baking powder, so they do not depend on the egg foam for all their leavening. A chiffon cake is a cross between an oil cake and a sponge cake. It includes baking powder and vegetable oil, but the eggs are separated and the whites are beaten before being folded into the batter creating the rich

flavor like an oil cake, but with a lighter texture that's more like a sponge cake. They can be baked in tube pans or layered with fillings and frostings. The lack of butter, however, means that chiffon cakes lack much of the rich flavor of butter cakes.

Method- Scale all the ingredients. Use good quality flavorless vegetable oil. Sift the dry ingredients including part of sugar into a mixing bowl. Mixing with the paddle attachment gradually add oil, yolks, water and flavoring in a slow steady stream. Mix until smooth. Whip the egg whites along with cream of tartar, sugar to firm moist peaks. Fold the whipped egg whites in the flour liquid mixture. Deposit in pans and bake.

3.6 CAKE IMPROVERS

Cake Improvers are "miracle ingredient." When added to cake batter at the creaming stage, it supposedly renders the crumb soft and moist and increases shelf life. The mysterious product contains rice starch, polyglycerol esters, and mono- and di-glycerides - the same additives found in many boxed cake mixes and commercial baked goods.

How Cake Improvers works: : The addition of small amounts of certain forms of starch to cake batter mixes surprisingly and unexpectedly improve the basic important properties of the batter mix as shown both by the prebaked batter mix specific gravity as well as the substantially increased cake volumes obtained in the finished baked cakes. Moreover, it is found that in using these particular forms of starch, the finished baked cakes have extremely good crumb softness initially and can retain crumb softness over a storage period of six days. This fact is extremely important since the average family will not consume a cake on the same day that it is baked. Thus, the capability of a cake to retain a desirable level of softness for a long time is of prime concern. It is found that the addition of small quantities of a pre-gelatinized starch which does not contain more than about 18% by weight of amylase leads to vastly superior cake batter mixes and to the finished baked cakes obtained there from. While any form of pre-gelatinized low amylase-containing starch can be used. It effects in the batter mix system, such as hydration speed, quantity of absorbed water, extent of decreasing the specific gravity or the extent of increase in cake volume or the capacity to retain crumb softness in the finished baked cake is greatly improved. The starch must be pre-gelatinized before addition to a cake batter mix. Pre-gelatinization is carried out in conventional manner by heating the starch in the presence of excess water until the starch granules have broken and then the starch is dried upon drum rollers or any other form of conventional drying apparatus.

Various low amylase-containing starches may be incorporated in cake batter mixes, like waxy maize starches, waxy sorghum starches, starch ethers and esters, which are considered to contain at most trace amounts of amylase. An improved method of cake baking which comprises preparing a cake batter of principally flour, sugar and shortening and adding thereto from about 1% to about 5% of a pre-gelatinized starch

which contains not more than 18% by weight of amylase, and then baking the said batter at elevated temperature to obtain an improved cake, said proportion of added pre-gelatinized starch being based upon the weight of solid ingredients in said batter. In general the batter mix is capable of rapidly taking up water at high absorption levels so that the viscosity of the batter mix can be adequately increased. With a high viscosity the cake batter can entrap sufficient air during the mixing cycle with liquid components to provide a low specific gravity. A low specific gravity, in turn, will almost always yield finished baked cakes of adequate volume and good softness, texture and tenderness. Basically then, the desired properties in the batter mix system are rapid and high levels of hydration, high viscosity, and low specific gravity after the mixing cycle.

Cake gel is a cake improver, comprised of emulsifiers and humectants, which greatly improves volume through increased aeration and provides a more uniform crumb structure. It also improves softness in cake. Additionally, it increases batter stability and reduces variances that may be caused due to changing flour quantity and changing process parameters.

Adding Cake gel helps in smooth mixing of all ingredients, improves batter consistency and strength, better and uniform crumb texture, extra volume and better eating qualities. It contains ingredients such as Emulsifiers, propylene glycol and water. It is to be added in the cake batter at a dosage of 3 to 8% on flour weight. (30g to 80g per 1kg flour).

What is a cake enhancer? These fatty acids come from vegetable fats, and act as emulsifiers, allowing fats and liquids to combine more easily. They also serve as stabilizers and texture enhancers. Widely used in commercial baked products, they keep baked goods fresh and soft, and help cakes stay moist, light and fluffy and stay fresher longer.

3.7 FILLINGS & FROSTINGS

Some cakes come out of the oven, cool, and are good to go. But many benefit from (and some require) "finishing," meaning that they need to be combined with other components to taste and look their best. For many cakes, this means **stacking layers** on top of each other, sandwiched with a **filling.** But cakes can also be baked in long, thin sheets and **rolled up** with a filling. And even cakes without layers are often topped with a **glaze** or **frosting.** Finally, lots of cakes are made more beautiful with the addition of edible **decorations.**

Many cakes use combinations of these techniques - for instance, a syrup and custard between the layers, frosting on the outside and piped decorations. Some techniques go better with certain types of cake. Mixing and matching various types of cakes and finishing techniques is one of the most creative parts of cake-baking. Below are the most common options:

BETWEEN THE LAYERS

Anything that goes between the layers of a cake (or inside the cake, if it's rolled up) is called the filling. Many cakes use more than one type of filling - either all together, such as whipped cream and berries between each layer, or alternating fillings between different layers, such as Ganache between some and butter cream between others. Some types of fillings can also be used to cover the outside of the cake—many of the fillings listed below fall into this category.

- **Sugar Syrup:** This is brushed on cake layers to moisten them. It's particularly essential for drier cakes, such as Genoese, but even some butter and oil cakes can benefit from being brushed with syrup, which will keep them fresher longer. For this reason, syrup is popular in wedding cakes and other large projects that must be made in multiple stages. The cake is made first and can be several days old by the time it's served - the syrup keeps it tasting fresh and moist. Syrup is not usually used alone as a filling - generally the layers are brushed with syrup and then another filling, such as jam or butter cream, is spread on top. Basic sugar syrups can be flavored with myriad ingredients, including espresso, vanilla extract, liquors, liqueurs, eaux-de-vie, and fruit juice. The flavoring of the syrup should complement or match the flavors of the cake and other finishing agents.

- **Jams and Jellies:** These are also best in combination with other fillings such as butter cream or ganache. To use a jam or jelly as a cake filling, simply stir it to soften, or heat it slightly if it's too thick. You may also want to strain jams to remove the seeds for a smoother texture.

- **Custards:** These include **fruit curds**, such as lemon or orange curd, and **pastry cream**, custard thickened with flour or cornstarch. Custards are used as fillings in many European-style cakes—they work well between layers of Genoese—but can also be used with any layers that aren't too rich, such as white or chiffon cake. Pastry cream can be flavored with vanilla or other flavorings, and sometimes a small amount of whipped cream is folded in to lighten it. Custards are generally used only as fillings—they're too rich and have the wrong texture to cover the outside of a cake. But a small amount of custard can be folded into a cream cheese frosting to flavor it.

- **Whipped Cream:** Whether lightly flavored or left as is in all its fluffy goodness, whipped cream is a classic and simple cake filling. Since it's somewhat bland itself, whipped cream works particularly well with assertively flavored cakes, such as devil's food or spice cakes. But, when paired with other fillings like fruit, it's also good with lighter cakes such as Genoese. Whipped cream can also be used to cover the outside of a cake and piped to form soft decorations.

- **Butter cream:** Butter cream is extremely versatile—it can be used both between the layers and to cover the outside of a cake, and it goes well with both butter/oil cakes and lighter Genoese-based layer cakes. It can also be

piped to form decorations. Traditional butter cream starts with a base of eggs and sugar, then soft butter is beaten in. To finish, flavorings are added—these can include vanilla extract, coffee, chocolate, lemon juice, or fruit purées. There are four traditional types of butter cream—two called "meringue" varieties, because they use only egg whites, one that uses yolks, and one that uses whole eggs:

- ***Swiss meringue butter cream*** uses only egg whites. The whites and sugar are warmed in a metal bowl over boiling water, then whipped and cooled before the butter and flavoring are incorporated. This type of butter cream is the simplest to make and is probably the best for most situations.

- ***Italian meringue butter cream-*** also uses only egg whites, like Swiss meringue. The difference lies in how the ingredients are combined: For Italian meringue, sugar syrup is boiled until it reaches 245 degrees, and then added to egg whites while they're whipping. The process is a bit complicated—the mixer must be running when the syrup is added or the hot syrup will cook and harden bits of egg. Italian meringue butter cream is not practical to make in small quantities, because there's so little sugar syrup that it's difficult to get an accurate thermometer reading. However, for large batches, some professionals prefer it to Swiss meringue because only the syrup needs to be heated, not the eggs.

- ***French butter cream*** - uses only egg yolks and is made the same way as Italian meringue. This type of butter cream is very rich. Some people like the rich flavor, but others find it too overwhelming. Due to the egg yolks, this butter cream is very perishable and should be kept refrigerated.

- ***Whole-egg butter cream*** - is also made with sugar syrup, like Italian meringue. It's richer than the meringue varieties, but not quite as rich as French butter cream. It's also quite perishable and should be refrigerated.

- **Confectioners' Sugar Icing:** Sometimes known as **"American butter cream,"** this is the classic frosting you'll find on old-fashioned birthday cakes. It's often used both as a filling and to cover the outside of the cake, but it's much sweeter than traditional European butter creams, and a bit gritty, so we think its best reserved for topping cupcakes. It's very easy to prepare: Butter and confectioner's sugar are simply beaten together, and then the mixture is softened with a little liquid such as milk or fruit juice. Flavorings like vanilla extract and chocolate can also be added.

- **Cream Cheese Frosting:** This is another easy medium for both filling and covering a cake: Cream cheese and butter are beaten together with confectioners' sugar and a flavoring such as vanilla extract. This type of

frosting is quite sweet, though the tanginess of the cream cheese cuts the sugar a bit. It's the classic pairing for American oil cakes such as red velvet and carrot cakes.

- **Fluffy White Icing:** Also called ***"seven-minute frosting,"*** this is a pure white, marshmallow icing that's made by warming egg whites, sugar, and a bit of water and beating the mixture until its fluffy and glossy. (In the days before electric mixers, it was beaten with a rotary beater for seven minutes, hence the name.) Fluffy white icing is most commonly used both between layers and to cover a devil's food cake—the contrast between the dark cake and the white frosting makes an appealing statement. This frosting is not as common these days, but it used to be wildly popular for many types of layer cakes, sometimes only as a topping, with jam used as the filling. Substituting light brown sugar for granulated sugar makes sea-foam frosting, an old-fashioned recipe that deserves a revival.

- **Ganache:** This is a rich mixture of chocolate and cream that can be paired with many different types of cakes. You can change the impact of a ganache by varying the ratio of chocolate to cream - *at* ***one-and-a-half parts chocolate to one part cream*** it makes a thick, luxurious filling for cake layers. If you use equal amounts of chocolate and cream, known as ***"ordinary ganache,"*** though it tastes pretty extraordinary, the result will be a bit thinner. At room temperature, this mixture will be a pourable glaze. Or, if chilled briefly, it will thicken slightly and can be spread on the outside of a cake.

ON THE TOP AND SIDES

Elements used to cover the top and sides of the cake include frosting (a soft substance spread on the cake), icing (can be a synonym for frosting, but also includes rolled icings such as fondant and thinner icings that are similar to glazes), and glaze (a thinner material brushed on top of a cake or poured over it while warm and allowed to cool or harden). French and Viennese pastry chefs originally invented the idea of glazing cakes as a way of preserving them—the glaze sealed off the cakes from the air and prevented them from growing stale.

In addition to the items listed above that can be used both inside the cake and on the outside, the following elements are typically used only for covering a cake:

- **Water Icing:** This is made from confectioners' sugar and water or milk, often with the addition of a flavoring such as citrus juice or vanilla extract. A thin water icing may be brushed on a simple cooled cake like a pound or coffee cake. If made thicker, it forms a white glaze that can be drizzled onto the cake—a standard finish for many rich cakes baked in Bundt pans.

- **Rolled Fondant:** This is a combination of sugar and vegetable shortening that makes a thick white puttylike substance that can be rolled out like pastry dough and stretched over cakes. Rolled fondant is popular among cake artists because it holds up well in hot weather, can be tinted any color, and forms a smooth, perfect surface for decorations. Unfortunately, while it looks terrific, fondant does not have much flavor and, if applied too thickly, can taste terrible.

- **Marzipan:** This almond paste is another thick material that can be rolled out and used to cover cakes. It's quite sweet and is off-white, so it's not a good candidate for tinting, but it has a much better flavor than fondant. Vienna's famous rum-soaked Punschtorte conceals a paper-thin layer of marzipan under a sugar icing. Marzipan can also be used to mold flowers and other decorations that are then placed on a cake.

- **Royal Icing:** This is made from a heavy paste of egg whites and confectioners' sugar beaten with a little vinegar or strained lemon juice to help the egg whites froth. The result is a pure-white, sticky icing that dries to a hard finish. Royal icing is used for delicate piping such as elaborate "string" decorations that are piped from a tiny plain tube or paper cone. Its pure-white color makes it a good option for tinting. Its flavor is sweet and unobtrusive, but due to its crisp texture when dry, it should not be used in large amounts.

- **Melted Chocolate:** This can be piped from a paper cone to write on a cake, or drizzled in a simple decoration. Dark chocolate looks particularly nice against a lighter-colored frosting.

COMMONLY USED FROSTINGS OR ICINGS, FILLINGS AND GLAZES:

DESCRIPTION / CONSISTENCY	HOW MADE	BEST USED FOR / COLORING	STORAGE	SPECIAL INFORMATION
7- MINUTE / BOILED ICING Marshmallow-like texture, 100% fat free. e.g.: Seven Minute Vanilla Bean Icing	Made by warming egg whites, sugar, and a bit of water and beating until it's fluffy and glossy. Substituting light brown sugar for granulated sugar makes sea-foam frosting. Sets quickly.	Most commonly used both between layers and to cover a devil's food cake. Is pure white and can be tinted to yield pastels.	Best used immediately. Iced cake can be stored at room temperature. Keeps for about 24 hours, and then deflates. Does not freeze well.	Will deflate if mixed with ingredients containing fat such as chocolate or whipped cream.
MERICAN BUTTER CREAM / CONFECTIONERS' SUGAR ICING Several styles. Is most popular choice for frosting. Sweet, buttery flavor. Can be slightly gritty. Great for most decorating. e.g.: Tami's or Perfect Butter cream or Tami's or Perfect Butter cream	**Butter (and/or shortening) and cream or milk are beaten together, and then confectioners' sugar added. Flavored with extracts and chocolate. Can be made thin to stiff consistency, and fluffy or smooth.**	**Use as an frosting and filling. Can be piped for smooth, borders, writing. Most decorations including roses, drop flowers, sweet peas and figure piping. Flowers remain soft enough to be cut with a knife. Use or serve at room temperature. Yields all colors. Most colors deepen overnight. Some colors may fade sitting in bright light.**	**Icing can be refrigerated in an airtight container for 2 weeks or frozen. Iced cake can be stored at cool side of room temperature for 2-3 days.**	**Does not hold up well in warm weather, unless shortening is used. Jams and ganache are always great alternatives to butter cream fillings and hold-up well in warm weather.**

BUTTER CREAM - FRENCH Is very rich. e.g.: Neoclassic French Butter cream	**Uses egg yolks (or whole eggs) and is made the same way as Italian meringue.**	**Filling and frosting.**	**Needs refrigeration**	Due to the egg yolks, this butter cream is very perishable and should be kept refrigerated.
BUTTER CREAM - MERINGUE ITALIAN (MOUSSELINE) AND SWISS Fluffy and buttery. Medium to thick consistency. e.g.: Italian Meringue or Mousseline Butter cream or Swiss Meringue Butter cream	**Both use only egg whites, but differences are how they are made. Italian: Hot sugar syrup is added to already whipped egg whites. Swiss: The whites and sugar are mixed together over heat and whipped. Then, cooled before the butter and flavoring are added. This type of butter cream is the simplest.**	**Frosting and filling on cake. Suggest making a filling dam if used as a filling otherwise may squish from cake. / Yields pastel colors.**	**Needs refrigeration.**	**Italian holds up well in warm weather (75 degrees plus) and is more dependable. Swiss tends to deflate a little quicker and doesn't hold up as well in warm environments.**
BUTTER CREAM - ROLLED Sweet. Similar to fondant. e.g.: Rolled Butter cream	**Made from stiff American butter cream. Dough-like consistency that is rolled out before applied to cake.**	**Covering cakes and cookies / Can be tinted; see butter cream**	**Same as American Butter cream**	**Is very soft and can be hard to work with.**
CANDY CLAY Edible and sweet. Texture like Play Dough. Also makes a delicious chocolate candy. e.g.: Easy Candy	**Can be made with a mixture of heated Candy Melts and corn syrup. Dough-like consistency that is rolled out before applied to cake.**	**Covering cakes, hand-molding and decorating. Mix with gum paste for more strength / Yields all colors if using white candy melts.**	**After making, handles best if hardened overnight. Several weeks at room temperature in**	**Will be very hard at the start; knead a small portion at a time until workable.**

Clay or Chocolate Plastic from Candy Melts			**a well-sealed container.**	
CITRUS (LEMON) CURD A conserve or custard with a thick consistency. Tart flavor. e.g.: Fresh Lemon Curd	**Made with lemons and butter and eggs and sugar, and cooked on the stovetop. Can be purchased ready-made.**	**Spread on bread or cakes. Used as a filling. Fold in with whipped cream or pastry cream.**	Keep refrigerated.	Needs refrigeration.
CREAM CHEESE Slightly tangy, but can be sweet. Thick and creamy. Thin to medium consistency. Classic pairing for American oil cakes such as carrot and spice cakes. e.g.: Cream Cheese Butter cream Frosting	**Cream cheese and butter are beaten together, liquid (milk, liqueur) is added and beaten in, and then confectioners' sugar is added, with flavoring at end, such as vanilla extract.** **Cream cheese frostings get really soft quickly after you take them out of the fridge.**	Filling and frosting cakes. / Colors to pastels.	**Iced cake must be refrigerated. Handy Pac cream cheese is shelf stable vs. using the actual cream cheese which needs to be refrigerated.**	**Do not move the frosted cake's surface when refrigerating, let it harden first in the refrigerator, then cover with plastic wrap. When you take it from the refrigerator, immediately remove plastic wrap and let it sit to soften before serving.**
CUSTARD OR PUDDINGS Different varieties. Pastry cream or Citrus curd (custards, cooked) or mousse (pudding,	**Custard (pastry cream) thickened with flour or cornstarch. See Citrus curd.** **Fruit puree or flavored base (mousse) folded in with whipped cream or beaten egg whites.**	**Fillings used alone. A small amount can be folded into whipped cream to flavor it.**	Must remain refrigerated.	Highly perishable. Needs refrigeration.

not cooked). Thick, smooth and creamy. e.g.: Pastry Cream or Fresh Lemon Curd or White Chocolate Raspberry Mousse				
FONDANT - ROLLED Used for its special look on wedding cakes. Rich, sweet flavor. Covers with a perfectly smooth, matte finish. Does not dry as hard as royal icing and stays semi-soft. Seals in freshness and moisture. e.g.: Rolled Fondant and Marshmallow Fondant	**Combination of sugar and vegetable shortening that makes a thick white dough-like substance, and then rolled out. Can be made with marshmallows. Knead in flavor and color of your choice. Can be purchased ready-made.**	**Rolled out and used as a cake covering. Use on any firm butter, pound or fruit cake. Even on cookies. Can be cut-out and used as decorations. / Yields pastel to deep colors. But, does not have much flavor.**	**The best choice for outdoor events. Excess can be stored 2 months in an airtight container. Can refrigerate but must take steps to rid of condensation from fondant-covered cake: place in an air-conditioned room or in front of fan after removing.**	**Holds up well in hot weather but, will soften in warm or humid weather. Prior to applying, cake must be covered in apricot glaze, butter cream icing or marzipan so fondant will adhere. Typically rolled to about 3/8- to 1/4-inch thick.**
FONDANT - POURED Very sweet flavor. Covers cakes with perfectly smooth,	Pours and dries to a semi-hard, smooth surface.	All cakes, petit fours and cookies	Excess may be refrigerated, gently reheated and poured again	Will soften or become sticky in warm, humid weather.

satiny iced surface. Seals in freshness. e.g.: Poured Fondant for Cakes and Cookies and Simple Fondant Glaze				
GANACHE Is a French term. Dark: decadent, rich, and very, very chocolatey. White: Rich velvety taste - a little more complex flavor than a butter cream. Can be glaze, whipped or smooth. e.g.: Poured and Whipped Ganache and Chocolate Ganache	**This is a rich emulsified mixture of chocolate and cream. Butter cream consistency can be made by whipping soft butter into its base, resulting in ganache beurre.**	**Glaze. Filling and/or frosting: whipped or smooth / Natural color is dark to medium brown or white. Can be flavored (oil-based). White can also be tinted(oil-based)**	Needs refrigeration after 2 to 3 days at room temperature, 2 weeks refrigerated and 6 months frozen. Keep excess with a piece of plastic wrap pushed on its surface. Gently reheat.	The better the chocolate used, the better the ganache. Good for warm (not hot) weather.
GLAZES Simple and sugary. Smooth: thick or thin. e.g.: Chocolate Glaze				
GUM PASTE Dough-like. Thick and malleable. ex: Gum paste or	Gum based paste with a stiffening agent. Can be purchased ready-made.	Cutting molding and modeling decorations. / Deep to pastel colors.	Excess can be stored 2 months in an airtight container. Best	Decorations will survive warm days, but is susceptible to extreme heat and

Tylose Gum Paste			not refrigerated. Do not freeze.	humidity where it will soften.
JAMS AND JELLIES e.g.: Italian Strawberry Tart or Crostata di Fragole and Strawberry Butter Cake	Can purchase ready-made: stir it to soften, or heat with small amount of liquid if it's too thick, and strain to remove the seeds.	Used as a filling alone or in combination with other fillings such as butter cream or ganache.	Refrigerate after opening. Is not perishable if used as a filling.	Great for warm or hot weather. But, filled cakes should be stored in refrigerator for long-term storage to prevent mold.
MARZIPAN It is used similarly to rolled fondant because it gives a smooth look. It has a delicious and unique almond flavor. e.g.: Marzipan	**Marzipan is made of almond paste. Can purchase ready-made.** **Dough-like consistency that is rolled out before applied to cake. Is stretchy. Stays semi-soft on cakes.**	Rolled out and used as a cake or cookie covering, and then, covered with a sugar icing, such as fondant or butter cream. Can be used to mold flowers and other decorations that are then placed on a cake or served alone. / Is off-white and can used in its natural color or be tinted.	Keep almond paste well covered and refrigerated, since it contains almonds which can go rancid.	Holds up well in warm weather.
MERINGUE Pure white fluffy beaten egg whites.	Is made from beating egg whites with sugar. There are many types depending on the ratio of its ingredients.	Used for covering pies, cakes and Baked Alaska. Can be piped.	Does not need refrigeration. Becomes sticky when refrigerated.	Can weep after storage, even for a day or two. Refrigeration speeds up the weeping process.
ROYAL ICING Pure white, sticky icing that dries to a hard finish.	Heavy paste of egg whites and confectioners' sugar beaten with a little vinegar or lemon juice. Can be made in different consistencies.	Used for general piping or delicate work such as elaborate "string" decorations. Decorating cookies and gingerbread houses. / Tints to pastel to dark colors.	Does not need refrigeration. Air-dried decorations last for months.	Will soften when placed on butter or fat based frostings.
SIMPLE SUGAR SYRUPS	Made from sugar and water, and then cooked. Can be	Brushed on drier cake layers to moisten them, such as Genoese.	Keep excess refrigerated.	Holds up well in warm weather, but gets

Simple and sugary.	flavored which should complement or match the flavors of the cake.	Syrup is popular in wedding cakes and other large projects that must be made in multiple stages; keeps it taste fresh and moist longer. Syrup is not usually used alone as a filling; the layers are brushed with syrup and then another filling, such as jam or butter cream, is spread on top.	Cakes that are moistened with sugar syrups can mold easily.	sticky when humid. Bowls/utensils must be grease-free. Cover icing with damp cloth while working, to prevent crusting.
WHIPPED CREAM Creamy, delicate sweetness. Perishable.	Whipping cream beaten with sugar. Can be flavored. Stabilized for longer life with gelatin.	Can be used as a filling and frosting. Can be piped to form soft decorations. /Tints in pastel colors.	Must remain refrigerated.	Use immediately because deflates readily. Iced cake must be refrigerated. Texture remains soft on decorated cake.

Cake Decoration

Coating	Ingredients	Techniques	Equipments
Chocolate	Chocolate	Melting Pouring Coating	Pan Bowl Drip tray/plate Cake board Turntable
Butter cream	Butter Icing sugar Water/fruit juice Flavourings	Sieving Creaming Spreading Smoothing	Bowl Sieve Tablespoon Wooden spoon/Beater Palette knife Cake board Turntable
Marzipan	Marzipan	Kneading Rolling Shaping Trimming Coating Smoothing	Rolling pin Sharp knife String Cake board Turntable
Apricot glaze	Apricot jam Water	Melting	Pan/Microwave Bowl Pastry brush Wooden spoon or plastic spatula

Royal icing	Merriwhite/ Egg white Water Icing sugar Colourings Glycerin Lemon juice	Sieving Mixing Spreading Paddling Smoothing Leveling Colouring Scraping	Damp cloth/cling Film Bowl Sieve Tablespoon Wooden spoon Plastic scraper Palette knife Icing scraper Icing ruler Cake board Turntable
Sugar paste	Sugar paste Icing sugar Colourings	Kneading Rolling Coating Smoothing Colouring	Rolling pin Sharp knife String Cake board Turntable

Cake Decoration types

Technique	Medium	Equipments
Modeling	Marzipan Sugar paste	Boning tool Veining tool Wheel cutter Sharp knife
Embossing	Marzipan Sugar paste	Cutter/stencil/anything small with a defined pattern on it.
Crimping	Marzipan Sugar paste	Crimping tool
Cut–outs	Chocolate Sugar paste Mexican paste Flower paste	Greaseproof paper/waxed paper Cutters/sharp knife/stencils Palette knife Rolling pin Brush

Garrett frills	Sugar paste Mexican paste Flower paste	Rolling pin Cutters Cocktail stick Palette knife Brush Greaseproof paper Scriber
Brush embroidery	Royal icing	Piping bags Tube No.1 Paint brush Cutter/stencil/design
Run outs	Royal icing	Piping bags Tube No.1 or 2 – plain nozzle Waxed paper/acetate film
Piping	Royal icing	Piping bags Tubes – plain No. 1 or 2 Shell or star nozzle (as required)

3.8 CAKE MAKING PROCESS

Cake batters are prepared using carefully tested formulas. Since these formulas are balanced, no changes should be made in the few ingredients that are added. For example, if the directions call for water to be added, do not add milk instead. Substituting ingredients or adding other ingredients will make the formula out of balance and can ruin the finished product. Follow the directions for a cake batter to get a good product.

Cake baking is not difficult, but it requires some organization and forethought. While the steps for making a cake vary considerably depending on the type, you'll want to do the following before attempting any recipe:

1. **Read through the recipe:** This sounds obvious, but cakes in particular have certain requirements, such as the temperature of ingredients, that cannot be altered. You don't want to realize too late that the butter you just mixed with sugar was supposed to be softened.

2. **Assemble ingredients and ensure their correct temperature:** Get all of your ingredients and equipment out on the counter before you begin and make sure they're at the proper temperature. This is especially important for butter and eggs: Soft butter makes for a smooth batter and a lofty cake, and room-temperature eggs keep the batter's temperature consistent.
   To soften butter, leave it out for several hours; it should offer no resistance when you press on it. Or, you can hurry the process using a microwave: Cut

the butter into 1/2-inch cubes, arrange them in a single layer on a microwave-safe plate, then microwave on high for 3 seconds at a time, testing in between, until the butter is softened but not melted.

3. **Preheat the oven:** Before preparing the batter, your oven should be at the correct temperature. A batter will not react properly to heat if it sits at room temperature for 10 minutes waiting for the oven to heat. Nor will it rise properly if the oven continues to warm up after the pan has been placed in it. Avoid burning your cake by setting a rack in the middle of the oven for cake layers or in the lower third for a tube cake so that the top of the pan is not too close to the top of the oven.

4. **Prepare your equipment:** To ensure that your finished cake has the right shape, it's important to make sure that it will come out of the pan in one piece. The most common way to do this is to coat the pan with butter, but the specifics may vary depending on the type of cake. For cake layers in general, you coat the inside of the pan with very soft but not melted butter using a brush. Follow that with a disk of parchment paper cut to the size of the inside of the pan. For a butter cake baked in a Bundt pan, coat with soft butter, and then coat the buttered surface with fine, dry bread crumbs, tapping the inverted pan to dislodge any excess. Follow with a quick coat of vegetable cooking spray for a guarantee that the cake won't stick. Line a rectangular or square pan with foil by molding the foil first on the back of the pan, then pressing it into the pan. Butter the foil. This makes it easy to lift a cake that you don't want to invert, such as a crumb cake, right out of the pan.

5. **Prepare the Batter:** Instructions will vary depending on the type of cake: For butter cakes, the ingredients will typically be combined using the creaming method; for sponge cakes the eggs will generally be beaten, then folded in. For the proper texture, be sure to follow the instructions closely, and then pour the batter into the pan or pans and bake.

6. **Test for Doneness:** To test a cake, plunge a thin knife or cake tester into the center (or halfway between the side and the tube if using a tube pan). When a cake is finished, you will find a few crumbs sticking to the knife or tester when you withdraw it. If the cake is not ready yet, there will be wet batter on the knife or tester.

7. **Cool the Cake:** Most cakes are cooled on a metal rack for even air circulation. A recipe will indicate whether the cake should be cooled in the pan or unmolded immediately. Follow instructions carefully—leaving certain types of cakes in the pan for too long may cause them to stick. Angel food cakes and chiffon cakes need to cool suspended upside down in their tube pans or they will deflate and look squashed and unappealing when you cut

them. Invert the pan over several inverted ramekins so that the edges of the pan are supported by them. It is best to figure out the system for doing this before you begin baking the cake by testing the empty pan over the ramekins to make sure your system will be stable.

8. **Unmold the Cake:** When you are ready, gently run a sharp, thin knife between the edge of the pan and the cake. Then invert a rack or platter (as indicated in the recipe) over the top of the pan. Turn the pan over and lift it off the cake. You may be asked to finish cooling the cake upside down or instructed to turn it right side up again. Be sure to follow instructions, as each type of cake cools best in a different way.

9. **"Finish" the cake:** As described in the section on fillings, frostings, and glazes, options for finishing a cake are numerous. Some varieties, such as pound cakes and crumb cakes, are finished already when they come out of the oven and don't need any embellishment at all. For others, a simple dusting of powdered sugar or quick brush with a glaze may be all that's required. And some cakes, such as European-style layer cakes, can be filled with multiple fillings, frosted with a different frosting or glaze, and then adorned with elaborate decorations, such as piped butter cream or marzipan crafted into roses and leaves.

It is to be noted that:

The oven temperature at which these cakes should be baked will vary over a considerable range, depending on factors such as richness of the formula, size of pan, and moisture content of the batter. Batters which are high in sugar content require low baking temperatures in the range of 325- 350ºF(160-175ºC), while leaner mixtures may be baked at a temperature range of 350-400ºF(175- 200ºC). The average baking time for layer cakes will take 15-20 minutes and for cupcakes 10-15 minutes.

SECRETS TO BAKING PERFECT CAKES

1. **Good results start in the mixing bowl.**
   A cake is essentially a chemistry experiment—a series of ingredients mixed in a specific order to cause reactions that produce specific effects. Butter cakes, like pound cakes and most layer cakes, get their soft, fine texture and moistness—called a crumb—by first creaming together fat and sugar, adding eggs, and slowly incorporating dry ingredients into the mixture while alternating with a liquid, such as milk or buttermilk. Angel food, sponge, and chiffon cakes get their signature airy, foam like textures when whole eggs or egg whites (depending on the cake) are whipped until voluminous, and then folded into the batter. The air incorporated by whipping the eggs gives these cakes volume, making them springy and elastic. So whatever cake you're

making, be sure to follow the recipe instruction closely. The order and method described really counts when cake baking.

2. **Know your oven.**
   To prevent an under- or overdone cake, get an oven thermometer—it's the best way to be sure your oven is calibrated correctly. Bake the cake in the middle (too close to the top or bottom can cause overbrowning). Gently close the oven door—a hard slam can release air bubbles trapped in the batter. To check for doneness, lightly press the center of the cake; if it springs back, it's done. Or insert a wooden pick; it should come out clean.

3. **Choose the proper pan size (and color).**
   Your recipe calls for two 9-inch round cake pans, but you only have 8-inch pans. What to do? Go get two 9-inch pans. Pan size is specified in recipes because a cake increases in volume 50 to 100 percent during baking; if your pan is too small, the cake could overflow. Color is important, too; glass or dark nonstick pans usually require a 25-degree reduction in baking temperature versus silver-colored aluminum pans.

4. **Use the right flour for the recipe**.
   Different flours contain varying percentages of protein—the more protein, the more gluten. Cake flour has the least protein and yields extra-light baked goods, like angel food cake. Bread flour has the most and is used for denser items; all-purpose is in the middle and produces tender cakes.

5. **Weigh, don't measure, flour**.
   If you don't have a kitchen scale, it's time to buy one. Weight is the only accurate way to measure flour. Depending on how tightly flour is packed into a measuring cup, you can end up with double the amount intended. That's why we give flour measurements in ounces first.

6. **Chemistry counts.**
   The intimate chemistry among key ingredients delivers the foundation for good cake. Flour thickens the batter and provides gluten, a protein that gives the cake structure. It forms when flour is combined with a liquid and agitated. Don't over mix, which can cause your cake to turn tough. Leaveners, like baking soda or powder, produce carbon dioxide bubbles, which are trapped by the starch in the batter and expand during baking, causing the cake to rise. Fats, like butter, shortening, or oil, help retard gluten formation while providing moisture for the cake. This ensures a tender texture. Sugar breaks up gluten, keeping the texture tender; it absorbs liquid, keeping the cake moist; and it caramelizes in baking, enriching flavors and helping the cake brown. Eggs firm up when cooked, helping cake batters set in the oven. Egg

yolks contain fat, as well as lecithin, an emulsifier that allows fats and water to mix smoothly and ensures even texture.

7. Give your cake a cool down.
   Cool cakes in the pan on a wire rack for 20 minutes, and then remove from pan. Once cooled, place a plate on top, invert the pan, and gently tap or shake it to release the cake. Angel food cakes are usually baked in tube pans, then inverted either on feet attached to the pan or over a bottle to cool upside down while still in the pan—gravity helps the cake keep its volume. When it has cooled, run a narrow spatula around the edges, and release onto a plate.

8. **Frost like a professional.**
   Put a small dollop of frosting in the center of the cake plate, and place the first cake layer on top. This will keep the cake from moving as you work. Use an offset spatula to frost the top, add the next layer, then coat the whole cake with a thin layer of frosting. (This "crumb coat" holds loose crumbs in place.) Place the cake in the freezer for 15 minutes, then remove and finish frosting, starting with the top, then the sides.

9. **Fondant may make for a beautiful cake, but...**
   Rolled fondant—the smooth coating seen on elaborate wedding and reality-show competition cakes—is a combination of gelatin, glycerin, and sugar that forms into an easily molded dough. It doesn't taste very good, though. Poured fondant is cooked-sugar syrup that's used as a cake filling, in candies, or to top petit fours—you might know it better as the center of a Cadbury Crème Egg.

10. **How to factor in a higher altitude.**
    Since there is less air pressure at higher altitudes, cakes rise more and can dry out because liquids evaporate more quickly. If you live above 3,500 feet, follow these guidelines: Increase the oven temperature to 375° and liquid by 2 tablespoons for each cup used. Decrease each cup of sugar by 1 tablespoon, each teaspoon of baking powder by ⅛ teaspoon, and the baking time by 5 minutes.

3.8.1 Cake formula balancing

What is a cake formula?

It is an accurate record of the quantities of the raw materials necessary to make a particular type of cake. In other words……..it is an accurate recipe. If the recipe is correct, it will produce a good cake. As important as the recipe is the correct temperature, time and packing of the product. A good cake is one showing no faults,

either in appearance, texture or while eating. It should be of good flavor and aroma and if it contains fruits, they must be evenly distributed. Bakery being the science that it is, we refer to the recipe as a ***formula.*** In the bakery, the range of ingredients that are used and which are essential is limited. There is Flour, Fat, Sweetening and Moistening. Each of these has a specific role to play and must be in ***Balance*** with each other.

What is balance?
The ingredients that are used in cake making are divided according to their functions:

The toughеners – these are the ingredients that provide structure and form and give shape to the product. These will include flour and egg. The starch in the flour gelatinizes and the protein in the egg coagulates during baking and gives shape to the cake.

The softeners – these are the ingredients that soften the texture of the cake and include sugar and fat and milk. This softens the texture of cake and makes it different from that of bread, which contains basically the same ingredients but in a different proportion.

The moisteners – these ingredients like milk, egg and liquid sweeteners like golden syrup provide the moistening effect in the batter and adjust the consistency.

The driers – are those ingredients, which absorb the excess moisture in the batter and include flour, milk powder, and cocoa powder.
The problem in Balancing is that certain ingredients perform more than one function. Eggs provide toughening but are also a moistening agent. Milk is a moistening agent, but milk powder is a drier!!!! The aim of formula balancing is to balance the moisteners with the driers and the toughеners with the softeners. A simple sponge recipe may be in perfect balance, but when converted into a chocolate cake, the addition of cocoa powder in the recipe will mean additional driers so the corresponding moistening (addition of milk) will have to be increased as well.
There are three simple rules that govern Formula Balancing:

- The weight of the fat should not exceed the egg
- The weight of the fat should not exceed the sugar
- The weight of the sugar should not exceed the total liquid

The Effect of Sugar: Sugar sweetens. It also has the power to lift and lighten the cake and to give the crust its color. It improves the taste and the flavour of the cake as well as the keeping quality and it adds to its nutritive value. The extra sugar in a recipe will result in the M Fault, when the extra sugar has lifted the batter to such an extent that the protein-starch structure can no longer hold up the cake and collapses. Excess sugar will result in spots on the crust and the crumb will be sticky (excess moisture). On the other hand, if the batter is made with less sugar, it will have a

decreased volume with a peaked surface. The crumb will be dry and harsh. The peaked top is the result of the lack of softening action of the sugar on the gluten, which in turn will have greater resistance to expansion resulting in a peaked top.

The Effect of Fat: Fat imparts a rich and pleasant eating quality to the cake and increases the food value. Butter adds flavor and improves the quality of the cake. Because of its shortening property, fat/butter also prevents toughness. It holds the air that is incorporated in the initial process of creaming. Too much fat in a recipe will result in a cake of poor vol; Ume. The top crust will be thick and greasy. An increase in fat must be balanced by an increase in the toughners (structural material) like flour and egg. Less fat will make the cake tough, the volume will be poor and the crumb structure will show tunnel like holes pointing to the centre of the crown of the cake.

The Effect of Baking Powder: Baking Powder is used for aeration, thus increasing the volume of the cake. Some recipes do not use baking powder and the aeration is provided by mechanical means like creaming or beating (of eggs) or by sieving. Excess baking powder will produce the same effect as an excess of sugar will produce. The only difference is that there is a generation of gas beyond that which the flour and egg can take, with the result, the cake collapses. The crust of the cake is darker than normal and the crumb is open and is discolored especially near the base of the cake. Less baking powder will produce a cake of poor volume.

3.8.2 Characteristics of cakes

The following are the characteristics of a cake:

	External		Internal
1.	Volume	1.	Grain
2.	Colour of Crust	2.	Colour of crumb
3.	Symmetry of form	3.	Aroma
4.	Character of crust	4.	Taste.
		5.	Texture

Volume: It is difficult to set standards for volume of cakes which will vary according to different types of cakes and also according to consumer preference. However, the cakes should not have a pinched appearance and should not appear over extended too. A well risen cake will have a pleasing appearance with slight convex top surface. Although, the relative weight of a particular volume of cake will differ in different types of cakes, but a cake should not appear too small or too large for its weight.

Colour of crust: The crust should have a pleasing golden brown colour. Too dark or too light or dull colour is not desirable. Crust must have a uniform colour, free from dark streaks or sugar spots or grease spots.

Symmetry of form: Cakes should have a symmetrical appearance. Peaking, low sides, sunken or high centre, burst, caved in bottom or uneven top are undesirable characteristics of cakes.

Character of crust: Crust of a good cake should be thin and tender. Thick, rubbery, sticky or over moist, too tender, tough or blistery crust is indicative of poor quality of cakes

Texture: Texture denotes the pliability and smoothness of the crumb as felt by sense of touch. It depends on the physical condition of the crumb and type of grain. A good texture is soft and velvety without weakness and should not be crumby. Rough, harsh, too compact, lumpy or too loose texture is not desirable.

Grain: The grain is the structure formed by the extended gluten strands including the area they surrounded. Grain will vary according to the type of cake. However; uniformity of the size of cell and thin cell walls are desirable qualities. Coarseness, thick cell walls, uneven size of cells, large holes and tunnels are indicative of poor grain. Grain should not be too open or too close.

Colour of crumb: Crumb should have a lively, lustrous and uniform colour. It should be free from any streaks or dark patches. Grey, non-uniform, dark, light or dull colour of crumb will be undesirable.

Aroma: Aroma of good cake should be pleasant, rich, sweet and natural. It is not desirable to have any foreign aroma i.e. aroma not produced by normal ingredients of cake. Flat, musty, strong or sharp aroma is indicative of poor quality of cake.

Taste: Taste of a cake should be pleasant, sweet and satisfying. Cakes should not have any unpleasant after taste in the mouth, should not have a blend taste and should not have any foreign taste i.e. taste which cannot be acquired by the use of normal ingredients of cakes. Use of excessive salt or soda will also adversely affect the taste.

3.9 COMMON CAKE FAULTS A ND REMIDIES

Some of the common faults of cake are listed below in tabular form for your better understanding**.**

EXTERNAL APPEARANCE	
FAULT	**CAUSES**
Cracked middle	a. Too much raising agents e.g. baking powder. b. Cake tin too small c. Oven temperature to hot d. Too much flour
Sunken cake	a. Oven temperature too low b. Oven door opened before the cake has set c. Too much of a particular ingredient d. Excessive jarring or moving of the cake during baking. e. Excessive mixing of the batter.
Side of the cake crunchy/burnt	a. Too much fat used to butter pan b. Oven temperature too hot c. Butter not suitable for baking d. Cake left in the oven for too long e. Cake tin not sufficiently lined
Can't get cake out of the pan	a. Cake tin not well lined b. Cooled too long
Cake too dark	a. Oven temperature too hot b. Incorrect amount of water c. Excessive sugar
Cake burned on top	a. Oven temperature too hot b. Incorrect amount of water
Cake shiny and sticky	a. Oven temperature too cool b. Not baked long enough c. Too much sugar in recipe
Crust too thick	a. Excessive baking time
Cake shrinks	a. Excessive liquid b. Oven temperature too hot c. Improper mixing procedure d. Cake baked too long

Cake rose unevenly	a. Flour was not blended well into the main mixture b. Oven temperature uneven c. Oven temperature too high
Cake too small	a. Scaling weight too low. b. Oven temperature too high. c. Batter temperature too high. d. Batter temperature too low. e. Incorrect amount of water.
Sugary top or white spots on the crust	a. Too much sugar b. Not enough liquid or hydration c. Sugar too coarse d. Batter standing too long before baking
Wet Streak at the Base of the Cake	e. Too much liquid f. Not rested properly
INTERNAL CAKE APPEARANCE	
Cake very dense/ dense grain	a. Enough air wasn't beaten into the cake b. Eggs added too quickly c. Not enough raising agent d. Excessive liquid e. Improper mixing
Close texture	a. Insufficient raising agent b. Too heavy handling of dough c. Not enough liquid d. Oven too cool f. Too little creaming of fat and sugar e. Curdling of creamed mixture
Coarse and irregular grain	a. Improper mixing procedures b. Stiff batter c. Depositing batter carelessly into pan d. Oven temperature too cool

Dry, crumbly texture	a. Baked for too long in too slow oven b. Insufficient liquid c. Too much raising agent d. Over-mixing of the batter e. Too little egg f. Too much sugar
Off color cakes	a. Unclean equipment b. Oven temperature too cool c. Improper mixing procedure
Sunk fruits	a. Fruits are too large/heavy b. Sugary syrup on outside of fruit was not washed off causing fruits to slide through mixture when heated c. Cake mixture over beaten/ too wet so could not hold fruit in place d. Oven temperature too hot
Burnt on top, isn't cooked in the middle	a. Cake tin too small b. Oven temperature too hot
GENERAL FAULTS	
Batter overflowed (weeping)	a. Wrong adjustments to recipes b. Cake tin too small
Poor flavor	a. Improper mixing procedure b. Faulty baking conditions c. Improper cleaning of equipment
Cake too tough	a. Excessive mixing b. Batter too stiff(insufficient water) c. Batter too thin(excessive water)
Cakes too tender for cutting	a. Over mixing of the batter b. Less egg c. More sugar d. Slow baking
Top crust peels and flakes off	a. Over mixing b. Cool oven c. Insufficient steam during baking

Lacks body structure	a. Excessive mixing b. Insufficient liquid
Dries out too soon	a. Excessive baking time b. Insufficient liquid c. Improper mixing procedure
Cake Staling Quickly	a. Oven too cold so the cakes are in the oven too long, and the crumb dries out b. Too much baking powder **c.** Not enough liquid in the batter to keep the cake moist

CHECK YOUR PROGRESS-I

1. Classify ingredients upon their function in cake making.

2. Give examples of emulsifiers used in cake making.

3. What is Chiffon cake?

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3.10 VARIETIES OF CAKE

You can find details on this topic in chapter 3.4 of this unit

3.10.1 WEDDING AND SPECIALITY CAKES

The term specialty cake is generally used to describe a cake that has been filled, iced, and has some type of finishing touch on the icing. Whether or not the cake is decorated attractively can influence your sales to a great degree. The decoration should tempt the customer to try the product and, at the same time, it should suggest the flavor and texture of the cake and filling. The decoration is the final wrapping, or packaging, designed to market your product.

Wedding and specialty cakes are a culmination of the talent, skills, and knowledge of the pastry chef or baker. To make a beautiful and flavorful cake, the pastry chef or baker must hone his or her skills in almost all aspects of the baking and pastry arts. Creation and development of cakes such as the ones in this chapter are limited only by the creativity of the individual.

Traditional British-style wedding cakes are perhaps the quintessential wedding cakes, from which most other wedding cake styles are derived. These are, in general, unfilled dark fruitcakes. The richness of the cake reflects a time when refrigeration was unavailable. Dried fruit, sugar, suet, and thick layers of coatings and icings helped the cakes stay fresh for one year, as the top layer would be saved and eaten on the couple's first anniversary. The cakes are traditionally coated with a layer of jam, then with marzipan, and finally with several coats of royal icing. The jam and

marzipan keep the white icing from absorbing oils or moisture from the cake, while protecting the cake itself from moisture loss and staling. Traditional British-style cakes consist of three tiers supported by pillars, generally pastillage, and both the icing and the decoration, which consists of royal icing piping and pastillage, are pure white. The British cultural influence is reflected in the styles of wedding cakes that evolved in countries colonized by Britain. Decoration consists of minute royal icing piping and gum paste flowers. Colors, if used at all, are the softest of pastels. Although these cakes may be quite ornate, their overall appearance is very soft and delicate. The tiers may simply be stacked, may be supported on pillars, or, often, may be displayed on offset asymmetrical cake stands. Beautiful realistic flowers are created from gum paste, and royal icing embroidery, string work, flood work, and ornaments are used to create stunning and intricate effects.

The British cake also spawned American-style cakes. American wedding cakes are most clearly defined by the use of buttercream icing, buttercream piping décor, and buttercream roses, often colored. There is no single cake type of choice in American cakes, but pound cakes, high-ratio cakes, génoise, and carrot cakes are most common. (Fig.3B)

Modern wedding cake: Modern-style cakes are efficient in production, visual and taste appeal and can be tailored to the customers liking. Simple elegance and a light, fresh appearance are the objectives, in contrast to the baroque ornamentation of more traditional styles. Cutouts can be made in advance, and then placed on the cake relatively quickly for decoration. The taste of the finished product is an important factor in favor of the modern-style wedding cake, with virtually no restrictions on the type of cake or fillings. Generally, as with modern cuisine, fresh and seasonal products are employed to their best advantage. If a customer loves fresh strawberry charlotte, there is no reason the patisserie cannot create a festive, attractive wedding cake composed of charlottes.

Specialty cakes: Specialty cakes employ many of the same techniques as do wedding cakes. There are two elements that distinguish wedding cakes from specialty cakes: Specialty cakes are typically not tiered or stacked as are wedding cakes, and they are most often less ornately decorated. In some respects, however, the creation of a specialty cake presents fewer restrictions for the pastry chef or baker's creativity. Specialty cakes are less limited by shape, color, and type of décor. Types of décor for these cakes will be restricted only by ambient temperature and humidity.

Layered Cakes

Single layer cake

Fig. 3B Wedding and Speciality cakes

3.11 INTRODUCTION TO CHOCOLATES

Chocolate is a typically sweet, usually brown food preparation of Theobroma cacao seeds, roasted and ground. It is made in the form of a liquid, paste, or in a block, or used as a flavoring ingredient in other foods. Chocolate has become one of the most popular food types and flavors in the world, and a vast number of foodstuffs involving chocolate have been created, particularly desserts including cakes,

pudding, mousse, chocolate brownies, and chocolate chip cookies. Many candies are filled with or coated with sweetened chocolate, and bars of solid chocolate and candy bars coated in chocolate are eaten as snacks. Gifts of chocolate molded into different shapes (e.g., eggs, hearts) have become traditional in almost all countries of the world.

Cocoa is the dried and fully fermented fatty seed of the cacao tree, from which cocoa solids and cocoa butter are extracted. They are the basis of chocolate. The cacao tree (*Theobroma cacao*) is native of warm and humid climates around the equator. It is s a small (48 m or 1526 ft tall) evergreen tree in the family. It may have originated in the foothills of the Andes in the Amazon and Orinoco basins of South America where today, examples of wild cacao still can be found. Cacao trees will grow in a limited geographical zone, of approximately 2 degrees to the north and south of the Equator. Nearly 70% of the world crop is grown in West Africa. A tree begins to bear when it is four or five years old. A mature tree may have 600 flowers in a year, yet only about 2pods. About 300-60 seeds (1pods) are required to produce 1 kg (2.2 lb) of cocoa paste.

Varieties of Cocoa: Cocoa can be classified into 4 types:

a. ***Forastero***- forms the greater part of all cocoa grown, is hardy and vigorous producing beans with the strongest and more bitter flavour flavor and is usually blended with other varieties.

b. ***Amelonado***-is the Forastero variety most widely grown in West Africa and Brazil. It has a smooth yellow pod with 3 or more pale to deep purple beans.

c. ***Crillo***-with its mild chocolate flavour is grown in Indonesia, Central and South America. Crillo trees are not as hardy and they produce softer and fragile pods which are red in colour, containing 20-30 white, ivory or very pale purple beans.

d. ***Trinitario***-plants are not found in the wild as they are cultivated hybrids of the other two types (crillo and forastero). Trinitario cocoa trees are grown mainly in the Caribbean area but also in Cameroon and Papua New Guinea. The mostly hard pods are variable in colour and they contain 3or more beans of variable colour but white beans are rare.

3.11.1 MAKING OF CHOCOLATES

The harvested pods are opened typically with a curved knife the pulp and cocoa seeds are removed and the rind is discarded. The pulp and seeds are then piled in

heaps, placed in bins, or laid out on grates for several days. During this time, the seeds and pulp undergo sweating, where the thick pulp liquefies as it ferments. The fermented pulp trickles away, leaving cocoa seeds behind to be collected. Sweating is important for the quality of the beans, which originally have a strong bitter taste. The fermented beans are dried by spreading them out over a large surface and constantly raking them which can be done on huge trays under the sun or by using artificial heat. Finally, the beans are trodden and shuffled about (often using bare human feet) and sometimes, during this process, red clay mixed with water is sprinkled over the beans to obtain a finer color, polish, and protection against molds during shipment to factories. The entire process of processing of coffee beans is illustrated below: (Fig. 3C)

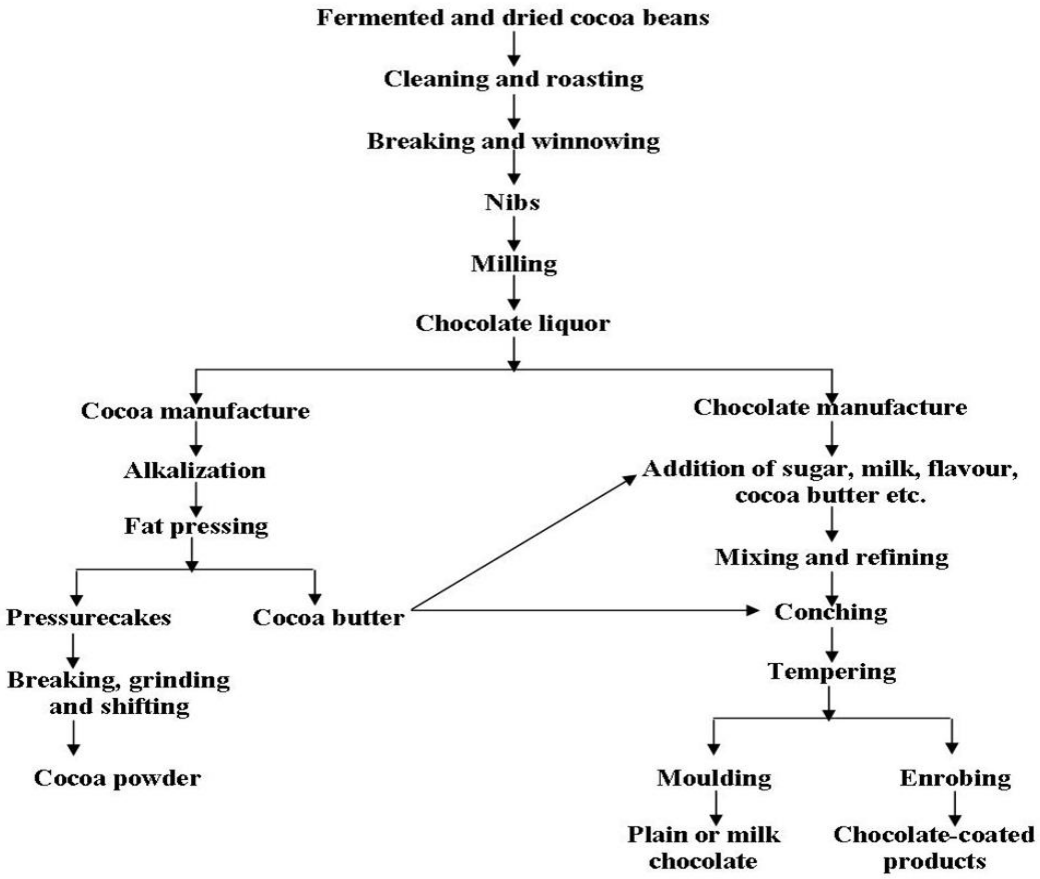

Fig. 3C Processing of coffee beans

Chocolate production: Chocolate is a range of products derived from cocoa (cacao), mixed with fat (i.e. cocoa butter and / or plant oils) and finely powdered sugar to produce a solid confection. There are several types according to the proportion of cocoa used in a particular formulation.

To make 1 kg (2.2 pounds) of chocolate, about 30 to 60 healthy beans are processed, depending on the desired cocoa content. In a factory, the beans are roasted and then cracked and de-shelled by a winnower. The resulting pieces of beans are called *nibs*, which are ground, using various methods where the heat produced during this procedure melts the cocoa butter releasing *chocolate liquor or cocoa paste*, which is removed by being pressed out. This liquoris then further processed into chocolate by mixing in (more) cocoa butter and sugar (and sometimes vanilla and lecithin as an emulsifier), and then refined, *conched* and tempered. The cocoa solids will now be formed into a dry cake and used as the base ingredient in the production of chocolate or processed into a fine cocoa powder using a hydraulic press or the *Broma* process. This process produces around 50% cocoa butter and 50% cocoa powder. Standard cocoa powder has a fat content of approximately 10-12 %.

Summary of the Process of Transforming Cocoa beans into Chocolate

Step 1. The cocoa beans are cleaned to remove all extraneous material.

Step 2. To bring out the chocolate flavour and colour the beans are roasted. The temperature, time and degree of moisture involved in roasting depend on the type of beans used and the sort of chocolate or product required from the process.

Step 3. A winnowing machine is used to remove the shells from the beans to leave just the cocoa nibs.

Step 4. The cocoa nibs undergo alkalization, usually with potassium carbonate, to develop the flavour and colour.

Step 5. The nibs are then milled to create cocoa liquor (cocoa particles suspended in cocoa butter). The temperature and degree of milling varies according to the type of nib used and the product required.

Step 6. Manufacturers generally use more than one type of bean in their products and therefore the different beans have to be blended together to the required formula.

Step 7. The cocoa liquor is pressed to extract the cocoa butter leaving a solid mass called cocoa press cake. The amount of butter extracted from the liquor is controlled by the manufacturer to produce press cake with different proportions of fat.

Step 8. The processing now takes two different directions. The cocoa butter is used in the manufacture of chocolate. The cocoa press cake is broken into small pieces to form kibbled press cake which is then pulverized to form cocoa powder.

Step 9. Cocoa liquor is used to produce chocolate through the addition of cocoa butter. Other ingredients such as sugar, milk, emulsifying agents and cocoa butter

equivalents are also added and mixed. The proportions of the different ingredients depend on the type of chocolate being made.

Step 10. The mixture then undergoes a refining process by travelling through a series of rollers until a smooth paste is formed. Refining improves the texture of the chocolate.

Step 11. The next process, conching, further develops flavour and texture. Conching is a kneading or smoothing process. The speed, duration and temperature of the kneading affect the flavour. An alternative to conching is an emulsifying process using a machine that works like an egg beater.

Step 12. The mixture is then tempered or passed through a heating, cooling and reheating process. This prevents discoloration and fat bloom in the product by preventing certain crystalline formations of cocoa butter developing.

Step 13. The mixture is then put into moulds or used for enrobing fillings and cooled in a cooling chamber.

Step 14. The chocolate is then packaged for distribution to retail outlets

Conching- here the cocoa solids are mixed together with cocoa butter slowly for few days, when they develop a smooth subtle texture and flavour. Then it is fortified with other ingredients like cocoa butter, sugar, vanilla, soya lethicin etc to impart a particular texture and taste.

Types of Cocoa powders: There are two types of cocoa powder a) natural (non - alkalized) and b) Dutch process (alkalized).

a. ***Dutch*** **-** process cocoa has been treated with a chemical, such as potassium carbonate, to reduce the natural acidity of the cocoa beans. Dutching also darkens the cocoa to an appetizing rich, deep reddish - brown color; extreme Dutching results in the distinctively flavored charcoal - black cocoa used to make Oreo cookies. Dutch - process cocoa may or may not be labeled as such, but cocoa processed with alkali should appear on the ingredient statement.

b. ***Natural*** coco***a*** is typically labeled cocoa. - Generally, higher fat content improves the flavor and quality of cocoa. Natural cocoas contain 1to 12 percent fat, although superior - quality, high - fat natural cocoa is available with 22 to 24 percent fat. The flavour is fruiter and mellow.

Types of chocolate:

a. ***Semi-Sweet Chocolate*** **-** Made from unsweetened chocolate (chocolate liquor), but with the addition of sugar, cocoa butter, lecithin and vanilla mixed in. Semi-sweet chocolate must contain at least 35% unsweetened chocolate, and typically is less than 50%.

b. ***Dark Chocolate*** **-** The rules regarding classification of chocolate in this category vary throughout the world. However, the one constant is that this type of chocolate contains no milk solids, but has sweeteners and cocoa butter added to the mix. In Europe, dark chocolate must consist of at least 35% cocoa solids while in the U.S.; it must have a 15% concentration of chocolate liquor.

c. ***Milk Chocolate*** **-** Like you'd guess from the name, milk chocolate is made with condensed or powdered milk. In Europe, milk chocolate must consist of at least 25% cocoa solids, while in the US, it must have 10% concentration of chocolate liqueur and a minimum of 12% milk solids. Milk chocolate is primarily used for eating and is the most popular form of chocolate in the U.S.

d. ***White Chocolate*** **-** The name given to white chocolate is a misnomer because it isn't really chocolate at all. Strictly speaking, chocolate is defined as any product 100% based on cocoa solid. White chocolate doesn't contain any cocoa solids and is made from cocoa butter, milk solids and sugar.

e. ***Couverture Chocolate*** - Chocolates under this classification are true gourmet chocolates that are rich in cocoa butter (upwards of 35%) which creates an extremely high fat content. Cocoa butter is the fat extracted from chocolate liquor. These chocolates contain a very high percentage of cocoa which is the solid powder left after the cocoa butter is extracted from the chocolate liquor.

In family or bakers' chocolate the cocoa fat content is replaced by a vegetable-based fat. This has a detrimental effect on the texture and hardness of the chocolate but makes the product cheaper to purchase and easier to use. When used for making chocolates, decorations or moulded chocolates, couverture first has to go through a process of tempering called 'pre-crystallization'.

3.11.2 BASIC CHOCOLATE WORKS

Melting (Tempering) chocolate : Tempered chocolate has been melted, cooled, and handled in a manner that allows very specific fat crystals (called beta crystals) to form. The result is chocolate that's shiny, will snap when broken, and isn't tacky to the touch.

Dark, milk and white couverture all contain cocoa butter. When the chocolate is warmed, the fat crystals in the cocoa butter melt and the chocolate becomes liquid. This starts to occur at 25^0c, but cocoa butter contains a variety of fat crystals, some of which will not melt until a temperature of 37^0c has been reached. To make sure that the mass of chocolate is totally melted it is common practice to heat the chocolate to 45^0C, the following practices must be applied when melting chocolate;

Using a Double Boiler

- Use double boiler. Double boilers are great if you need the chocolate to stay melted for a long time.
- Bring water to boiling stage in the bottom pan of the double boiler.
- Put the chocolate chips/scrapings in the upper pan. If you are working with large amounts of chocolate, consider putting only two-thirds of it in first.
- Place the upper saucepan on top of your lower saucepan. Make sure that the bottom of your saucepan or bowl does not touch the surface of the water. If it does, pour some of the water out. Make sure that the fit is tight, and that no steam can escape.
- Wait for the chocolate to melt most of the way, stirring occasionally with a clean and dry rubber spatula. If you are working with large amounts of chocolate, you can add in the remaining third a little bit at a time.
- Take the upper pan off of the bottom one, and set it down on the counter.
- Continue to stir the chocolate until the mixture is smooth and there are no chunks of chocolate left. Once the chocolate is melted and is at right temperature, you can add in other ingredients to it, such as shortening, paraffin or nuts.
- Use the chocolate as required.

Dark chocolate
Temperature is 31-32^{0}C

Milk chocolate
Temperature is 30-31^{0}C

White chocolate
Temperature is 28-29^{0}C

Fig. 3 D Melting temperature of chocolate

USING A MICROWAVE

- Put the chocolate chips into a wide, shallow microwave-safe bowl. It is important that the container you use remains cool or very slightly warm after several minutes of microwaving, otherwise, the container itself will overheat the chocolate. The container must also be perfectly dry, as any moisture will cause the chocolate to harden and become grainy.

- Microwave the chocolate on medium power for 1 minute, and then give it a stir. You can stir the chocolate with a rubber spatula or a spoon, but make sure that whatever you use is dry. Also, keep in mind that every microwave oven is different, so your chocolate may not be melted completely after this. That is perfectly fine; you can always continue heating the chocolate in short bursts. Chocolate doesn't lose its shape when you microwave it, so stirring it will help make it smooth and saucier.

- Continue heating the chocolate at 10 to 15-second intervals, stirring between each one, until it is almost melted. Milk chocolate and white chocolate tend to overheat quicker than dark chocolate. It would be best to stir them every 10 seconds.
    - 1 ounce (30 grams) will take 1 minute total.
    - 8 ounces (225 grams) will take 3 minutes total.
    - 1 pound (450 grams) may take up to 6 minutes.

- Take the chocolate out of the microwave and continue stirring the chocolate until it turns smooth. Once the chocolate is mostly melted, take the bowl out of the microwave, and set it down onto a heat-safe surface. Continue stirring the chocolate, scrapping the bottom and sides of the bowl often, until it is smooth and no chunks remain.

- Add in other ingredients to it, such as shortening, paraffin or nuts.

- Use the chocolate as required.

Pre-crystallizing chocolate: If chocolate has been melted at 45^0C then poured into a mould and left to set without further processing, the following will occur:

- The chocolate will take a long time to harden
- When the chocolate has eventually hardened it will have a grainy structure and a grayish colour
- The chocolate will stick to the mould

The reason for this is that as the chocolate cools, crystals from in the cocoa butter, but these crystals are unstable. Cocoa butter actually contains six different forms of crystal, but only one is stable. It is this form of crystal that makes chocolate hard and shiny with a deep and even colouring. The chocolate will also turn out of the mould easily.

There are several different techniques used to pre-crystallize chocolate; crystals can be created in melted chocolate though manipulation and temperature control or by adding chocolate that already contains the stable crystal.

Tabletop pre- crystallizing: It is preferable to use a marble or a granite worktop, which will retain heat better than stainless steel.

1. Melt the chocolate to 45^0C
2. Stir well
3. Pour two-thirds of the chocolate onto the work surface. Leave the remaining chocolate in the bain marie.
4. Spread the chocolate over the work surface, moving it around with a palette knife and a scraper. This movement cools down the chocolate mass evenly. The chocolate will being to thicken as it cools. This is an indication the stable crystals are forming
5. At 27^0C the chocolate will be too thick to process and use. Return it to the bain marie and mix together well with the remaining warm chocolate
6. This will create the right amount of stable crystals throughout the chocolate, which is now ready to use required

It is easy focus on just the temperature when preparing chocolate. This will not guarantee that there are sufficient stable crystals present in the chocolate. Pre-crystallizing is a form to 'tempering', in other words bringing the chocolate to a

certain temperature. However, if the chocolate is just left to cool down to 32^0C after melting, it will have been tempered but not pre-crystallized. Without the stirring and moving around of the chocolate required to from the crystals, the result will be a chocolate that hardens slowly, is dull and sticks in the mould.

The seeding method: This method user ready-to-use pre-crystallized chocolate collets or small pieces of chopped chocolate block, which are added to the chocolate being processed.

1. Melt the chocolate to 45^0C
2. Stir well
3. Add 15-20 per cent of collets or chopped chocolate block and stir well into the melted chocolate; these pieces contain the stable cocoa crystals. They will slowly melt and cool down the mass. When the chocolate reaches its correct processing temperature, stir well again; it will be completely pre-crystallized.
4. If all the crystals melt quickly before the correct temperature has been reached, just add a small extra quantity and stir in well until the correct temperature has been obtained.

Temperature control for chocolate: The ideal processing temperature after melting and pre-crystallization are different for the three different types of chocolate (dark, milk and white). This is attributing to their different composition; for instance, the higher the quantity of milk fats (milk and white chocolate), and the lower the processing temperature. Irregular cooling can create a dull appearance and a soft structure in finished chocolate. The ideal temperature to cool and harden chocolate is 10-15^0C. A refrigerator with air circulation set to this temperature range is ideal for setting chocolate.

Tempering Chocolate temperatures			
	Melt to:	Cool to:	Reheat to:
Dark chocolate	49^0C/120^0F	27^0C/82^0F	32^0C/90^0F
Milk Chocolate	46^0C/115^0F	26^0C/800F	30^0C/86^0F
White chocolate	43^0C/110^0F	25^0C/780F	28^0C/82^0F

Self life and storage of chocolates: The ideals temperature for storing chocolate is 12-20^0C, and the temperature should not fluctuate. At higher temperature the chocolate becomes soft and will lose its sheen, and at lower temperature it may be affected by condensation. Chocolate that has been stored at a lower temperature should, when required for use, be left to acclimatize in its original packaging for a few hours until it reaches ambient temperature.

Chocolate is sensitive to humidity and easily absorbs smells and flavours. It is also liable to oxidization if it is exposed to light, direct sunlight and air for too long. Therefore, chocolate should be stored in a cool, dry place, completely sealed from light and air. Always ensure that the packaging is resealed after using.

Finished products are also very sensitive to temperature, foreign smells, flavours, light, air and humidity and to the effects of time and transportation. Typical changes that can occur during storage of chocolate products include:

- **Fat bloom**- a thin layer of fat crystals on the surface of the chocolate. The chocolate loses its sheen and a soft, milky white bloom appears on the surface, giving the finished chocolate an unattractive appearance. Fat bloom is caused when fats in the chocolate crystallize or when the fats in the ganache/filling migrate to the chocolate layer. The appearance of fat bloom can be delayed by storing the chocolate at a constant temperature of 10-15^{0}C.

- **Sugar bloom-** in contrast to fat bloom, sugar bloom creates a rough, coarse layer on top of the chocolate. Sugar bloom is mainly caused by condensation, which can form on the surface of chocolate if storage temperatures are too low or if the chocolate is left in a refrigerator for too long. This moisture will dissolve the sugar within the chocolate and when the moisture evaporates, the sugar re-crystallizes on the surface. Avoid rapid changes of temperature to help prevent this occurrence.

  If the storage time for chocolate can be kept short, the quality of the product will be much better. Each type of chocolate will have a different shelf life, which is measured from the initial production date and is shown on the packaging. Because of the milk fat solids present in white and milk chocolate, these have shorter shelf lives than dark chocolate. Chocolates that contain a filling need special consideration. Chocolates made with cream or butter filling have a very short storage life (the recipes shown in this chapter have a shelf life of one week), provided they are stored in ideal conditions. The substitution of cream or butter with alternative ingredients (such as light sugar solutions) will help to increase shelf life.

Purchasing Chocolate: Purchase chocolate in either a block or in a package of small disks. Don't confuse with baker's chocolate, which is unsweetened. Do not use chocolate chips, baking chocolate or store bought chocolate bars because they are the wrong thickness/fluidity (technical word is "viscosity") for molding. All the ingredients to be used should be of high quality and the utensils and moulds to be in proper shape, clean and dry.

MOLDING CHOCOLATE CANDY

Common Recipes: Once you know how to make molded chocolates, you can use this method to fill molded chocolates with all sorts of different fillings, like caramel, soft fondant, or marshmallows.

Gather all ingredients
1/2 cup heavy cream, 1 cup) chopped bittersweet chocolate, 1/2 tsp vanilla, 2 lbs tempered semi-sweet chocolate, Heart-shaped candy molds Small, clean paint brush

For preparing ganache, boil the cream

Once the cream is near boiling, pour the hot cream over the chopped chocolate and let it sit for one minute to soften the chocolate.

Whisk the cream and chocolate together gently until smooth, add vanilla, stir to blend, cool

Fill the clean mold completely with chocolate

Pour excess chocolate from the molds by flipping it upside down, excess chocolate will drip down onto the paper

Scrape chocolate from the top of the mold with a knife or spatula or scrapper, cool for 5 minutes

Fill the set molds with ganache to 3/4 tapping frequently to release any trapped air bubles, refrigerate for 10 minutes to make it firm

Cover the ganache with more chocolate by spooning some melted chocolate till the cavity is full and sealed

Scrape excess chocolate from the top of the molds with a knife or spatula or scrapper, allow to set for 20 minutes

Release the chocolates from the mold by turning upside down or gentky tapping them out

Molded chocolates are complete to be served or get decorated and packed.

Fig. 3E Process of molding chocolate candy

Fig. 3 F Preparing chocolate display piece

HONEY AND CINNAMON MOLDED CHOCOLATE

INGREDIENTS	**40-50 CHOCOLATE**
Dark chocolate (minimum 60% cocoa)	250g
Milk chocolate (minimum 32% cocoa)	250g
Double cream	250g
Clear honey	80g
Cinnamon	2stickor20gpowder
Pre-crystallized dark chocolate	50g
Pre-crystallized white chocolate for moulding	1kg

Method of work

- Place the double cream in a saucepan with the cinnamon and bring to the boil. Remove from the heat and leave to infuse 15 minutes.
- Melt white chocolate, add cinnamon-infused cream and honey, mix well and allow the ganache to cool.
- Melt Pre-crystallized dark chocolate and white chocolate separately.
- Prepare the chocolate moulds by polishing well with cotton cloth to ensure there are no marks, dust or remaining chocolate.

- Take a little pre-crystallized dark chocolate and using a plastic disposable glove, dip a finger into it. Rub some chocolate into each mould and leave to set at cool place.
- If desired, a fine spray of coloured cocoa butter can be applied to build up a pronounced presentation of the finished chocolate. Leave to set.
- To leave a clean finish, remove any remaining chocolate from the top any the edges using a palette knife or scrapper.
- Using the pre-crystallized white chocolate, fill the moulds. Swirl and shake out any air bubbles in the chocolate.
- Pour out the chocolate and make sure all the edges and corners in the mould have been covered. Cool again for 5 minutes.
- To leave a clean finish, remove any remaining chocolate from the top any the edges using a palette knife or scrapper.
- Pour the ganache in a disposable piping bag and pipe into the centre of each chocolate shell. Take care not to pipe too much ganache into the chocolate shell; it is best to leave 2mm gap from the top. Make sure the ganache is not too warm otherwise it will melt the chocolate shell. Leave the filling to solidify.
- To close the chocolates, put a small amount of the pre-crystallized white chocolate onto the mould and spread over each moulded ganache chocolate, pat to remove any trapped air bubbles. Scrape off any excess chocolate and leave to set at 10^0C for 30 minutes.
- Tap the moulds gently onto a sheet of paper and carefully turn out the chocolates.

RASPBERRY MOLDED CHOCOLATE
40-50 pieces

INGREDIENTS	**Quantity**
Dark chocolate (minimum 64% cocoa)	300g
Raspberry puree	150g
UHT cream	125g
Caster sugar	10g
Invert sugar	25g
Unsalted butter	60g
Alcohol (framboise or kirsch)	15g
Pre-crystallized dark chocolate (minimum 64% cocoa) for moulding	1kg

Method of work

- Melt the dark chocolate.

- Place the raspberry puree, caster sugar and invert sugar into a saucepan and bring to the boil. Using a sugar thermometer continue cooking the puree to 104^0C.
- Add the UHT cream carefully and stir in. Incorporate into the dark chocolate and add the alcohol. Leave to cool.
- When cool, beat in the softened unsalted butter.
- Follow the method for moulding the chocolates the chocolates in the previous recipe, but using the dark chocolate.

VANILLA CHOCOLATE TRUFFLES
40-50 pieces

INGREDIENTS	**Quantity**
Dark chocolate (minimum 70% cocoa)	400g
Whipping cream	325g
Milk chocolate (minimum 36% cocoa)	200g
Invert sugar	40g
Unsalted butter	50g
Vanilla	1 pod
Pre-crystallized dark chocolate (minimum 64% cocoa) for dipping	1kg
Cocoa powder	500g

Method of work

- Melt the dark and milk chocolate together.
- Bring the cream to the boil the split vanilla pod. Remove from the heat and leave to infuse for 5 minutes.
- Pour the infuse cream onto the chocolate and add the invert sugar. Combine the ingredients well.
- Beat in the softened unsalted butter when cold.
- Fill a disposable piping bag with the truffle filling and pipe out small truffle shapes onto silicone paper. Leave to harden for at least 3 hour in a refrigerator.
- Dip the individual truffles into the pre-crystallized dark chocolate. Shake off any excess chocolate.
- Immediately place the truffles into a container filled with cocoa powder and roll until completely covered with a fine layer of the powder.

PRALINES
40-50 pieces

INGREDIENTS	Quantity
Milk chocolate (minimum 38% cocoa)	100g
Praline paste	220g
Pure hazelnut paste	50g
Unsalted butter	50g
Pre-crystallized milk chocolate (minimum 38% cocoa) for moulding	1kg

METHOD OF WORK

- Melt the milk chocolate to 40^0C.
- Add the praline paste and the hazelnut paste.
- Blend together to form a smooth paste and beat in the soften butter.
- Prepare the moulds using the pre-crystallized milk chocolate, as described previously. An alternative is to marble with a little pre-crystallized white or dark chocolate to create an interesting design.
- Pipe the praline filling into the prepared moulds and finish by topping off and leaving to set.

Chocolates (Pralines):- Preparation
Needed:

- Moulds for chocolates (pralines)
- Ladle
- Melting pan or tempering machine
- Small palette knife
- Triangular palette knife
- Paper

Temper the melted chocolate
Ensure that the moulds are at room temperature and warm them lightly with a hot air blower (the ideal temperature of the moulds is 26° to 27°C). Avoid the moulds becoming warmer than the tempered chocolate.
For the filling:

- Ganache, praline or filling of choice
- Piping bag with plain tip

- Small palette knife

Moulding hollow figures

Moulded hollow figures or Easter eggs can be made using one or different type of chocolate. The chocolate first has to be pre-crystallized and is then poured into a mould and cooled down.

Most chocolate and chefs work with polycarbonate moulds because they are easy maintain, are quite strong and will give a good end result. Metal moulds are available, but are used less due to their price and weight. PVC moulds are also popular. They are flexible, allowing the chocolate shape to be turned out quickly, and cheap, but they can scratch easily and will often break.

There are two basic forms of moulds:

- **Single moulds** - sometime referred to as half moulds, the chocolate is poured into the mould, cooled and then removed from the mould. The chocolate halves are then joined together.

- **Double moulds** - these are made up of as two half moulds linked together to form one mould. The chocolate is poured into the mould and cooled. The moulded shape is then removed by unfastening the two half moulds and sold separately.Before moulding figures, the moulds must be thoroughly cleaned and then polished with cotton wool, and they must be at room temperature. The chocolate must be pre-crystallized and the various pieces of equipment, such as palette knives, plastic spoons, stainless steel trays, silicone paper and wire cooling racks, should be prepared in advance.

The following method should be used to produce a small moulded figure:

Small display pieces: Chocolate design can be relatively simple and still be creative and eye-catching. Learning a few uncomplicated decorative techniques will equip the chef to be able to produce striking chocolate display pieces for banquets, festivals or dinners, or just for fun!

The molding techniques explained in this chapter can easily be transferred to create Eater eggs, chocolate bars or other molded pieces. However, the following techniques will further enhance any display, and can also be used in the decoration of desserts.

Acetate curls

Flat cutting: This is a technique used to create different forms and shapes. The items produce can be used as decoration, as bases for decoration pieces or combined to create figures.

Display figure: The techniques discussed above have been utilized to create the small display piece shown here. The composition of the piece is a 22cm egg - that has been cut in half and re-sealed with chocolate-moulded mini bars of chocolate with a sprayed color, acetate decorations and a flat cut base. The egg and the base have a soft matt finish.

1. Lay plastic sheet or silicon paper onto a board, Pour a layer of pre-crystallized chocolate and spread as evenly as possible to the required thickness. Lay another sheet of silicone paper on top and smooth it to remove any air bubbles that may have formed.
2. Before the chocolate completely sets, cut out the desired shape using a sharp craft knife. A template can be used for more detailed designs.
3. When set, peel off the paper and use as required.

A canister of confectioner's freeze spray is helpful when assembling the display piece; the spray will melt chocolate used to glue the parts together and set it instantly. This saves time when working or large or multiple displays. (Fig.3F)
To assemble the display figure:

1. Flat cut the base into triangles and join together with melted chocolate
2. Position and fix the egg in the centre of the base, maintaining the balance of the piece
3. Spray the piece with fluid chocolate if desired.
4. Add the acetate curls around the base of the egg.
5. Finish with a bar of chocolate on top the pieces.
6. Display Piece

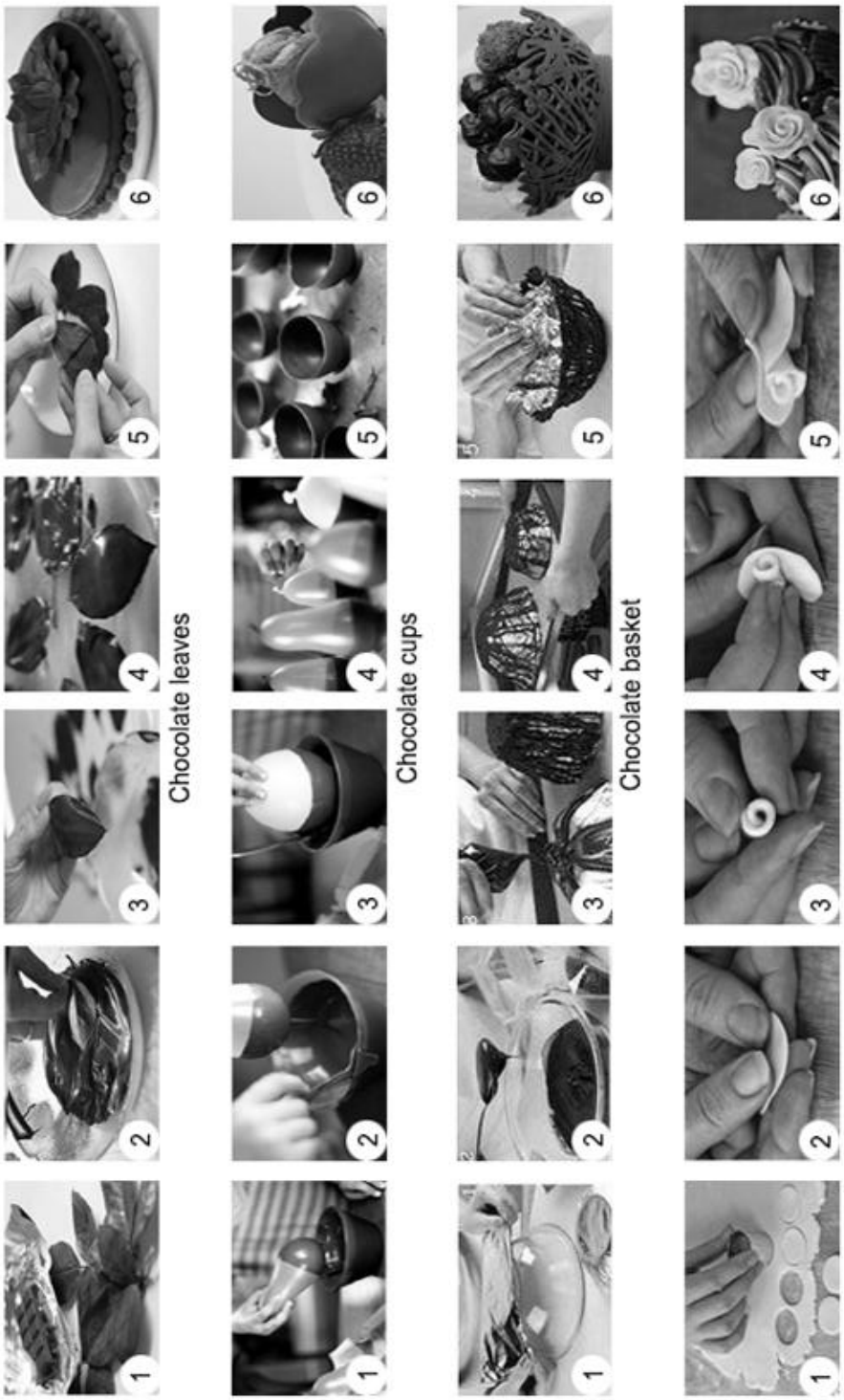

Fig. 3G Some interesting chocolate display work

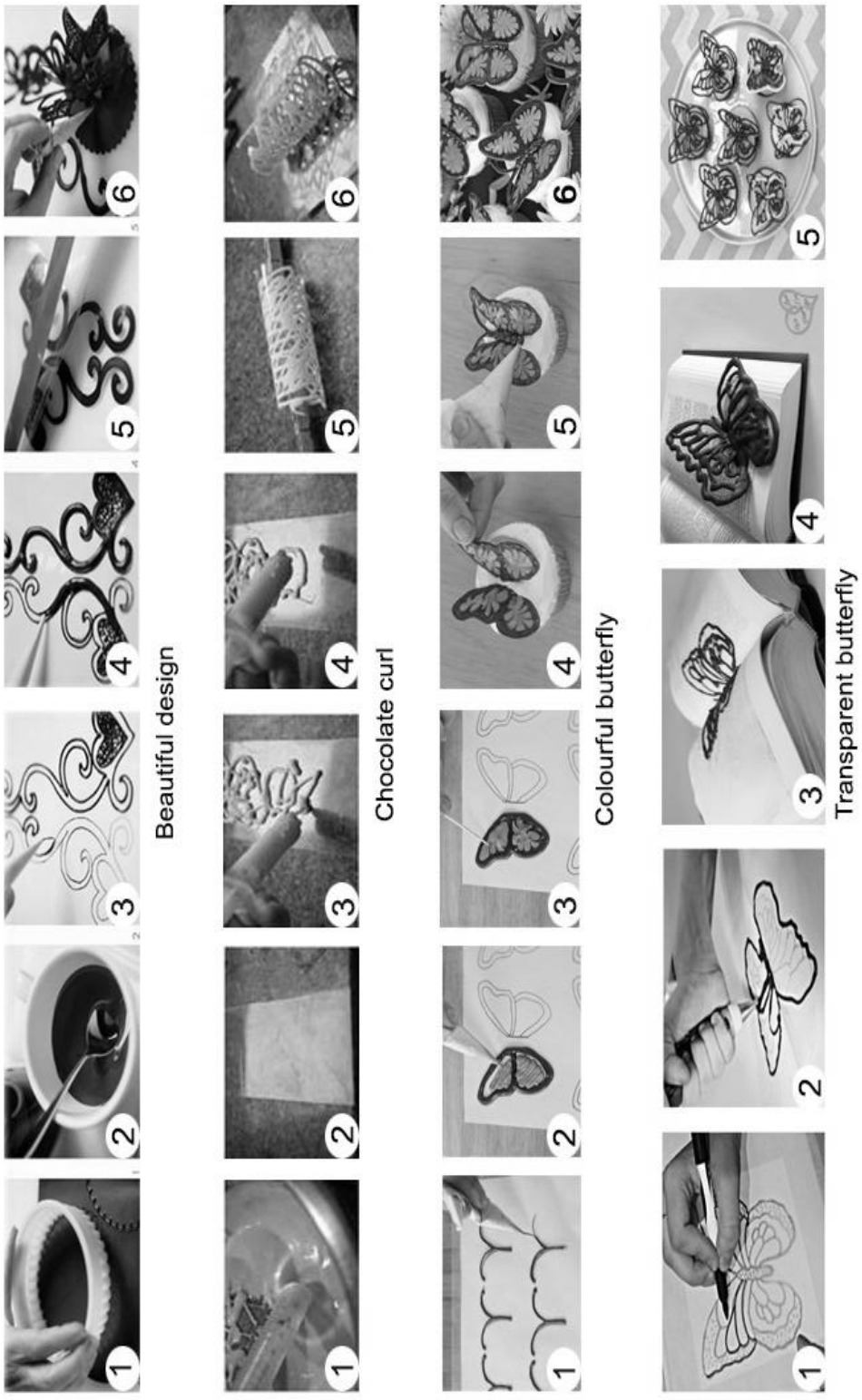

Fig. 3H Some interesting chocolate display work

CHECK YOUR PROGRESS-II

1. Classify chocolates.

2. What is milk chocolate?

3. What is Couverture Chocolate?

3.12 SUMMARY

- Cakes are traditionally rounded. This symbolizes the cyclical nature of life, the sun and the moon, which is probably the reason why we have cakes during important events; highlighting that we are embarking on a new journey in our life-span.
- Cake making ingredients are classified as:
    - Essential ingredients: Flour, sugar, shortening, milk and eggs.
    - Optional ingredients: Baking powder, flavourings and essences, fruits, nuts, cocoa powder, chocolate, cake improvers, syrups etc.

- Chlorination of cake flour provides two great benefits. First is bleaching, which gives a bright whiter crumb color to cakes but second and more importantly it lowers the gelatinization temperature of the starch within the cake flour.
- Egg yolk is also a rich source of emulsifying agents Lecithin
- Leaveners can be of three kinds- chemical leaveners, biological leaveners and mechanical aeration.
- Baking Powder –made from Cream of tartar and sodium bicarbonate and starch, is a leavening agent, which causes your batter to rise.
- Yeast (Saccharomyces cerevisiae) is a biological leavener.
- Creaming, beating, whipping and folding are all mechanical leaveners.
- Biscuit are type of sponge cake contains both egg whites and yolks, but, unlike in Genoese, the whites and yolks are whipped separately and then folded back together.

3.13 GLOSSARY

Baking powder- made from Cream of tartar and sodium bicarbonate and starch, is a leavening agent, which causes your batter to rise.

Baking soda- pure sodium bicarbonate. It reacts with acidic components in batters, releasing carbon dioxide, which causes expansion of the batter and forms the characteristic texture and grain in cakes, quick breads, soda bread, and other baked products.

Cake improver- substances when added to cake batter at the creaming stage, it supposedly renders the crumb soft and moist and increases shelf life.

Castor sugar- finely granulated white or pale golden sugar.

Creaming- is the technique of softening solid fat, like shortening or butter, into a smooth mass and then blending it with other ingredients, typically sugar. The technique is most often used in making buttercream, cake batter or cookie dough.

Crillo- mild flavoured Indonesian chocolate.

Crystallization- refers to the solid-liquid separation and purification technique in which mass transfer occurs from the liquid solution to a pure solid crystalline phase.

Fondant icing- also commonly referred to simply as fondant is an edible icing used to decorate or sculpt cakes and pastries. It is made from sugar, water, gelatin, butter, and glycerol.

Food additives- are substances added to food to preserve flavor or enhance its taste, appearance, or other qualities.

Ganache- Ganache is a glaze, icing, sauce, or filling for pastries made from chocolate and cream. Ganache is normally made by heating cream, then pouring it over chopped chocolate of any kind. The mixture is stirred or blended until smooth, with liqueurs or extracts added if desired. Butter is traditionally added to give the ganache a shiny appearance and smooth texture.

Leavening agents- substance causing expansion of doughs and batters by the release of gases within such mixtures, producing baked products with porous structure.

Marzipan- is a confection consisting primarily of sugar or honey and almond meal (ground almonds), sometimes augmented with almond oil or extract.

Rolled Fondant- This is a combination of sugar and vegetable shortening that makes a thick white puttylike substance that can be rolled out like pastry dough and stretched over cakes.

Royal Icing- This is made from a heavy paste of egg whites and confectioners' sugar beaten with a little vinegar or strained lemon juice to help the egg whites froth.

Seeding-addition of pieces of hard chocolate to liquid chocolate in chocolate production. This process helps in increasing the taste, flavour and self-life of the chocolate.

Shortenings-refers to the fat or oil that is used for making the baked products, which shortens the gluten strands making the product fluffy, crumbly and velvety.

Temper- The process of gaining degree of hardness and elasticity in bakery products. Mainly used in terms of chocolate.

Trinitario- Caribbean cocoa tree

Water Icing- Is icing made from confectioners' sugar and water or milk, often with the addition of a flavoring such as citrus juice or vanilla extract.

Whipping-beating with a wire whisker until it is light and fluffy.

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3.15 TERMINAL QUESTIONS

Short answer type questions:

4. What is the difference between Ganache and margipan?
5. What is the importance of chlorination of cake flour?
6. What are the tenderizing agents used in cake making?
7. Discuss the role of salt in cake making.
8. What is a cake improver?
9. What is the difference between Sponge method and
10. What are the chemical leaveners used in cake making?
11. List the additives used in cake making.
12. Differentiate between lean cake and rich cake.
13. Classify chocolates
14. What are the different types of cocoa powders?

Long answer type questions:

1. Describe in detail the ingredients used in cake making.
2. Describe the cake making methods.
3. Classify cakes in detail.

4. Classify and elaborate the different leavening agents involved in cake making.
5. What are the characteristics of a good quality cake?
6. Elucidate on cake improvers.
7. Explain elaborately how will you melt chocolate?
8. Explain the changes that occur to stored chocolate.
9. Write in detail the different types of frosting used in cake making.
10. What are the preparations to be done before starting Chocolate work?
11. What may be the fault and possible remedy if the cake is :
    a. Fruits get sunken
    b. Brittle crust
    c. Cake burnt on top
    d. Cake shrinks
    e. Developed close texture
    f. Dry and crumbly
    g. Staling quickly
    h. Too tender for cutting
    i. Very dense grain
    j. Cake too small

UNIT: 04
INTRODUCTION TO ICINGS

STRUCTURE

4.1 INTRODUCTION

Icing, often called frosting in the United States. In America, "icing" is used colloquially, but people tend to use frosting in writing, here people commonly refer to these sugary spreads as frostings, but it can get confusing because we also call them icings. In other countries, icing is the more popular term because confectioners' / powdered sugars are known as icing sugars.

A handful of culinary dictionaries state that frosting and icing are one and the same, but most other sources differentiate the two: They define frostings as relatively thick, sometimes fluffy recipes that are used to fill and/or are spread over a cake. Icings are considered to be typically white, have a thinner consistency and are usually poured or drizzled over cakes, forming smooth, shiny coatings. The main requirement for frosting or icing is that it be thick enough to adhere to the item being coated, yet soft enough to spread easily. It has three main functions:

1. Frosting is stiffer and fluffier than icing, it pipes well and consists of cream and butter and has more volume because air is whipped into it, and won't dry hard like icing. Icing is more like a glaze, is thinner, isn't whipped, and will dry harder when cooling.

2. Frosting contributes flavor and richness to the cake. It also adds interest and provides a smooth surface for decorating on;

3. Frosting improves the cake's appearance. Special occasion cakes become more festive with frosting and decorations; and,

4. Frosting improves the keeping the qualities of the cake by forming a protective coating around it, sealing in moisture and flavor and allowing it to be eaten over a couple of days.

Icing actually existed before frosting, probably as early as the 1600s. It was a cooked granulated sugar and egg white mixture spread on cakes and allowed to harden so that it resembled ice. Frosting recipes, based on butter, cream or milk, and powdered icing sugar started to appear at the start of the 1900s.

4.2 OBJECTIVE

After studying this unit, the learners will be able to understand the following:

- The different types of Icings used in bakery and confectionary.
- Preparation and use of marzipan.
- Preparation and use of Nougat.
- Pastillages work
- Production and uses of Sugar
- Sugar works
- Handling and uses of Isomalt

3.4 ICINGS

Icing is a sweet, often creamy glaze made of sugar with a liquid, such as water or milk that is often enriched with ingredients like butter, egg whites, cream cheese, or flavorings. It is used to flavour, cover or decorate baked goods, such as cakes, cupcakes, cookies and pastries, or formed and used when decorating as a wise Baker, ranging from simple to elaborate. . When it is used between layers of cake, it is called filling.

Icing can be formed into shapes such as flowers and leaves using a pastry bag. Such decorations are commonplace on birthday and wedding cakes. Chef's color dye (food coloring) is commonly added to icing mixtures to achieve the desired color. Sprinkles, coloring mist, edible ink designs, or other decorations are often used on top of icing.

Icing can be applied with a utensil such as a knife or spatula, or it can be applied by drizzling or dipping (see glaze), or by rolling the icing out and draping it over the cake. The method of application largely depends on the type and texture of icing being used. Icing may be used between layers in a cake as a filling, or it may be used to completely or partially cover the outside of a cake or other baked product.

Function of Icing: Basically, cake icing has three separate and important functions.

1. First, cake icing, of course, makes a cake look nice. Cake icing is the pretty shimmer on the cake, the thing that holds it all together.
2. The second main function of cake icing is to reflect the theme or design of the cake. The cake icing helps to hold together the overall design of the cake.
3. Finally, cake icing can help prolong the cake. Many people don't realize it, but cake icing can help keep the cake fresh.

4.3.1 VARIETIES OF ICINGS

1. **Buttercreams-** Buttercream is made by creaming butter until pale with icing sugar, vanilla and milk. This soft, buttery icing can be spread over a cake or piped into patterns. It can also be flavoured with colour or chocolate and is perfect for small cakes, like cupcakes. Buttercream hardens on refrigeration, and does not keep for more than a few days. Remember to keep this icing cool as it icing melts easily. Here are some of the most common types of buttercream:

    a. **American-style buttercream**- This is probably what most people think of as a classic birthday cake frosting. Made primarily from butter and confectioners' sugar, this buttercream can be tinted or flavored in a number of different ways.

    b. **Crusting buttercream**- is a variant of American-style buttercream that is frequently made with part shortening and a little more sugar than usual so that it is soft when made, but sets as it firms. This type of buttercream is especially popular for cakes featuring piping, as the designs are a bit sturdier against elements such as heat or possible jostling.

    c. **Flour buttercream**- Sometimes called boiled milk frosting, flour buttercream is unique in that it is made by boiling together a mixture of flour, sugar and milk until it thickens to a somewhat pudding-like consistency. It is then cooled, and then beaten with butter and flavorings to make a silky, delicious buttercream that visually resembles an American buttercream. This was the original type of

frosting served on red velvet cake, although in recent years cream cheese frosting has become more popular.

d. **Cream cheese frosting** -Cream cheese frosting is a type of American-style buttercream that employs cream cheese instead of or in addition to butter (or other fat). It is a common frosting to use on top of carrot cake, Hummingbird cake and red velvet cake.

e. **Custard buttercream**- This buttercream is sort of like a cross between boiled milk buttercream and French buttercream. A pastry cream is combined with butter and/or confectioners' sugar to a spreading consistency. This type of buttercream is best for a filling, but when enough sugar is added, it can be piped.

f. **French buttercream**- Not to be confused with French meringue buttercream, this rich cake topping and filling is made with hot sugar combined with egg yolks rather than whites. Since the eggs are not cooked, they can be pasteurized before making this type of buttercream to reduce the chance of food borne illness.

g. **Fudge buttercream**- There is a particular sub-set of American-style buttercreams that contain chocolate (either melted chocolate, or a cocoa powder mixture), which is then incorporated with a butter and sugar mixture. Not to be confused with fudge icing, which is boiled, this is a buttercream that starts with either melted chocolate or cocoa powder combined with butter, which is then cooled and whipped with sugar and flavorings to a fluffy consistency.

h. **Meringue buttercream**- Meringue buttercreams prominently feature egg whites. It is of three types:

    i. **French meringue—**sometimes referred to as "ordinary"—is the most basic of the trio and the least stable until baked. Egg whites are beaten until they coagulate and form soft peaks, at which point sugar is slowly incorporated until the mixture has attained full volume; is soft, airy, and light; and stands at attention when the whip is lifted. French meringue is customarily spooned or piped into different forms, including dessert shells (such as acherins) and cake layers (as in a dacquoise), and baked, later to be topped with fruit, mousse, or whipped cream. It is also often folded into batters (for lady fingers, sponge cakes, soufflés, and the like) and baked.

    ii. **Swiss meringue** is prepared by gently beating egg whites and sugar in a pan that sits above boiling water, without touching

it. When the mixture reaches 120 to 130 degrees Fahrenheit and the sugar is completely dissolved, the mixture is pulled off the heat and beaten vigorously to increase and attain full volume and then at a lower speed until cool and very stiff. Swiss meringue is smoother, silkier, and somewhat denser than French meringue and is often used as a base for buttercream frostings.

iii. **Italian meringue** - is made by drizzling 240-degree Fahrenheit sugar syrup into whites that have already been whipped to hold firm peaks. Whipping continues until the meringue is fully voluminous, satiny, stiff, and cool. Italian meringue is often used to frost cakes (alone or as a base for buttercream frostings), to top filled pies, or to lighten ice creams, sorbets, and mousses.

i. **Rolled buttercream**- Often made with shortening, this is a buttercream to which a much higher amount of sugar has been added, giving it a clay-like consistency that can be rolled. It is not quite as flexible as fondant, but can be used for some of the same applications.

j. **Foam Icing-** Foam icing or boiled icing is simply an Italian meringue (made with hot sugar syrup). Foam icing is light and fluffy but very sweet. It may be flavored with extract, liqueur or melted chocolate. It is frequently used to ice layer cakes and complements lemon, coconut or chocolate cakes especially well. Foam icing is rather unstable. It should be used immediately and served the day it is prepared. Refrigeration often makes the foam weep beads of sugar. Freezing causes it to separate or melt. An easy foam icing can be made by following the formula for Italian Meringue. As soon as the meringue has cooled to room temperature, it can be flavored as desired with an extract or emulsion.

2. **Caramel icing-** The process of making this icing is similar to the process of making candy. A brown sugar and milk mixture is boiled and combined with butter and sugar until it reaches a spreadable consistency. This icing is best applied to a cake right after it is made, as it will set firm.

3. **Ganache**- Is ganache a cake topping? Pastry filling? Glaze? Chocolate filling? The answer to all of the above is yes. One of the most common types of ganache is made using approximately equal weights in cream and chocolate (white or dark). It is made by bringing cream to a simmer, then pouring it on top of chopped chocolate, then mixing until smooth. The mixture starts out quite liquid, but firms as it sets. It can be used as a drizzle,

or as it becomes thicker as it cools, it can be used to cover an entire cake. Once firm, it can be used as a filling for chocolates.

4. **Glaze-** A glaze is a thin coating meant to be brushed, poured or drizzled onto a cake or pastry. The typical glaze is a simple mixture made from sugar, water and flavorings, such as the Basic Sugar Glaze that follows. (Glaze can also be made using melted fondant.) A glaze is usually too thin to apply with a knife or spatula. It is used to add moisture and flavor to cakes on which a heavy icing would be undesirable—for example, a chiffon or angel food cake. Glaze is often tinted with food coloring, the color chosen to reflect the flavor of the cake. Glaze may be of three types:

    A. **A thread glaze**- is a mixture of sugar and water cooked to 236°F (113°C), the thread stage. This type of glaze is used to create a crystallized coating on gingerbread cookies and other pastries. Brushing the thread glaze over cooled pastries helps it crystallizes, developing an opaque sweet coating with a subtle texture.

    B. **Flat icing**- or water icing is a specific type of glaze used on Danish pastries and coffeecakes. It is pure white and dries to a firm gloss. A glaze made from fondant is also used for this purpose. The invert sugar in fondant prevents it from crystallizing.

    C. **Chocolate glaze**- A chocolate glaze is a pourable chocolate topping. It can range from translucent to opaque, but it is typically thin enough that it can be poured. A ganache could be used as a chocolate glaze, but a number of varieties exist. This easy version includes butter, corn syrup, and chocolate.

    d. **Other flavored glazes**- Glazes can be made with all sorts of flavorings and ingredients, from sour cream to rosewater.

5. **Gum paste-** Gum paste is pliable dough which is often used for cake decorating. It is made using egg whites, confectioners' sugar, and shortening. It can be rolled quite thin and is ideal for creating hand-modeled flowers or other intricate decorations. While fondant will remain soft, gum paste dries quite hard and is better suited for decoration on a cake than for, say, covering an entire cake.

6. **Fondant-** a thick paste made of sugar and water and often flavoured or coloured, used in the making of sweets and the icing and decoration of cakes. This stiff and shiny icing can be kneaded and rolled out to cover fruit or chocolate mud cakes, often over a layer of marzipan. Since its firmness helps

keep cakes fresh, it is often used for big cakes, wedding cakes and cakes that require traveling.

a. **Rolled fondant**- is a pliable, dough-like icing which is popular for use on occasion cakes. It is made of sugar, water, and gelatin and food-grade glycerin. Its smooth appearance gives cakes a polished look, and rolled fondant is also flexible and workable enough to mold into shapes, which is very effective for decorating cakes.

b. **Poured fondant**- is a sweet, creamy paste that can be used as a filling or icing for pastries such as éclairs and Napoleons. Poured fondant can be made from nothing but sugar, shortening, and water. High-ratio shortening imparts extra creaminess. Sometimes corn syrup or glucose is used, too.

7. **Fudge icing-** Milk or cream, cocoa powder, sugar, and other flavorings are brought to a boil and cooked until they thicken to make this icing. While it will be pourable/spreadable at first, it will firm to a fudge-like consistency as it cools, so it is best used right away. This is similar to caramel icing, but made using cocoa powder instead of brown sugar.

8. **Marzipan**- This mixture of almond paste, sugar, and flavorings is an elegant addition to cakes. Thick and pliable, it can be molded into cake decorations, rolled and used like fondant, or used as a cake layer or filling.

9. **Mexican paste-** This paste is somewhat similar to fondant, but firmer and with a glossier finish. This is primarily used for creating sculpted or cut out elements for a cake, but can be difficult to work with if trying to cover an entire cake.

10. **Modeling chocolate**- This is a chocolate paste made by melting chocolate and combining it with corn syrup or simple syrup and then kneaded until it reaches a stiff, pliable consistency. Used like clay, this modeling chocolate can be molded into a variety of shapes that are not as easily performed with the softer fondant. Modeling chocolate can be made from white, dark, semi-sweet, or milk chocolate. White chocolate is the easiest type to tint in colors.

11. **Pastillage-** A thick sugar paste, similar to gum paste that can be molded into different shapes and forms. When dried, it is hard and brittle. Unlike gum paste, pastillage dries much quicker and stronger. Made with gelatin, water and icing sugar, it hardens quickly and can only be shaped or molded for a short while by hand. While the rigid texture will largely rule it out as an all-

over coating for a cake, it can be an extremely effective tool in creating crisp, clean elements that won't lose their shape or sag in the cake decoration.

12. **Royal icing**- Often confused with fondant, royal icing is a white meringue-like mixture made from egg whites, acetic acid and icing sugar and has a consistency that can be piped, but it dries hard. Becoming rock-hard once set, it is ideal for attaching decorations to cakes and is a popular icing for piping.

13. **Simple syrup**- Simple syrup is made by combining equal parts sugar and water, sometimes with flavorings, and then heating the mixture until it reduces to a syrup-like consistency. This can be used as a glaze, or it can be used to keep cake layers moist.

14. **Whipped cream frosting**- Whipped cream can be used as a frosting or filling for cakes. Typically, the type used for cakes is a stabilized whipped cream, which is enforced with marshmallow, butter, or gelatin for a more firm texture that won't melt as easily.

COMPARING GUM PASTE, CHOCOLATE AND FONDANT

Fondant: Generally when it comes to cake decorating, rolled fondant is the type in question. Rolled fondant is a pliable, dough-like icing which is popular for use on occasion cakes. It is made of sugar, water, gelatin and food-grade glycerin. Its smooth appearance gives cakes a polished smooth look, and rolled fondant is also flexible and workable enough to mold into shapes, which is very effective for decorating cakes, but can get dry around edges forming cracked appearance. The ingredients used are cheaper and easily available. Tastes like butter cream.

Gum Paste: Like fondant, gum paste is pliable dough which is often used for cake decorating. However, instead of gelatin it is made using egg whites only, confectioners' sugar, and shortening. It can be rolled quite thin and is ideal for creating hand-modeled flowers or other intricate decorations. While fondant will remain soft, gum paste dries quite hard and becomes brittle and is better suited for decoration on a cake than for, say, covering an entire cake. The ingredients used medium cheaper and have to hunt for availability. Tastes like sugar crackers. It is also called florist paste as it can be easily modeled into various shapes, widely accepted by florists for making different floral models.

Chocolate Paste: This is a chocolate paste made by melting chocolate and combining it with corn syrup or simple syrup and then kneaded until it reaches a stiff, pliable consistency. Used like clay, this modeling chocolate can be molded into a variety of shapes that are not as easily performed with the softer fondant. Modeling chocolate can be made from white, dark, semi-sweet, or milk chocolate. White

chocolate is the easiest type to tint in colors. It is highly priced and easily available. It is very tasteful and melts in mouth.

4.4 MARZIPAN

Marzipan (sometimes called as almond candy dough) is a confection made by mixture of almond paste, sugar and glucose or corn syrup that may be colored and sometimes augmented with almond oil or extract. It is used like modeling clay for sculpting small fruits, flowers or other objects. Due to its plasticity, it can be rolled into thin sheets and cut into various shapes or used to cover cakes and pastries. It is widely used as an ingredient in chocolate candies and petits fours.

The best-quality marzipan is made from equal parts by weight of fresh almonds and sugar, with liquid sweetener for pliability. With their high fat content (50 percent), almonds need sugar to bring out their delicate flavor. A higher amount of sugar creates a sweeter marzipan that may be more difficult to handle. Quality marzipan is ivory in color, subtle in almond flavor, and short textured but not sticky, and should hold its shape when modeled.

Difference between marzipan and almond paste: While they both are made of almonds, marzipan and almond paste are completely different creatures. Marzipan is smooth, sweet, and often dyed and molded into shapes. It's also used to cover sweets much like fondant and is sometimes eaten as is. Almond paste, however, is coarser, less sweet, and used as an ingredient or filling for baked goods. Some formulas call for more or less sugar or use different moistening agents, such as fondant or egg whites. The ratio of almonds to sugar varies depending on the intended use of the finished product, as does the temperature to which the syrup is cooked—the hotter the syrup, the firmer the marzipan. For confectionery work, the syrup is usually cooked to 257°F/125°C to make a firm marzipan. The syrup for a pâtisserie marzipan, which is used for fine décor work, is cooked only to 246°F/119°C, resulting in a softer marzipan. Marzipan should be to the smoothest possible texture. In order to preserve the color of the marzipan, be sure that all equipment, including bowls, mixer attachments, and work surfaces, is very clean. Use stainless steel rather than aluminum mixing bowls because aluminum discolors marzipan.

Marzipan dries quickly when exposed to air and forms a crust on the surface. To avoid this when you are working with marzipan, keep unused portions in a bowl covered with a damp cloth. To store marzipan, keep it wrapped or covered in an airtight container. It keeps indefinitely if protected from air. If left uncovered, it eventually becomes hard as a rock.

When marzipan is kneaded and worked, the oil content (from the almonds) comes to the surface and makes the marzipan sticky. To avoid this, dust the work surface

lightly with confectioners' sugar. Confectioners' sugar is used to prevent the marzipan from sticking, as flour will add an undesirable flavor and may cause it to ferment.

Marzipan should be firm but not dry or brittle. To fix marzipan that is too hard or dry, massage in a few drops of liquor or glucose. To fix marzipan that is too brittle, for each 2 lb 4 oz/1.02 kg of marzipan, massage in a piece of fondant approximately the size of a walnut.

When marzipan is ground without sufficient moisture, it will separate and appear oily. If this occurs, add a small amount of liquid, either a spirit or syrup, to the marzipan to return it to the proper consistency. The liquid enables the marzipan to reabsorb the oil that has separated out. It may also be necessary to add a small amount of confectioners' sugar. Marzipan should be firm but not dry or brittle. To fix marzipan that is too hard or dry, massage in a few drops of liquor or glucose. To fix marzipan that is too brittle, for each 2 lb 4 oz/1.02 kg of marzipan, knead in a piece of fondant approximately the size of a walnut. If the marzipan is so soft that it sticks to your hands or the work surface, massage in confectioners' sugar or a mixture of equal parts powdered milk and cornstarch. One can replace from 25 to 50 percent of the almonds in marzipan with other nuts such as hazelnuts or pistachios.

Recipe of marzipan

Almond paste- 1 lb. 480 g
Glucose or corn syrup- 4 oz. 120 g
Powdered sugar, sifted- 1 lb. 480 g
Egg white - 1 no (optional)

- In a clean stainless-steel bowl, blend the almond paste and glucose or egg white, using the paddle attachment, until smooth.
- Either egg white or liquid sugar should be used. Do not use both as it will make marzipan soggy.
- Add the sifted sugar, a little at a time, just as fast as it is absorbed. Stop adding sugar when the desired consistency is reached. The marzipan should be stiff but workable and not too dry.
- If colored marzipan is desired, add a small amount of color and work it in.

Modeling with marzipan: Marzipan is the perfect medium for making edible decorations. Fruits, vegetables, animals, flowers, and many other shapes can be molded out of marzipan. Small marzipan fruits, served as petits fours or candies, are perhaps the most popular items. (Fig.4A). Marzipan will start to harden when it is exposed to the air so keep any unused marzipan tightly wrapped in plastic food bags. It does not need to be kept in the fridge. Keep a bowl of icing sugar handy. Not only will you use it to knead and roll out your marzipan on but it will stop your fingers

from getting sticky when making models. Do not use corn flour. The two can react together to create mould and cracking in the marzipan.

Stick your models together using a little cooled boiled water. You can also use cooled boiled water to "paint" the marzipanned cake to create a sticky surface if you plan to cover your cake with sugar paste. You will not have to do this if covering the marzipan with royal icing.

If your marzipan is quite cold and hard you can soften it in the microwave for a few seconds. Repeat if necessary. You must take care not to overdo it though as the oil in the marzipan can get very hot and could burn you. This tip will not work on old dried out marzipan.

Coloring Marzipan: Marzipan can easily be coloured using food pastes in the same way as you would sugar paste. However because marzipan is made from almonds even "natural" marzipan has a grayish tinge to it so you cannot achieve a pure white colour so take that into account and perhaps avoid trying to make a marzipan snow scene. Use natural marzipan rather than golden marzipan if you plan to add colour as the paler hue of the natural marzipan will not distort the colour as much as golden marzipan will. Apply the paste with a cocktail stick and knead it in. Try to avoid liquid colours as these will make the marzipan soggy and unusable.

Rules:

- Use at room temperature (may be microwaved for a few seconds to soften if hard)
- Keep covered whilst using to prevent it crusting over
- Colours may be kneaded in and/or dusted on top
- Use icing sugar to prevent sticking, or if it dries out, knead in a little white vegetable fat
- Simple models will stick without the use of glue
- Basic shapes for modeling are the ball, cone and sausage shapes, from which the majority of figures or animals can be created! It is important that the marzipan is kneaded well to eliminate any cracks before starting.
- Use a glaze on the finished item to give a professional looking finish.
- Add flavoring and nuts

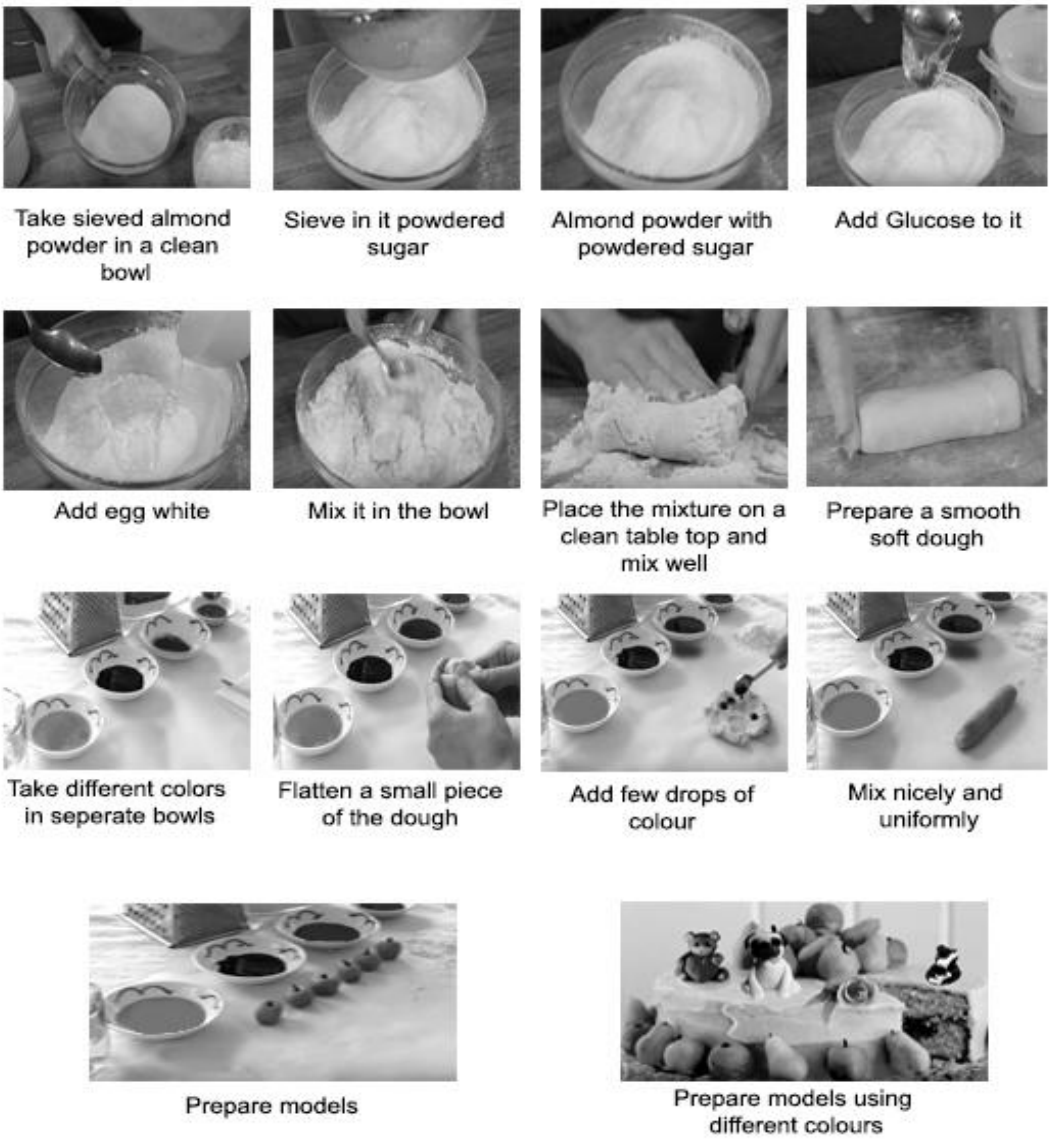


Fig.4A Modeling with Marzipan

4.5 NOUGAT

The word nougat comes from Occitan pan nougat, seemingly from Latin panis nucatus 'nut bread' (the late colloquial Latin adjective nucatum means 'nutted' or 'nutty'). Some say that the word nougat is derived from the Latin word nux, meaning

"walnut." There is evidence that, in ancient times, precursors of today's nougat were made using egg whites, honey, and nuts.

Nougat is a family of confections made with blending of sugar or honey, roasted nuts (almonds, walnuts, pistachios, hazelnuts, and macadamia nuts are common), whipped egg whites, and sometimes chopped candied fruit. The consistency of nougat is chewy, and it is used in a variety of candy bars and chocolates. It can range from soft and chewy like caramel to hard and brittle or sticky. Using cocoa butter in the formula helps it resist stickiness. Nougat is used as an ingredient in petits fours, chocolates, creams and mousses. Like all nut brittle and sugar candies, nougat softens easily under humid conditions. Nougat formulas are versatile and may be made by replacing all or some of the almonds with sliced toasted hazelnuts, walnuts, cocoa nibs, coffee beans or toasted sesame seeds.

There are three basic kinds of nougat. The first, and most common, is white nougat (mandorlato or torrone in Italy, turrón in Spain), made primarily from whipping egg whites, sugar, nuts (usually almonds, pistachios, or hazelnuts), and honey together; it appeared in Cologna Veneta, Italy, in the early 15th century, in Alicante, Spain with the first published recipe in the 16th century, and in Montélimar, France, in the 18th century. The second is brown nougat (nougat noir in French, literally "black nougat"), made in a very similar fashion as white nougat, except generally without the egg whites and brown nougat usually uses caramelized sugar, making it a lot thicker, firm and crunchier than white nougat. The third is the Viennese or German nougat which is essentially a chocolate and nut (usually hazelnut or almonds) praline.

The nougat in candy bars typically is not made with sugar, but rather uses sucrose and corn syrup, then aerated hydrolyzed soya protein or gelatin, instead of egg whites.

Once finished, nougat may be deposited in a slab, sandwiched between wafer papers, or cut into individual portions or bars and dipped partially or fully in chocolate. Given all of the variables of texture, flavor, inclusions, and finishing techniques, the possible variations are nearly endless.

Variations of Nougat: Many countries claim parentage to this traditional delight. Variations are found in Italy, France, Spain and the Middle East, but its actual origins are obscure. Some trace it back to the Romans in the ancient writings of the Roman epicure, Apicius from 1st-century AD, whose notes were used for the ancient cookbook, De Re Coquinaria from the 4th-century AD. This describes a nut custard made of honey, walnuts and eggs. Or perhaps more likely, the Arabs, who have cultivated various types of nuts (almonds, pistachios, walnuts), honey and sugar for centuries. Most Middle Eastern recipes use nuts and honey without eggs. Yet a recipe with egg whites, called Halwa, very similar to that of nougat is cited in the

15th-century eastern Islamic cookbook of Ibn al-Mabrad for both honey and sugar-based versions.

While there are literally dozens of variations, perhaps hundreds, they generally fall into soft and hard versions. This being adjusted by the ingredients and length of cooking time. Versions of nougat made with honey tend to be softer, while the sugar versions are harder, even brittle.

Italian Nougat: Called Torrone in Italian, it is said to have been first created in Cremona, Lombardy for a wedding celebration of aristocrats in the 15th century. Found throughout Italy, noteworthy nougats are from Alba, Mombercelli and Novi Ligure in Piedmont (a hard version with hazelnuts), Siena, the Benevento, the Abruzzi and Calabria. The city of Caltanissetta, Sicily produces a delicious version with Arab roots, called "cubaita" and Sardinia's version contains 100% Sardinian honey and no sugar.

French Nougat: Made in the Provence region since at least the sixteenth century. Known as 'nougat' in the Middle Ages. There are two types, the traditional crunchy black nougat made without eggs and the soft white nougat such as the famous Nougat de Montélimar, made with Lavender honey, almonds and pistachios in the ratio of at least 30% almonds, or 28% almonds and 2% pistachios, and 25% honey of the sugar content.

Spanish Nougat: Known as Turrón or Torró in Spain. It is believed to have been introduced by the Arabs, but has been made in Jijona (Xixona – Spanish) for more than 500 years. Turrón is made of toasted almonds (Marcona almonds), pure honey (Orange Blossom or Rosemary honey), sugar and egg whites, and has creamy white color and a hard crunchy texture.

Iranian (Persian) Nougat: A very popular candy, Gaz is the traditional name of Persian nougat originating from the city of Esfahan, located in the central plateau of Iran. The primary difference between this nougat and European kinds is the source of the sweetness. It isn't from sugar or honey, but from the sweet, milky sap of the native desert plant called gaz-angebin, which translates to "sap of angebin", a member of the Tamarisk family and native to the Zagros mountain range located to the west of the city. Other ingredients include pistachio or almond kernels, rosewater and egg whites.

Basic Nougat Recipe (Fig- 4B)

This formula is recommended for those working in a humid environment.

Yield: 3 lb. 8 oz. (1680 gm)

Glucose or corn syrup-	14 oz. 420 gm
Fondant-	1 lb. 3 oz. 570 gm
Almonds, sliced, toasted and warm-	1 lb. 5 oz. 630 gm

Unsalted butter or cocoa butter- 2 oz. 60 gm

Method:

- Over medium-high heat, bring the glucose syrup to a boil in a heavy saucepan without stirring.
- Add the fondant and let it dissolve without stirring. Cook until the syrup turns a golden amber color, approximately 320°F–330°F (160°C–166°C).
- Remove from the heat. Quickly add the almonds, and then stir in the butter.
- Pour the cooked nougat out on a silicone baking mat or a lightly oiled marble slab. Wait a few moments before rolling the nougat to prevent it from sticking to the rolling pin.
- Roll the mixture to approximately1/16 inch (1 millimeter) thick for most uses, slightly thicker for showpieces.
- If the nougat hardens before the required thickness is reached, place it on a silicone mat or lightly oiled sheet pan and reheat in a 275°F (135°C) oven. Nougat rolled to1/8 inch (3-millimeter) thickness will take approximately 8 to 10 minutes to soften. Reheat the nougat anytime during the cutting or shaping process.
- When the nougat is rolled evenly thin, quickly flip the baking mat, nougat side down, onto a sheet of parchment. (Or lift the nougat with a spatula and flip onto the paper) Immediately cut into shapes and press into molds.
- Leftover nougat scraps can be stored in an airtight container. Scraps can be reheated and reworked at a later time. Slightly overlap the pieces on a paper-lined sheet pan and place in a 300°F (150°C) oven. Remove the warm nougat and roll to form a uniform sheet.

Recipe of Almond Honey Nougat

Whole hazelnuts, toasted- 3/4 cup
Whole almonds, toasted- 3/4 cup
Whole pistachios, toasted- 3/4 cup
Granulated sugar- 2 cups
Light corn syrup- 1 cup
Honey- 1/2 cup
Salt- 1/4 tsp.
Water- 1/4 cup
Egg whites- 2 nos.
Vanilla extract- 2 tsp.
Almond extract- 1 tsp.
Softened butter- 1/4 cup
Orange essence- 1 tsp.
Parchment paper

Method:

- Prepare a 9x13 pan by lining the bottom with edible rice paper.
- Place sugar, corn syrup, honey and water in a large heavy saucepan over medium heat. Stir constantly until the sugar dissolves, then use a wet pastry brush to wipe down the sides of the saucepan to prevent sugar crystals from forming.
- Insert a candy thermometer and continue to cook the syrup, without stirring, until the candy thermometer reads 252^0 F.
- When the sugar syrup is nearing the proper temperature, begin to beat the egg whites until stiff peaks form. Try to time the beating so that the stiff peaks stage coincides with the proper temperature of the syrup. If the egg whites are ready before the syrup, stop the mixer so that they are not overbeaten and crumbly.
- Once the sugar syrup is at 252^0F, carefully remove 1/4 cup of syrup and keep the rest of the syrup on the heat. With the mixer running, slowly pour the hot 1/4 cup of syrup in a thin, steady stream into the egg whites. Beat the whites at high speed for five minutes until they hold firm peaks.
- While the egg whites are being beaten, continue to cook the sugar syrup until the thermometer reads 315^0F. Monitor the syrup carefully, as it can quickly overheat and burn near the end of the cooking process.
- Once the syrup reaches 315^0F, remove the pan from the heat. If you have a large heat-safe measuring cup with a spout, pour the sugar syrup into the cup to make it easier to pour into the mixer. If not, be sure to be very cautious when working with such hot liquids. With the mixer running, pour the hot syrup slowly into the egg whites. Beat them on high for an additional five minutes, or until they hold their shape.
- Stop the mixer and add the vanilla extract, almond extract, orange blossom water, salt, and butter. Turn the mixer back on and for an additional five minutes or until a thick ribbon forms when the whisk is lifted from the bowl. Stir in the nuts by hand.
- Pour the nougat into the prepared pan, and use an offset spatula or knife sprayed with nonstick cooking spray to smooth the top. Cover the top completely with another sheet of rice paper. Place a second 9x13 pan on top of your nougat, and place a large book or other heavy object in the pan to weigh it down.
- When you are ready to cut the nougat, spray a knife with nonstick cooking spray and run it along the edges of the pan to loosen the candy.
- Turn the nougat out onto a cutting board. Using a knife sprayed with nonstick cooking spray, cut the nougat into small squares or rectangles. Nougat can be served immediately or stored in an airtight container at room temperature. You might want to wrap the pieces in waxed paper so that the sides do not stick together. Serve nougat at room temperature.

Fig. 4B Preperation of basic Nougat

4.6 PASTILLAGE

The origin of pastillage date as far as the 17th century when sugar icing was invented, and it was used to decorate wedding cakes, but due to sugar costs, it remained a luxury for the wealthy. British created royal icing, pastillage, and rolled fondant, since they were major sugar importers. Pastillage became popular in the 19th century when Queen Victoria's wedding cake was decorated with this sugary dough. Since then, and into the 20th century, when inventions such as chemicals, tools, and machinery pastillage had become more artistic, and common. They also used wooden moulds to make intricate sculptures of buildings, towns, people, decorations, and woven baskets, all out of pastillage.

Pastillage (pronounced "pahss-tee-yahzh") is a sugar paste that is used for modeling decorative items. Unlike gum paste or marzipan and other modeling pastes, it is rarely, if ever, intended to be eaten. Although it is made entirely of edible items, pastillage is as hard and brittle as plaster of Paris when it dries, and nearly as tasteless. It can be molded into different shapes and forms and is used primarily for making display pieces, such as centerpieces for dessert buffet tables, or small baskets or boxes to hold petits fours and candies. Pastillage is normally left pure white, although it may be colored in pastel shades.

Unlike gum paste, pastillage dries much quicker and stronger. Made with gelatin, water and icing sugar, it hardens quickly and can only be shaped or molded for a short while by hand. It can be an extremely effective tool in creating crisp, clean elements that won't lose their shape or sag in cake decoration. If handled too long, surface will begin to dry and crack. It can also be rolled in a variety of thicknesses and cut in to shapes to dry and join later. After hardening, sand paper can be used to achieve very smooth and even textures. It is a perfect material to produce very small to very large sugar toppers or centerpieces to decorate cakes. It can be used for making structures like buildings, gazebos, carriages, boat, sail etc. Pastillage's disadvantage is that you only have a short time to work with it but its quick firmness gives a huge advantage to cake decorators who require a quick response from materials. Decorative work made from pastillage is not temperature or humidity sensitive. Protected from dust, it will keep for a year.

Gum paste and pastillage are essentially the same medium; however, gum paste is more elastic and may be rolled thinner and manipulated more easily without cracking. Most gum paste and pastillage décor elements should be dried overnight before use. When working with sugar pastes, the work surface and all tools must be kept clean and free of any debris, as the white paste accentuates any impurities. Keep sugar paste covered with plastic wrap as much as possible as it is being worked with because it dries out quickly. Rolled fondant is used for covering cakes as well as creating décor elements. However, it does not dry to a brittle state as easily and therefore cannot be used for the same applications as pastillage or gum paste. It will develop a dry outer crust, so care should be taken to keep it covered when working.

Characteristics of Pastillage:

- Pastillage dries quickly. If you need to complete a cake decorating project quickly, pastillage will "set" far faster than gum paste.
- The strength and firm texture of pastillage makes it ideal for sculpting or creating cake elements that you don't want to sag, such as the upper portion of the shoe cake pictured above.
- Pastillage fares better in humid conditions than its softer counterparts. This means that pastillage elements will likely stand up better when served at a warm summer event.
- Pastillage is sturdy enough to be gently "sanded." This means that you can buff pastillage surface until they have a smooth texture, which is not possible with fondant or gum paste.

Recipe of pastillages-1

Icing sugar-	750 gm or 26 ounces
Water-	70ml or 2.5 ounces
Gelatin powder-	18 gm or 1.1 ounce
Lemon juice or cream of tartar-	1 gm or 0.2 tsp

Method:

- Weigh all the ingredients properly
- Dissolve gelatin in water in a double boiler
- Add the gelatin mixture into the icing sugar
- Add lemon juice or cream of tartar
- Mix well, knead to soft dough
- If sticks you palm, you can knead the dough while dusting with little powdered sugar
- Immediately wrap it in plastic wrap for future use

Recipe of pastillages-2

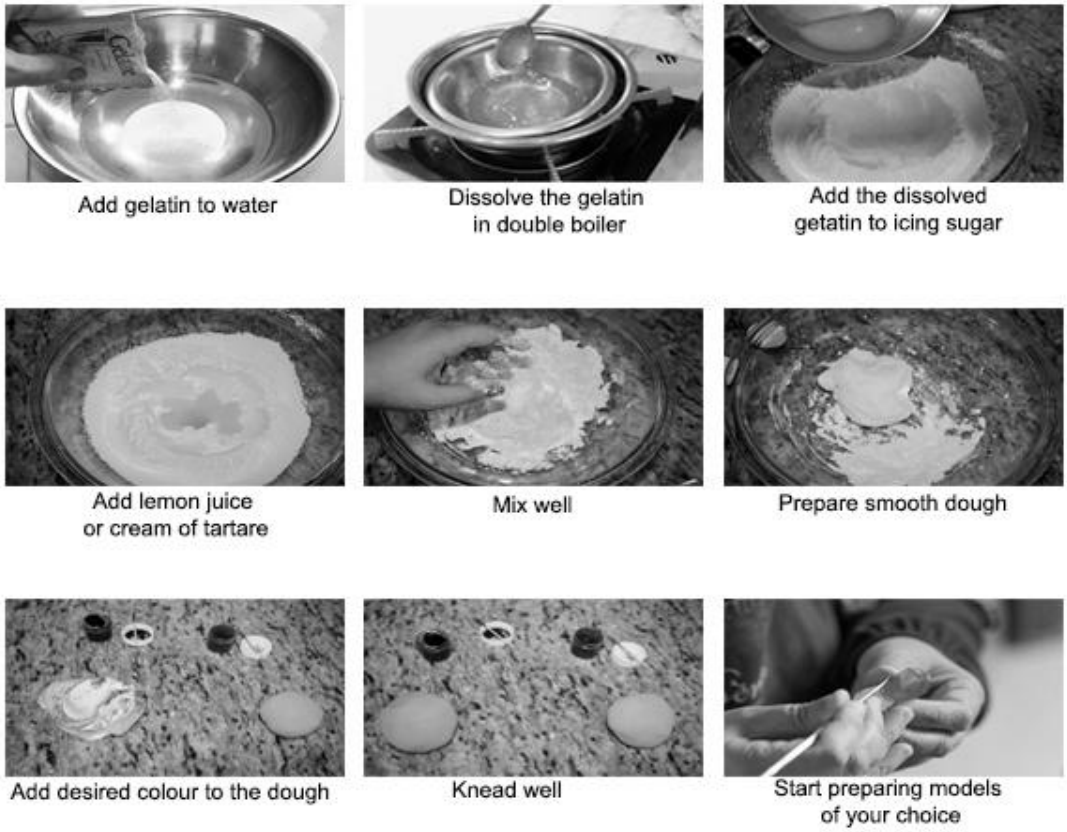
Confectioner's sugar-	1 pound or 450 gm
Cornstarch-	½ cup or 120 gm
Cool water-	¼ cup or 237 ml
Cream of tartar-	¼ teaspoon
Gelatin-	1 envelope or 20 gm

Method:

- In a large bowl, mix the sugar, cornstarch, and cream of tartar.
- Place the cool water into a small saucepan and sprinkle the gelatin over the water.

- Let the gelatin soak in the water for at least five minutes.
- Then place the saucepan over a low flame in double boiler and stir until the gelatin has completely dissolved and the water has warmed.
- Mix and knead until the pastillage is smooth.
- Immediately wrap it in plastic wrap. Keep in mind that pastillage becomes stiff very quickly.
- Remove as much pastillage from the plastic wrap as you will use for one decoration and add powdered food coloring to achieve the shade you are looking for.

- Handling pastillage:
- Icing sugar mix has 10 percent starch. As a result, this makes it reasonably lump free and smoother dough.
- If you use pure icing sugar you must sift and add some starch.
- Small adjustments with the amount of water make a big difference to how hard or soft it is.
- If you use corn syrup which is more runny than glucose, recipe will need to be balanced by adding more icing sugar to the mix or reducing the amount of water.
- If you boil the water more than a few seconds, there will be a reduction in the amount of water due to evaporation, so you may need to adjust recipe.
- You can use pastillage immediately after producing it.
- If you store it, you will need to recondition it back to a workable state by heating it up in a microwave. Be careful not to heat it up too much or you will not be able to knead and work with it because it will be too soft, sticky and hot to touch. Only do 10 - 15 seconds (depending on the amount being used) at a time to make sure you do not heat it up too much.
- While making pastillage, you may also heat up the gelatin and water in a microwave (instead of on the stove) but ensure that the container being used is microwave safe and can handle hot temperatures. Also allow room for rising. Keep watch and only heat up a couple minutes at a time to make sure it doesn't overflow when reaching a boil.
- While gluing pastillage models use water or egg white or Royal icing




Some pastillage models

Fig.4C Working with Pastillages

CHECK YOUR PROGRESS-I

1. What is icing?

2. What is florist paste?

3. What is Nougat?

4.7 SUGAR

Sugar is one of the major ingredients in the bakery industry and plays an important role. Sugars vary in their sweetening quality and sweeteners are the soul of all desserts. When we refer to desserts, they have to be sweet sugar is one of the most important ingredients used in confectionery and its usage is not only limited to providing sweetness, but, it has various other uses such as altering the texture of products, giving colour to the baked goods, etc. It is a class of sweet tasting carbohydrate in concentrated form of sucrose. It consists of a molecule of glucose combined with a molecule of Fructose. A molecule of sugar is composed of 12 atoms of carbon, 22 atoms of hydrogen, and 11 atoms of oxygen ($C_{12}H_{22}O_{11}$). There are two basic groups of sugars: simple sugars or monosaccharide, which means "single

sugars" like glucose and fructose, and complex sugars or disaccharides, meaning "double sugars" like maltose (malt sugar} and lactose (found in animal milk).
It is also formed naturally in the leaves, stems, roots or fruits of plants. Sugar may be obtained from varied plants like from maple tree- Canada, date palm- Africa, sugarcane- tropical region, beetroots from temperate region and from sorghum, grapes, potatoes, honey etc. As it occurs naturally in nearly all plant structures, but for general commercial use, it is obtain from two major sources, the sugarcane and sugar beet.

Classification of Sugar:
Sugars are classified under one or in the combination of following:

1. The source (sugarcane or sugar beet)
2. The country of origin
3. The method of processing, which in turn determine the type of sugar produced, e.g. cube sugar, icing sugar.
4. Catering use – specific type of sugar should purchase for particular use.
5. Chemical group - sugar may be classified in two chemical groups, mono and disaccharides.

MANUFACTURE OF SUGAR

From sugarcane: Sugarcane refers to any of several species, or their hybrids, of giant grasses in the genus *Saccharum* in the family *Poaceae*. The plant is widely grown in south and Southeast Asia. The crop is harvested mechanically or by hand, chopped into lengths and conveyed rapidly to the processing plant (commonly known as a sugar mill). The juices are taken out by crushing the plant part and then it is cleaned with the help of chemicals (milk of lime or carbon dioxide). It is then filtered and concentrated by evaporation under reduced pressure until crystallization occurs. The residue left after crystallization is called molasses (used mainly as cattle fodder) and the fiber from the stems, known as bagasse, is burned to provide energy for the sugar extraction process. The crystals of raw sugar have a sticky brown coating and either can be used as they are or can be bleached by sulfur dioxide or can be treated in a carbonization process to produce a whiter product. The crystallized sugar is further refined through bone ash to get pure opaque sugar. The different sizes of the crystals are produced by variation in boiling technique and duration.

From beet root: Sugar beet became a major source of sugar in the 19th century when methods for extracting the sugar became available. It is a biennial plant, a cultivated variety of Beta *vulgaris* in the family *Amaranthaceae,* the tuberous root of which contains a high proportion of sucrose. It is cultivated as a root crop in temperate regions with adequate rainfall and requires a fertile soil. The crop is harvested mechanically in the autumn and the crown of leaves and excess soil removed. The roots do not deteriorate rapidly and may be left in a clamp in the field for some weeks before being transported to the processing plant. Here the crop is washed and sliced and the sugar extracted by diffusion. Milk of lime is added to the raw juice and carbonatated in a number of stages in order to purify it. Water is

evaporated by boiling the syrup under a vacuum. The syrup is then cooled and seeded with sugar crystals. The white sugar that crystallizes out can be separated in a centrifuge and dried. It requires no further refining.

Forms of Sugar:

1. **Turbinado Sugar**- also called Demirara sugar. It is partially refined, light in color with coarse grain and caramel flavor. It is used in beverages and certain baked products.

2. **Icing Sugar**- Icing sugar is used for creaming methods where it would be used as icing for cakes and pastries. Icing sugar can also be sifted on top of dry baked sweet products as a garnish.

3. **Castor Sugar**- This is superfine sugar (A Grade) - made by crushing and sieving fine granulated sugar. It dissolves quickly and easily in liquids. Used in making pastries, cakes, desserts, ices etc. as it produce tender and light cakes.

4. **Granulated/ White Sugar -** This is the regular white sugar which in used in homes. Usage of this sugar will find its place in any preparation which has sufficient liquid to dissolve it. For example, whipping eggs, making sugar syrups, cooking sabayon over double boilers, etc. It contains 99.7% sucrose.

5. **Powder Sugar**- It is obtained from granulated sugar by pulverization (refining of granulated sugar to get more fine form). It is available in various degree of fineness, use for different purposes in confectionary.

6. **Brown Sugar**- It is simple refined sugar with some molasses returned to it or it is the residual sugar obtained during the process of refining sugar. It is brown in color and has distinctive color and flavor. As it contains moisture, it forms lump. Used in the preparation of certain puddings, cakes, etc.

7. **Vergeoise Sugar**- solid residue from refining beet or cane sugar giving a product of soft consistency, golden or brown with pronounced color.

8. **Glucose-** It is present in body and in fruits in natural form. Commercially it is sold as Dextrose. It is less sweet than sucrose, but it is use because of its waster holding capacity. It has ability to control the size of the crystals in candies and as a food for yeast, during the fermentation.

9. **Fondant**- sugar syrup beaten with cream of tartar to form thick white paste. Used for decorating pastry or confectionary.

10. **Date Sugar**- It is obtained from drying and pulverizing dates. It is very sweet and although it does not dissolve very well it is used in many baked products.

11. **Liquid Caramel**- liquid sugar in which caramel colour is added to give it dark brown colour. It is a thick free-flowing liquid and may be used in preparation of puddings and some types of confectionary.

12. **Invert Sugars**- These are sucrose-based syrups that are treated with acids or chemicals. The acid breaks the sucrose molecule into glucose and fructose. Since there are now two molecules of sugar it will be sweeter than sucrose. Corn syrup is a type of invert sugar and this property of inverting sugar does not let the sugar to crystallize easily and hence the product stays moist.

13. **Pastillages**- Icing sugar mixed with gelatin, starch or gum. Used in decoration.

14. **Treacle/Molasses**- are products of refined sugar. When the sugarcane juice undergoes refining, it undergoes many stages. In the first stage the white sugar or the raw sugar is removed. The remaining sugar syrup is used to make treacle which is stronger than golden syrup but less than molasses. Used in the preparation of sugar.

15. **Maltose**- It is use as a flavoring and coloring agent in the brewing of beer.

16. **Lactose**- It is commercially extracted solution of whey formed by crystallization. It is usually added to bakery products because its presence adds to the brewing of food products.

17. **Golden Syrups**- It is thick amber coloured liquid obtained from sugar during the refining process. It is treated with acid to cut down on the sharp taste. It looks similar to honey and is used in making confectionery products and to add flavour to the food products.

18. **Honey**-It is natural sugar consisting of glucose and fructose. It is a natural sugar obtained from bee hives. The colour and flavor of honey will vary with its source. Some commercial honey farms allow bees to suck the nectar from

only one particular flower to produce the honey of that flavor. One can use honey in most of the baked products but care has to be taken as honey can caramelize even at lower temperatures. It is used as leavening agents and in sherbets.

19. **Maple Syrup**- It is natural sweetener and is a sap of maple tree. It is boiled down to thick syrup. Pure maple syrup is very expensive, as to obtain 1 liter of maple one has to boil down at least 10 liters of maple sap. For easy processing, commercial maple syrup added to them. It could be added in the range of 2-6 percent. The percentage of the maple is always mentioned on the bottle and this decides the price of the product.

20. **Palm Syrup**- Palm sugar is traditionally made from the sap of Palmyra palm or the date palm. It is extensively used in Asian cooking, especially

21. **Corn Syrup**- It is very sweet and contains high amount of fructose and glucose or dextrose. It is chemically refined syrup made from corn kernels and is prepared by converting corn starch into simple sugar compound by the use of enzymes. Used in icing and candy masking.

22. **Isomalt**- It is a natural sugar substitute and in reality it is sugar alcohol. It is available in crystalline forms and is used for preparing sugar garnishes as it is more stable than sugar and does not caramelize thereby giving an appearance of thin glass sheets.

23. **Sugar Substitutes**- These are chemically produced and have no nutrition value at all. Saccharin and cyclamates are best known and more commonly used in food items, especially for people who are diabetic. It is slightly bitter in taste and is used as a sweetener in low calorie or diet soft drinks.

Uses of Sugar:

- Adds sweetness and flavour to the products.
- To colour the cooked products by the process of caramelization.
- They give crust color. And help get even texture.
- Makes the texture firm and tender by weakening the gluten strands.
- To retain moisture and prevent in particularly baked goods such as cakes from drying out.
- Act as preservative.
- To help as an activator, sugar helps yeast to grow faster by providing it with a readily available source of nourishment.
- As anti-coagulant.

- They act as creaming agents with fats and as foaming agents with eggs.
- As a main ingredient for cake decorating, e.g. different types of icing (topping the cake).

4.7. 1 SUGAR WORKS

When cooking sugar, all your equipment must be clean and free of any grease. The sugar must also be free of impurities, such as flour or other ingredients. Sugar has a very high caramelization point and any impurities in the sugar are likely to burn at a much lower temperature, before the sugar begins to caramelize. A copper or other heavy-bottomed saucepan should be used to ensure constant, even heat. Sugar may be cooked by one of two methods: wet or dry.

When cooking or caramelizing sugar by any method, a small amount of an acid (typically lemon juice at approximately ½ tsp/ 1.25 ml 227 gm of sugar) can be added to help prevent crystallization from occurring during cooking.
Regardless of the cooking method, when caramelizing sugar, it is important to stop the cooking process by shocking the pan in an ice water bath just as, or just before, it reaches the desired color. Sugar retains heat and can easily become too dark or burn if the cooking process is not arrested.

It is also important to heat any liquids to be added to the caramel and to add them carefully. Caramelized sugar is very hot and will splatter when a colder ingredient is introduced.

i. **Wet method:** The wet method is best used when sugar must be cooked to a specific stage or temperature. The ration of sugar and water taken should be 3:1. If less of water is added, then there will be chances of the sugar to get re-crystallized. Dissolve the sugar in water and then put to boil, stirring constantly. When the syrup starts to thicken, it splatters on the sides of the pan forming crystals. These crystals, in turn, can easily act to "seed" the rest of the sugar in the pan, causing it to begin to crystallize, carefully remove the crystals using pastry brush dipped in cool water. Also skim off any impurities present in the syrup. The wet method of sugar cooking, however, dissolves the sugar in water; then as the solution cooks, the water evaporates, acting to increase the concentration of sugar and resulting in a supersaturated, non-crystalline sugar solution. The concentration of the sugar solution increases as the solution is cooked, the temperature increases, and more of the water evaporates. Add the acid ingredient (cream of tartar, lemon juice, etc.), if using. Adding a small amount of an acid can help prevent crystallization during cooking; when boiled with a dilute acid, sugar will result in an invert sugar that interferes with the crystallization process.

ii. **Dry method :** The dry method is used exclusively for caramelizing. The characteristically nutty and roasted flavor of caramel is best achieved through the use of this method. In this method first small amount of sugar is added to pre-hot pan over low heat and stirred constantly. When it melts, the rest of the sugar is added in small batches till all the sugar has exhausted. Cook to the desired color. Using this method, sugar crystals are melted through the application of heat, resulting in sugar that caramelizes almost as soon as it melts. Because it cooks so quickly, it is important to monitor the sugar constantly.

Out of these two methods, only the wet method is important and can be used in various types of sugar preparations.

COOKING SUGAR TO DIFFERENT STAGES

Temperature	Stages	Uses
100- 105^0 C (212-221^{0}F)	Short thread	Syrup will form a loose thin thread. Thin syrup used as syrups.
105-111 ^{0}C (221-233^{0}F)	Long thread	Syrup will form a thick thread. Thick syrup used as syrups
112 - 115^{0}C (234-240^{0}F)	Soft ball	Syrup will form a soft, sticky ball that can be flattened when removed from the water. Used in Fondant, marzipan, fudge, butter creams, pralines
118-120°C (244-248°F)	Firm ball	Syrup will form a firm but pliable, sticky ball that holds its shape briefly. Used for caramels, butter creams, nougat, marshmallows, Italian meringues, gummies, and toffees
121-130°C (250-266°F)	Hard ball	Syrup will form a hard, sticky ball that holds its shape. Used for caramels, nougat, divinity and toffees
132-143°C (270-290°F)	Soft crack	Syrup will form strands that are firm yet pliable. Used for butterscotch, firm nougat, Hard toffee and nougat
146-154°C (295-310°F)	Hard crack	Syrup will form threads that are stiff (brittle) and break easily. Used for brittles, toffees, glazed fruit, hard sweets, pulled poured spun sugar and moulding sugar
154- 160 ^{0}C (310-325^{0}F)	Caramel	Syrup will become transparent and will change colour, ranging from light golden brown to dark amber. Used for

		pralines, brittles, caramel-coated moulds, and nougat and also as colouring agent
160 ^{0}C (325^{0}F) and above	Black Jack or burnt sugar	Colouring agent

The names of the stages come from the process used to test the syrup before thermometers became affordable: a small spoonful of syrup was dropped into cold water, and the characteristics of the resulting lump were evaluated to determine the concentration of the syrup. Long strings of hardened sugar indicate "Thread" stage, while a smooth lump indicates "ball" stages, with the corresponding hardness described. The "crack" stages are indicated by a ball of candy so brittle that the rapid cooling from the water literally causes it to crack. This method is still used today in some kitchens. A candy thermometer is more convenient, but has the drawback of not automatically adjusting for local conditions such as altitude, as the cold water test does. Once the syrup reaches 340°F or higher, the sucrose molecules break down into many simpler sugars, creating an amber-coloured substance known as caramel. This should not be confused with caramel candy, although it is the candy's main flavouring.

Inversion of sugar: When a sucrose solution is heated with an acid, some of the sucrose breaks down into equal parts of two simple sugars, dextrose and levulose. A mixture of equal parts of dextrose and levulose is called invert sugar. It is about 30% sweeter than regular sucrose. Invert sugar has two properties that make it interesting to the baker. First, it holds moisture especially well and, therefore, helps keep cakes fresh and moist. Second, it resists crystallization. Thus, it promotes smoothness in candies, icings, and syrups. This is why an acid such as cream of tartar is often added to sugar syrups. The acid inverts some of the sugar when it is boiled, thus preventing graininess in the candy or icing. Invert sugar is produced commercially. It is also present in honey.

Cooking of Sugar:

1. One should take the following precautions while cooking sugar :
2. Use thick bottom bowl.
3. Equipment should be clean and free from oil grease.
4. Use quality sugar
5. Add sufficient water so that it will dissolve well.
6. Add lemon juice before the solution reaches boiling point
7. Lemon juice helps remove dust from sugar syrup
8. Use slow fire and do not stir the syrup when boiling.
9. Remove the scum with the help of a thick wet cloth.
10. During boiling, small specks of sugar crystals will be sprayed on it. It must be removed.
11. Stop the boiling when the required stage has been reached.
12. If the sugar has gone over the required stage, adjust by adding warm water.
13. Maintain the correct temperature.

14. Follow the methods carefully.
15. If colour or essence is added, ensure that they are free from oil.

Caution: Working with hot sugar can be dangerous, so use caution. Be watchful of children underfoot. Take care when transporting boiling sugar and when working and molding hot sugar with your hands.

- Make sure to have cool water handy in case of an emergency. If hot sugar or water burns skin, place skin in cold water (not ice). If done within the first minute or so, cold water emersion for up to 30 minutes can reduce total area and severity of the burn.
- The crystallization process starts with stirring and heat. Crystals affect the sugar's texture. Large crystals form in hot syrups occasionally stirred. Small crystals form in cool syrups that are constantly stirred. Avoid crystallization by cooling the syrup rapidly in cold water. When pulling sugar, take care not to work the sugar too long; over pulling can result in the sugar re-crystallizing and taking on a dull matte finish.
- Use a heat lamp to soften sugar while you are working with pulled sugar.
- Wipe spills on the counters or floors immediately to avoid hardened sugar later. Some sugar work, especially spinning, can be quite messy, so it is a good idea to cover up areas where flicking sugar may drop.
- Before beginning a sugar project, place two plastic bags nearby. If the phone rings or you have to do other work, you can quickly use the plastic bags as gloves to keep from leaving a sticky trail.
- Remove hardened sugar stuck to pans by filling pan with boiling water. Wash down sides with a clean brush dipped in water.
- Climate can play role in sugar crystallization. If you live in a damp climate, you may find it more difficult to work with sugar due to high humidity.

Hand test for checking sugar:

Short thread - Dip the dry finger on the sugar syrup and rub the mixture between thumb and finger and draw apart. A thread will be formed. At this stage, the thread will break if stretched.

Long thread- Do the same as above. At this stage the thread will stretch as far as the span of the finger without breaking.
Soft ball - The sugar can be shaped into a ball but will just hold its shape and be soft and pliable.

Hard ball- At this stage the sugar can be very easy to make a ball and the ball will be very firm when pressed with the finger.

Soft crack- When placed in water the sugar will form a film on the finger. It will snap but has a tendency to be pliable
Hard crack- Do the same soft crack test. When biting the sugar should snap but not stick to the teeth.

Caramel- The sugar will begin to colour gradually to darker shades of brown.

Black jack- At this stage the sugar will turn very hard with tan black colour.

4.7.2 WORKS WITH SUGAR

Sugar can be used to create a number of doughs, pastes and syrups used for artistic and decorative work. Depending on the temperature to which the sugar is cooked, the sugar will be clear and firm or dark and brittle. When making a concentrated cooked sugar syrup or caramel, ensure that the sugar is free of traces of flour or other contaminants that may crystallize the syrup. Sugar cubes may be used in place of granulated sugar for this reason.

Sugar art is a specialty within the candy and pastry making field which involves using sugar to create complex shapes, scenes, textures, and patterns. Displays of sugar art appear in a wide variety of settings, from wedding cakes to store windows, with it being especially common during the winter holiday season. When making any cooked sugar syrup, care must be taken to prevent re-crystallization of the syrup. Do not stir a sugar solution after it comes to a boil. Using a clean pastry brush dipped in water, brush away any sugar crystals that adhere to the sides of the pan.

In order to do sugar art, people need training in working with sugar. A wide variety of techniques can be used for this art, including blown and pulled sugar, and all of these techniques require skills and practice. Sugar can be very finicky to work with, and sometimes dangerous, in the case of sugar working techniques which involve heating sugar to high temperatures.

A skilled artisan can create a range of shapes in blown sugar, including animals and ornaments. Pulled sugar may be used to create ribbons of sugar and similar decorative items, and people may also work with sugar which has been molded into various shapes. While some artisans work with plain sugar, most use colorings, for everything from surprisingly realistic flowers to delicate blown sugar ornaments on a holiday-themed cake.

Invert sugar, you remember, resists crystallization, and plain sucrose (granulated sugar) crystallizes easily. The amount of sugar that is inverted depends on the amount of acid present. Just enough cream of tartar or glucose is added to the syrup to create a mass of extremely fine sugar crystals that give fondant its pure white color. This technique is also used for the sugar work discussed in this section, especially in pulled sugar. If too much cream of tartar or glucose is used, too much sugar is inverted, so the sugar is too soft and sticky to work and doesn't harden enough when cool. If not enough cream of tartar or glucose is used, too little sugar is inverted and the sugar is hard, so it is difficult to work and easily broken.

Cooking the sugar to a higher temperature makes it harder and more brittle and thus more difficult to work. Cooking to a lower temperature makes a softer sugar that is easier to work, but the pieces may not hold up as well, especially in a humid climate. Two more precautions are necessary regarding temperature and the addition of tartaric acid (cream of tartar). First, boiled invert sugar discolors more rapidly than pure sucrose. Therefore, the acid should not be added until near the end of the boiling process. Second, the syrup should be boiled rapidly over moderately high heat. Boiling slowly gives the syrup more time to discolor, and it will not be clear white. If color is added to the syrup during boiling (for poured or pulled sugar), it should be added partway through the cooking, at about 260°F (125°C). If it is added earlier, it has more time to discolor, but it must be added early enough for the alcohol or water to cook off.

Slightly different syrups are used for each of the techniques in this chapter. Follow the specific recipes in each section, keeping these guidelines in mind:

1. Use pure white granulated cane sugar.
2. Place the sugar and water in a clean, pan. Place the mixture over low heat and stir gently until the sugar is dissolved.
3. When the sugar is dissolved, raise the heat to moderately high and do not stir any more. To prevent crystallization, use a clean pastry brush dipped in hot water to wash any sugar crystals down the side of the pan. Do not let the brush touch the syrup.
4. Always use a sugar thermometer.
5. Add coloring and tartaric acid solution at the temperatures specified in the recipes.
6. Liquid colors in an acid solution should not be used. For best results, use powdered colors and dissolve them in a little water or alcohol. Good quality paste colors can also be used.

Equipments used for sugar work:

1. Stainless steel pots pr pans- for melting sugar.
2. Latex and insulated gloves- help protect the hands from high heat
3. A digital thermometer with a detachable probe- to monitor the correct temperature of the sugar during cooking and after the mass is formed is essential for sugar work.
4. Eyedroppers- to add the proper amount of cream of tartar or coloring to the sugar mass.
5. Marble or granite slabs- are used to work upon like to quickly cool down cooked sugar, to beat the sugar lumps, fold it flatten it etc.
6. Hooks/hanger- to pull the sugar.
7. Ladle- for cooking the sugar
8. A metal spatula, or metal dough cutter- for turning the sugar mass.
9. Scissors, cutters and knives- used to cut and handle the sugar mass.
10. Silicone mats/silicone moulds- for moulding.
11. Fans or hot and cold dryer- to heat the sugar mass or to cool it.

12. An infrared heat lamp- is used to soften the sugar mass and to keep it malleable.
13. Alcohol burner/ blow torch - used to partially melt pieces of sugar work and then "glue" the components together.
14. A sugar pump and metal blow pipe- are used to gently inflate sugar for blown pieces.

DIFFERENT TYPES OF SUGAR WORK

1. **Poured Sugar or Cast Sugar**- In this technique, sugar is poured into molds. This technique produces more sturdy pieces than pulled and blown sugar, and is almost always used for the base and structural elements of showpieces. Cast sugar can also be used in many recipes such as a simplicity called cake. Usually it is cast in flat sheets like glass, although, like nougat, it can be bent and shaped while it is hot and pliable. The syrup can also be colored before it finishes cooking. One can use any kind of mould to fill the boiled sugar, but keep in mind to lightly oil the inner lining of the mold to prevent the sugar from sticking. Once cooled, remove it from the mould. To bend cast sugar, remove it from the work surface while it is still soft enough to be pliable. If it gets too hard, simply place it on an oiled baking sheet and heat it in an oven just until it is pliable. Then bend as desired, or use an oiled mold to shape it.

   Poured Sugar formula

   High quality granulated sugar- 1 kg
   Cold water- 500 g
   Glucose- 250 g
   Food coloring (powder or paste), dissolved in a very small amount water

Method:

- Mix together sugar and water and cook it on medium flame and allow boiling.
- Remove any froth or skim occasionally, add glucose and increase the heat. Wash down the side of the pan with a wet brush (to avoid any crystal formation on the sides).
- Cook till soft ball stage, add colour (optional).
- Cook further till 146-154°C (295-310°F) to hard crack stage. The syrup has become transparent and shiny.
- Pour into the moulds or spread on a silicone mat.
- Cool and use accordingly.

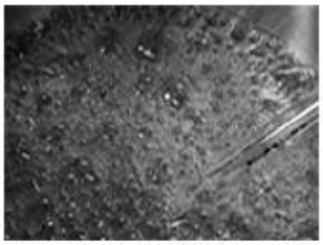
Mix together sugar and water, boil

Skim off the dirt occasionally while boiling

Add Glucose, keep boiling

Remove sprinkled sugar crystals from the sides by a wet pastry brush

Measure the required temperature, add colour (Optional)



Boil to 146-154°C (295-310°F) to hard crack stage

Pour in individual moulds to make the sculptures

Poured sugar sculpture display

Fig. 4D Poured/ Cast sugar work

2. **Pulled sugar** – Pulled sugar is sugar which has been heated and specially handled so that it turns into a glossy and smooth mass. It can be used to make a variety of shapes and ornaments in sugar, such as flowers, animals, decorative pieces etc. When the boiled sugar reaches 320^0F (160^0C), it should be poured out onto a silicone mat and folded.

Here the temperature is maintained at approximately 100°F (37°C). The folding keeps the sugar flexible while incorporating air and cooling it; if the sugar is to be colored, coloring agents can be added at this point. Once the sugar is cool enough to handle, you need to pick it up with rubber gloves and stretch it, as though you are pulling taffy. Fold the stretched sugar and stretch it again, repeating the folding and stretching process until the sugar is smooth and glossy; most people do this under a heat lamp to keep the sugar soft, but make sure that the lamp does not melt the sugar. Once the sugar has been pulled, small chunks can be broken off, stretched, and curled, folded, or twisted to make all sorts of things decorative things and intricate designs. 'Sugar ribbons' are made by pulling sugar into a thin and long glossy ribbon. They can then be worked into beautiful designs such as curls and bows. (Fig.4 E)

3. **Blown sugar-** sugar blowing resembles glass blowing and allows you to create beautiful spheres and globes that you can further shape into different designs. Expert sugar sculptors will combine all of these techniques to create intricate scenes and sculptures that can truly be described as fine art. In blown sugar, a portion of pulled sugar at temperature 320^0F (160^0C), is placed on a rubber pump which is tipped with either wood or metal. Here the temperature is kept at approximately 175°F (79°C). Pumps are most commonly hand pumps. While being blown, the sugar can be shaped, often into animals or flowers. Blown sugar cannot be quickly cooled by dipping it in water, so chefs must use fans to cool the sugar, all the while rotating it, so that it does not come out of shape. This technique is very useful in making balloons for wedding cakes. (Fig.4 F)

Pulled and Blown Sugar formula

Tartaric acid solution:

Cream of tartar-	30 gm
Hot water-	30 gm
Sugar mass:	
Granulated sugar-	1020 gm
Water-	420 gm
Glucose syrup-	210 gm
Food coloring (optional) as needed	as needed

Method:

- Combine the cream of tartar and boiling water. Stir to dissolve. Let cool.
- Boil sugar and water in a heavy bottomed pan for 2 minutes, whisking occasionally the inner lining of the pan with wet brush.
- Add the glucose syrup. Return the mixture to a boil.

- Cook until the mixture reaches 230°F (110°C). Add the food coloring (if required).
- Cook until the mixture reaches 285°F (143°C). Add 12 drops of the tartaric acid solution.
- Remove the mixture from the heat when it reaches 310°F (155°C). Immediately dip the bottom of the pan into cold water to stop the boiling process. Wipe the pan dry.
- Pour the sugar mixture onto a silicone mat or lightly oiled marble slab. Once the mass has settled and formed a skin on the underside, begin to pull and fold it. Start by pulling from underneath the edges of the sugar mass, using a lightly oiled spatula or gloved fingers. Lifting from the ends, fold the sugar back onto itself. Or use an edge of the silicone baking mat to turn the sugar back onto itself.
- Move the sugar mass to a cool part of the marble. The mixture will spread out again. Fold over the edges of the sugar mass. Repeat the process until the sugar mass stops spreading.
- Wearing insulated gloves pull the sugar mass out between both hands to approximately 20 inches (50 centimeters) in length. Fold the sugar mass over and twist it together. Repeat pulling, twisting and folding the sugar until it develops a satin sheen throughout. Do not over-pull as this will cause the mass to over aerate, become opaque and crystallize.
- Using a sharp, oiled knife, divide the sugar mass into pieces of manageable size. Place a piece of the pulled sugar under a heat lamp to work into pulled or blown sugar. Set the extra pieces aside to be reheated under the heat lamp when needed.

Mix cream of tartar, water and sugar

Boil, cleaning the sides of the pan till, add glucose and cook to 160 deg C

Spread on a silicon mat, add colours

Fold the sugar with the colour, cut each coloured piece

Knead each sugar mould properly

Pull the sugar lump

Fold and twist

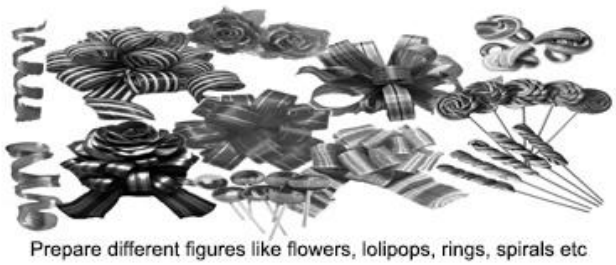
Stretch again

Fold and twist again

Stretch and repeat the process of folding, stretching, twisting many times

Stretch to form ribbons

You can attach one or more ribbons to form striped multicolour ribbon



Prepare different figures like flowers, lolipops, rings, spirals etc

Fig. 4E Pulled sugar work

Prepare sugar to pulled stage adding colour

Spread and collect to form a dough

Stretch by pulling

Twist and fold

Stretch again

Twist and fold

Repeat the process many times to get a shiny dough

For blowing you can use sugar blower, blow pipe or blow horn

Fix a small piece of dough to the mouth of the pipe

Blow carefully with the help od sugar blower/ blow pipe or blow horn to get the desired shape, heating occasionally by heat blower ot heat gun

A show-case of sculptures made of blown sugar

Fig.4F Blown sugar work

4. **Spun sugar**– is a confection consisting of long, fine, hair like threads of sugar made by flicking hot caramel rapidly across dowels. Mounds or wreaths of these threads are used to create elegant sugar nests to decorate ice cream desserts and use it to finish off a towering croquembouche and gateaux or tiered cake design. Making spun sugar is a messy process. The work station used to prepare spun sugar should be covered with paper or heavy plastic to catch sugar that flies around in the process. Should the caramel

harden, reheat it by placing it over low heat. Spun sugar should be made just before it is needed because it does not keep well. It gradually absorbs moisture from the atmosphere and starts dissolving and becoming sticky, so they are best used the same day they are made, stored in an airtight container until needed.(Fig.4G)

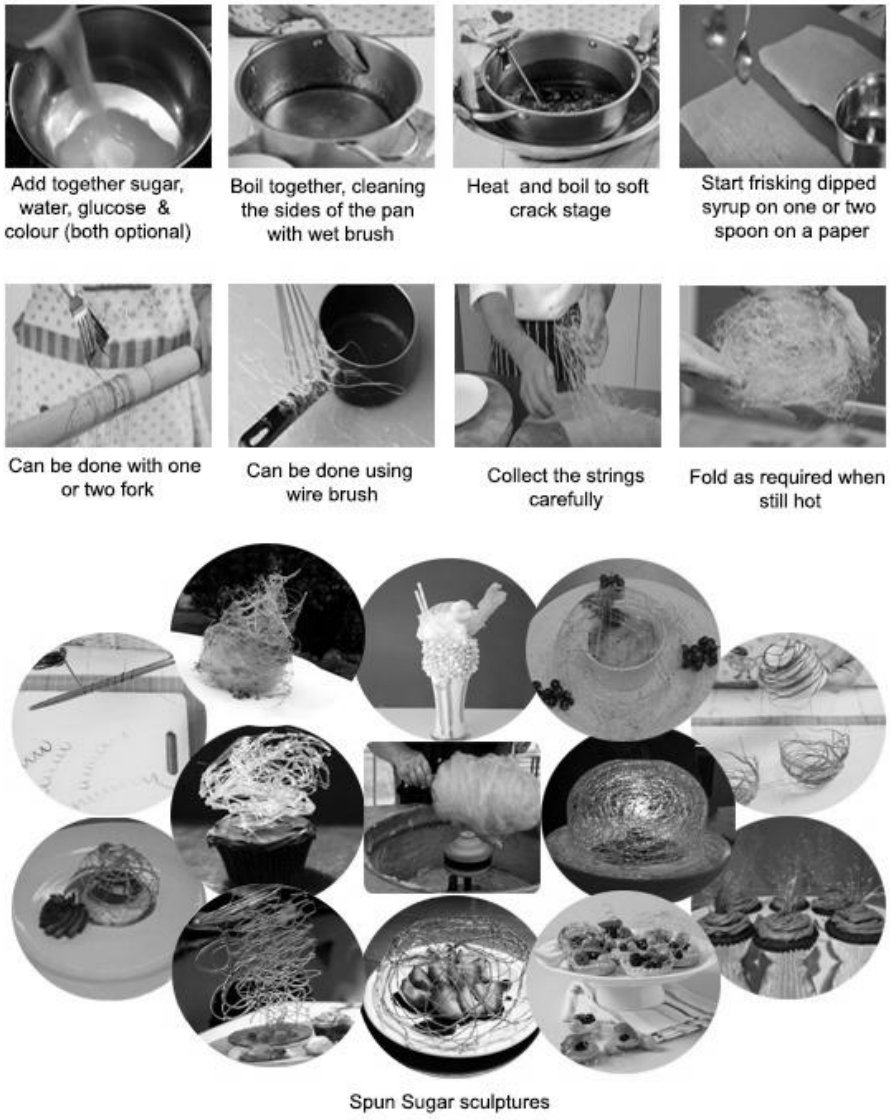


Fig.4 G Spun sugar work

5. **Caramel work**- caramels can be simple or decorative one. Both are used prepare candies, toffees, as spun sugar, preparation of decorative items etc. The recipe of each is as follows:

a) Simple dark caramel formula:

Water- 120 ml
Granulated sugar- 300 g
Glucose or corn syrup- 120 g

Method:

- Take water and sugar in a heavy saucepan. Bring it to a boil, cleaning the sides of the pan using a clean pastry bush dipped in water.
- Add the glucose syrup and without stirring, cook until the syrup reaches 325°F (160°C), or more as desired.
- Remove the pan from the heat and dip the bottom of the pan in a bowl of cold water for 30 seconds to stop the cooking process.
- Use immediately to make piped sugar decorations, spun sugar or other edible garnishes.

b) Decorative light caramel formula:

Water- 120 ml
Granulated sugar- 300 g
Glucose or corn syrup- 120 g
Liquid food coloring (optional) as needed as needed

Method:

- Take water and sugar in a heavy saucepan. Bring it to a boil, cleaning the sides of the pan using a clean pastry bush dipped in water.
- Add the glucose syrup and without stirring, cook the syrup to 275°F (135°C). Add food coloring (if required); pour the food coloring in the center of the pan without stirring. Cook until the syrup reaches 310°F (154°C).
- Remove from the heat and dip the bottom of the pan in a bowl filled with cold water; let sit 12 seconds or until the syrup no longer bubbles.
- Use immediately to make piped sugar decorations, spun sugar or other edible garnishes.

6. Pastillage- already described in the topic 4.6

7. Pressed sugar- Granulated sugar is mixed with a minimal amount of water, and is put under pressure. It hardens into a solid piece. Though this is used for showpiece bases, it is less often used because of the time required to produce it, and its lesser aesthetic value. Granulated sugar is mixed with water and pressed in desired molds to get desired shape.

Formula of pressed sugar:

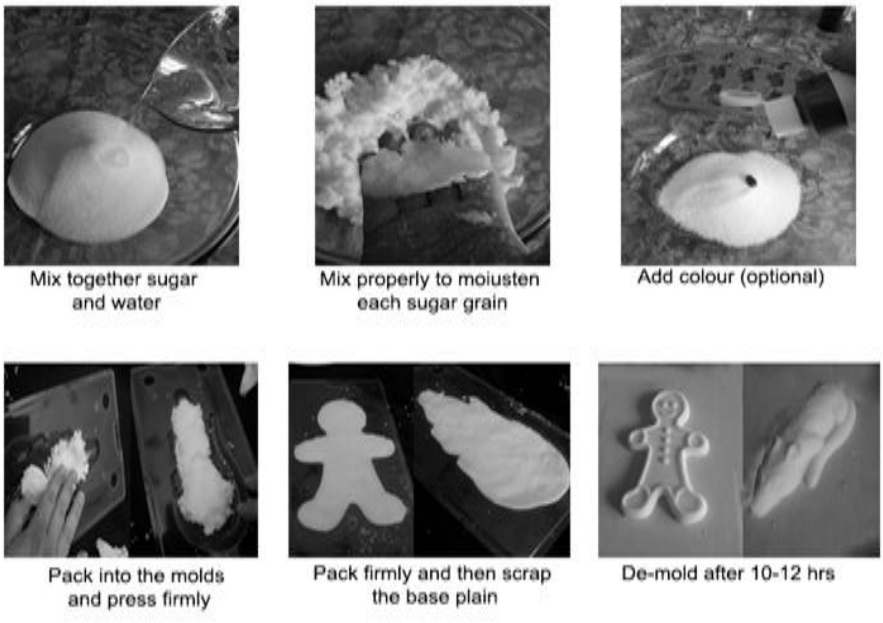
Sugar- 1/2 cup
Water- 1 teaspoon
Color (optional)
Any flavored liquid can be used instead of water, such as coffee, lemonade, menthol etc.

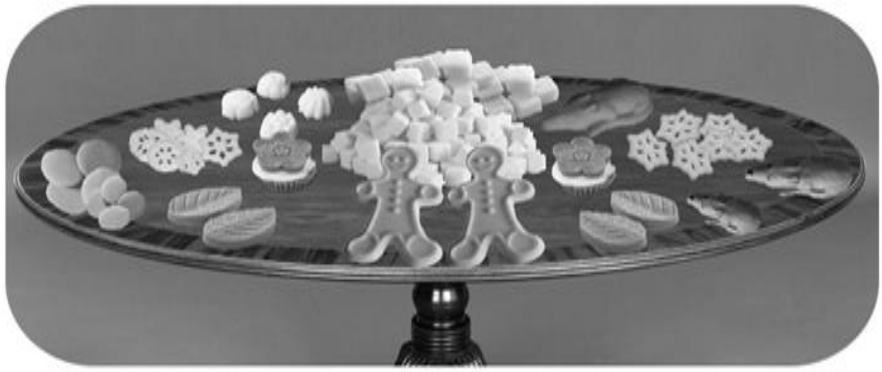
Method:

- Pour the sugar into a bowl slightly larger than you need, so that you have plenty of room to mix. Add the water and colour (optional), mixing the sugar

with a fork. It will first look lumpy where the water has been poured, but as you stir the sugar, it will progress from lumpy to crumbly but fairly even in texture, with a moisture sort of like brown sugar.

- Use a spoon to transfer it to the mold. Spoon some sugar into the mold, and then press it down. Pack the sugar very firmly--fit as much as you can into the vessels of the molds.
- Let the mold sit at room temperature for several hours or overnight so they can harden.
- Over-turn the mold to get the required structure.





A showcase of some pressed sugar products

Fig.4H Pressed sugar work

8. Rock sugar- or Rock candy is actually a collection of large sugar crystals that are "grown" from a sugar-water solution. Sugar, like many other materials, can come in many different physical states. As a solid it can either be amorphous, without shape, like when it forms cotton candy, or crystalline, with a highly ordered structure and shape, like when it forms rock candy crystals. Crystals form when the smallest particles of a substance, the molecules, arrange themselves in an orderly and repetitive pattern. Molecules are too small for us to see moving around and arranging themselves, but you can get a rough idea of what this would look like by taking a small shallow tray and filling it with marbles, ball bearings, or other spheres. As you add more spheres, the bottom of the tray becomes covered, then the spheres must form layers on top of one another, and a structure or pattern emerges.

So how do the molecules of a substance get together to form a crystal? First there have to be enough molecules in one area that they have a high chance of bumping into one another. This happens when a solution, which is made up of a liquid and the compound that will be crystallized, is saturated. In the rock candy, the liquid is water and the compound is sugar. A solution is saturated when the liquid holds as much of the compound dissolved in it as possible. For example, when making rock candy, you dissolve as much sugar as possible in water to make a saturated solution. In a saturated solution, the molecules bump into one another frequently because there are so many of them. Occasionally when they bump into each other, the molecules end up sticking together; this is the beginning of the crystallization process and is called *nucleation*. Once several molecules are already stuck together, they actively attract other molecules to join them. This slow process is how the crystal "grows."

Method of preparing rock sugar:

White sugar-	2-3 cups
Water-	1 cup
Food colouring-	as required
Flavouring (optional)	
Jars/champagne flutes	
Pegs	
Skewers	
Large saucepan	

Method:

- Add your water to the saucepan and bring to the boil.
- Start adding the sugar a 1/2 cup at a time, until it no longer dissolves (making a saturated sugar solution). The more sugar you add, the longer it will take to dissolve. Be patient and try to get as much to dissolve as possible.
- Add a few drops of your flavouring.
- Take your mixture off the heat and allow to cool – approximately 15 minutes.
- While you are waiting, take a plate and add some sugar to it. Get your skewers and dip them into the liquid sugar mixture then dip it into the plain sugar to coat the stick. This will give your Rock sugar something to ‘grow on’ (also called seed). Let them dry for a few minutes.

- Set out your champagne flutes/jars and add a few drops of food colouring to the bottom of each.
- Carefully add the sugary solution to each glass/jar and give it a little stir.
- Take your sugary skewers and place a peg at the top of each and place into the glasses (make sure they do not touch the bottom or sides as this will hinder the 'growing processes.
- Carefully place the flute/ jar in a cool place, away from harsh lights, where it can sit undisturbed. Cover the top loosely with plastic wrap or paper towel.
- Now it's time to be patient. The crystals will start growing in 2 – 3 days, but depending on how big you want your Rock sugar sticks will depend on how long you will need to keep them in the glasses (may be 1 to 3 weeks).
- When you are ready to remove them, remove the skewer and hang it upside down until the excess liquid drips off and it dries. You can pour out the liquid from the glass and use the glass to hang the skewer and catch the excess liquid.

4.8 ISOMALT

Isomalt is a sugar substitute, a type of sugar alcohol, used primarily for its sugar-like physical properties. It is the popular name for Isomaltitol which is a sugar substitute made from beet sugar. Over the past twenty years chefs, sugar artists and confectioners have found that isomalt has many advantages over sugar especially when making showpieces, cake decorations, dessert garnishes and candy. Unlike conventional sugar, isomalt is much more resistant to humidity and crystallization so decorative elements made with it have a longer shelf life and structural integrity. It can also be cooked to higher temperatures than granulated sugar and will stay clear without browning at temperatures as high as 340°F (171°C). Because of its superior workability, isomalt is used almost exclusively in televised food competitions and culinary art salons where professionals create dramatic showpieces and decorative cake ornaments to the delight of audiences worldwide.

Because of the high cooking temperatures needed to cook isomalt, long insulated gloves designed for sugar work are essential. Impurities in the water used to prepare isomalt syrup can discolor it. Therefore, distilled water is the preferred medium to use when working with this product. To prevent uneven cooking when preparing isomalt syrup, pastry chefs often use induction burners, which heat only from the bottom. Like all sugar alcohols, isomalt has a laxative effect, so it is not recommend for eating in any quantity. In fact, most pulled, blown and poured sugar is not eaten but used solely for decoration.

Rules for working with Iso-malt:

1. Use distilled water. The minerals in tap water can turn brown when exposed to elevated temperatures but because there is so little of these minerals it is perceived as a yellowing effect.

2. Add only enough water to make the Isomalt look like wet sand. Approximately the ratio of water and isomalt should be 1:3 by weight.
3. Use stainless steel pots and stainless steel utensils for stirring. Do not use a wooden spoon. Foreign materials in the wood leach out into the Isomalt which can turn the mixture yellow.
4. Do not cook less than 450 gm of Isomalt at a time. Cooking small amounts of Isomalt creates too shallow a depth of material which can cause hot spots in your mixture and lead to premature yellowing.
5. Cook Isomalt on an appropriately sized burner. Electric burner should be slightly smaller than bottom of pot. When cooking with gas, flame should not creep up the side of the pot and remain on the bottom of the pot only. These precautions prevent overheating of the sides of the cooking pot which can cause premature yellowing. Using an induction range is the best way to cook Isomalt because it delivers heat only to the bottom of the pot.
6. Do not use a natural bristle brush to wash down the sides of the pot once Isomalt comes to a boil. Use a nylon pastry brush. There are a host of chemicals and conditioning agents in the natural bristles that can turn your Isomalt yellow.
7. Test your candy thermometer. Many of them read inaccurately. Test by bringing water to a boil and inserting thermometer and observe the temperature is shows. It should read 100^0C (212 ^{0}F) at sea level.
8. Cook Isomalt to 170^0C (338^0F). Take off heat at about 167^0C (333^0F) and place bottom of pot in water to stop the cooking process. Allow the pot to stay in water only until the hissing stops. About 5 seconds.
9. Place Isomalt in a 135-148^0C (275 - 300^0F) oven and let rest for 15 minutes. You will have no bubbles and pure, clear liquid sugar to pour all day.
10. Allow unused Isomalt to cool and store in a microwave safe container with a tight fitting lid or multiple layers of plastic wrap. Place a silica gel packet on top of Isomalt before closing container. You can store cooked Isomalt in this manner for months and perhaps as long as a year.
11. Never store cooked or uncooked Isomalt in a refrigerator or freezer. The high humidity will ruin and even dissolve finished sugar pieces.

How to cook Isomalt

1. Add distilled water to Isomalt and stir until it is evenly distributed and resembles wet sand.
2. Place pot of Isomalt on a burner set at high (see step 5 above) and stir to help the crystalline Isomalt melt and turn into a liquid.
3. When Isomalt mixture comes to a boil, wash down sides of pot with a damp pastry brush and then insert thermometer.
4. Target cooking temperature is 170^0C (338^0F). Remove pot from heat when thermometer reads 167^0C (333^0F), allowing five degrees to compensate for the continuing rise in temperature as a result of carry over heat within the mixture itself.

5. Place bottom of pot in water just until the hissing sounds stops and return pot to burner set in the off position or rest pot on a folded side towel.
6. Add color when Isomalt cools to about 154^0C (310^0F). Higher temperatures can denature the color and make it less bright and vivid. Use paste, powdered or gel food coloring. If using a paste or gel color, apply color on top of Isomalt and stir the food coloring shallowly so it remains on top of the Isomalt. It will bubble profusely, which indicates that the moisture in the food color is evaporating.
7. Keep stirring color on top of Isomalt until the bubbling stops and all moisture has evaporated. This prevents water from being reintroduced into the Isomalt. Once the moisture has evaporated, it is safe to stir the food coloring deeply and incorporate it throughout the entire Isomalt mixture. Stir until an even color is achieved.

How to hold Isomalt

1. Place Isomalt in a 135 - 148^0C (275 – 300^0F) oven and let rest for a minimum of 15 minutes. Allowing Isomalt to rest in a hot oven enables the air to rise to the surface of your mixture and will result in a de-aired mixture that is absolutely free of bubbles.
2. Isomalt can be held in an oven up to three hours before it starts to slightly turn from clear to an ever increasing yellow shade. The lower the holding temperature, the longer it can be held without discoloration.
3. Once Isomalt starts to discolor, use it for your colored Isomalt creations.

How to store raw (uncooked) Isomalt: Isomalt, in its uncooked form, will absorb moisture from the air and should be kept in a tightly sealed container or a thick, tightly closed bag. Uncooked Isomalt has a shelf life of two years or more if stored correctly. The addition of food safe silica gel packets prolongs the shelf life of Isomalt by removing any moisture that may find its way into the storage container or bag.

How to store cooked Isomalt: Cooked Isomalt, if exposed to humid conditions, will absorb moisture from the air and become sticky. The sticky surface will eventually dry out as humidity conditions change and this sticky layer will re-solidify. Once this happens, the Isomalt will first lose its shine, then become cloudy and eventually re-crystallize – which makes it unusable. The key to storing cooked Isomalt is to protect it from humidity. One of the most effective methods to achieve this is to use Food Safe Silica Gel Packets. Silica Gel is a powerful de-humidifying chemical that absorbs moisture out of the air. Placing the correct amount of silica gel packets in an air tight container with your cooked Isomalt is the very best way to keep your sugar projects bright and shiny for months.

How to re-melt Isomalt: The best way to re-melt cooked Isomalt is with a microwave oven. Place container of Isomalt in the center of oven cavity and microwave for five - 10 minute intervals on the medium setting. Do not melt Isomalt

on a high setting. Pockets of liquefied Isomalt overheat and will turn yellow. Periodically stir the Isomalt to distribute heat evenly throughout the container. When you see bubbles rising in the Isomalt mixture from two thirds of the way down to the top, you are close to 148^0C (300^0F). Remove, stir and place in an oven set at 135-148^0C (275 – 300^0F).

CHECK YOUR PROGRESS-II

1. Classify sugar.

2. What is spun sugar?

3. What is hard crack?

4.9 SUMMARY

- Icings or frostings mainly consist of butter and sugar creamed together till fluffy consistency and is used to decorate cakes and pastries.
- Icings work like galze and they also impart shine, richness and flavour to the cake.
- Fondant- a thick paste made of sugar and water and often flavoured or coloured, used in the making of sweets and the icing and decoration of cakes.
- Fudge icing- Milk or cream, cocoa powder, sugar, and other flavorings are brought to a boil and cooked until they thicken to make this icing.
- Fudge icing- Milk or cream, cocoa powder, sugar, and other flavorings are brought to a boil and cooked until they thicken to make this icing.
- Marzipan- This mixture of almond paste, sugar, and flavorings is an elegant addition to cakes. Thick and pliable, it can be molded into cake decorations, rolled and used like fondant, or used as a cake layer or filling.
- Pastillage- A thick sugar paste, similar to gum paste that can be molded into different shapes and forms. When dried, it is hard and brittle. Unlike gum paste, pastillage dries much quicker and stronger.
- Royal icing- Often confused with fondant, royal icing is a white meringue-like mixture made from egg whites, acetic acid and icing sugar and has a consistency that can be piped, but it dries hard. Becoming rock-hard once set, it is ideal for attaching decorations to cakes and is a popular icing for piping.
- Nougat is of different varieties, like: Italian Nougat, French Nougat, Spanish Nougat, and Iranian (Persian) Nougat.
- Golden Syrups- It is thick amber coloured liquid obtained from sugar during the refining process. It is treated with acid to cut down on the sharp taste.
- Isomalt- It is a natural sugar substitute and in reality it is sugar alcohol. It is available in crystalline forms and is used for preparing sugar garnishes as it is more stable than sugar and does not caramelize thereby giving an appearance of thin glass sheets.
- When a sucrose solution is heated with an acid, some of the sucrose breaks down into equal parts of two simple sugars, dextrose and levulose. A mixture of equal parts of dextrose and levulose is called invert sugar.
- Pulled sugar is sugar which has been heated and specially handled so that it turns into a glossy and smooth mass. It can be used to make a variety of shapes and ornaments in sugar, such as flowers, animals, decorative pieces etc. Pulled sugar is sugar which has been heated and specially handled so that it turns into a glossy and smooth mass. It can be used to make a variety of shapes and ornaments in sugar, such as flowers, animals, decorative pieces etc.
- Blown sugar- is sugar blowing resembles glass blowing and allows you to create beautiful spheres and globes that you can further shape into different designs.
- Pressed sugar is granulated sugar is mixed with a minimal amount of water, and is put under pressure. It hardens into a solid piece.

4.10 GLOSSARY

Bloom (**chocolate**): The gray cast, spots, or streaks that appear on poorly handled chocolate bloom and Sugar bloom.

Buttercream: An icing made of butter and/or shortening blended with confectioners' sugar or sugar syrup and, sometimes, other ingredients.

Caramelize: To brown sugar by exposing it to heat. Caramelization produces flavors and colors similar to those produced in the Maillard reaction, but it is a distinctly different reaction.

Coating chocolate: "Chocolate" in which most or all of the cocoa butter has been replaced with another type of fat. Coating chocolate generally requires little or no tempering.

Cocoa butter: The fat found in cocoa beans.

Conching: A step in the manufacturing of chocolate, the purpose of which is to create a fine, smooth texture. A step in the manufacturing of chocolate, the purpose of which is to create a fine, smooth texture.

Conversion: The breakdown of starch, through hydrolysis, into various saccharides during the production of glucose syrup.

Couverture: The European designation for chocolate containing at least 32 percent cocoa butter. The term has no legal standing in the United States.

Creaming Method: A mixing method that begins with the blending of fat and sugar; used for cakes, cookies, and similar items.

Crystallize: To transform from the amorphous state to the crystalline state.

Dark Chocolate: Sweetened chocolate that consists of chocolate liquor and sugar.

Dutch processing: A method by which cacao is treated with an alkali; may be carried out at various stages of manufacturing.

Fondant: Sugar, water, and glucose syrup that is supersaturated and agitated to induce crystallization.

Fudge: A crystalline confection similar to fondant, but containing fats, dairy products, and flavoring.

Ganache: A mixture of chocolate with a water containing ingredient, most commonly cream. Cream-based ganache is a fat-in-water emulsion.

Gelatin: A water-soluble protein extracted from animal tissue, used as a jelling agent.

Gelatinization: The swelling of starches when heated in the presence of moisture, due to the absorption of water.

Glucose: Another name for dextrose. The name glucose syrup is often shortened to glucose, creating the potential for confusion.

Hygroscopic: The tendency to pick up water from the surrounding atmosphere. Amorphous sugar is hygroscopic.

Inversion: The hydrolysis of sucrose into dextrose and fructose. Inversion is accomplished mainly by acids or the enzyme invertase, but other factors, such as minerals and heat, can influence inversion.

Invert Sugar: A mixture of two simple sugars, dextrose and levulose, resulting from the breakdown of sucrose.

Lactose: The sugar found in dairy products. Lactose is very low in sweetness and readily participates in Maillard browning.

Maillard reaction: A browning reaction involving amino acids and reducing sugars that results in colors and flavors that greatly resemble caramelization.

Marzipan: A paste or confection made of almonds and sugar and often used for decorative work.

Pastillage: A sugar paste, used for decorative work that becomes very hard when dry.

Ph: Measurement of the relative acidity/alkalinity of a substance. A measurement of pH 7 is neutral; a pH lower than 7 is acidic; and a pH higher than 7 is alkaline.

Praliné: From the French for "sugar coated." A European term denoting a confectionery center dipped in chocolate. A praliné is usually a finished chocolate-coated one-bite confection.

Seed: To introduce crystals in order to induce crystallization. When tempering chocolate, the confectioner seeds it with Form-V cocoa butter crystals; fudge is often seeded with a bit of fondant.

Spun Sugar: Boiled sugar made into long, thin threads by dipping wires into the sugar syrup and waving them so that the sugar falls off in fine streams.

Sucrose: Common sugar obtained from sugar cane or sugar beets. Sucrose is a disaccharide consisting of one molecule of fructose bonded to one molecule of dextrose.

Swiss Meringue: Egg whites and sugar warmed, usually over hot water, and then whipped to a foam.

Temper: To pre-crystallize chocolate; to introduce enough stable cocoa butter crystals to cause the rapid crystallization of the rest of the cocoa butter.

Zest: The colored outer portion of the peel of citrus fruits.

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4.12 TERMINAL QUESTIONS

Short Answer Type Questions:

1. Discuss fondant
2. What are the functions of Icing?
3. Write the recipe of a Basic Nougat.
4. What are the characteristics of pastillages?
5. What do you mean by Inversion of sugar?
6. What precautions can be taken while handling sugar?
7. Write a note of the different types of equipments used in sugar works.
8. What is caramel?
9. What is the difference between Butterscotch Toffee and Caramel?
10. Write notes on:
    a. French Nougat
    b. Royal Icing
    c. Italian Nougat.
    d. Marzipan
    e. chocolate paste.
    f. Ganache
    g. Foam icing
    h. Swiss meringue
    i. **Fudge buttercream**
    j. **Isomalt**

Long Answer Type Questions:

1. Write in detail about 10 types of Icings.
2. Discuss the various forms of Nougat available for consumption.
3. Discuss the different forms of sugar.
4. Discuss the guidelines that are followed while working with sugar.
5. Discuss elaborately the different kinds of sugar work.
6. Elucidate the different cooking stages of sugar.
7. Write in detail what are the uses of caramel?
8. Discuss the rules of working with marzipan
9. Discuss the usage of Isomalt.
10. What is Glaze? What are its uses?

UNIT: 05
COOKIES

STRUCTURE

5.1 INTRODUCTION

The name biscuit comes from the French word ***bis,*** which means twice and ***cuit*** which means baked. It is a sweet or savory dry flat cake with a high calorie content (420-510 / 100 gm) The raw materials used for biscuit manufacture is flour, sweeteners, shortening, milk, leavening agents and other miscellaneous products.

The word cookie derives from a Dutch word that means "small cake." or sweet biscuits. The Dutch have provided bakers and confectioners with the word ***koekje*** which means small cake. Using this as the contemporary definition, the term cookie can include anything small, flat pastries usually eaten alone (although not singularly) as a snack or with coffee at the end of a meal. The Americans began to use the word cookie, whereas the English continue to use the word biscuit for the same product. There are more varieties of cookies than any other baked product because there are so many different shapes, sizes, textures and flavors that are possible.

Difference between cookies and biscuits: Both, cookies and biscuits mean the same, while the difference lies in the places where they are known differently, i.e. the word 'cookies' is often referred to biscuits and cookies in the American countries, whereas the term, 'biscuits' is generally used is in the British countries.

Cookies are soft sweet biscuits, which are made with lavishing nuts, oats, resins and chocolate chips. These ingredients add a fabulous flavor in the taste of cookies. There are varieties of cookies, available in various parts of the world. Generally,

cookies are favorites among the kids and school children. The whopping amounts of sugar in American cookies are responsible both for the crispiness and the chewiness. Biscuits are hard sweet baked bread, which are especially full of sugar and butter. Biscuits are also prepared same as that of the cookies, only differs in their content, i.e. biscuits are full of the basic ingredients, which are butter and sugar. There is not much stuffing obtained in biscuits as observed in the cookies. They are available in flavors and types.

5.2 OBJECTIVE

After going through this unit, you will be able to:

- Explain the different types of cookies.
- List the different ingredients used for making cookies.
- Learn the methods of preparation of cookies.
- Learn the making of biscuits.
- Learn the different types of frozen desserts and their characteristics
- Understand ice cream manufacturing process.

5.3 CLASIFICATION OF COOKIES

The mixing methods in the preparation of cookie and biscuits simple, it is better to classify cookies and biscuits according to their makeup. Cookies are broadly classified according to how they are formed, including at least these categories:

Class of cookie	Description	Examples
Drop	Made from soft dough and dropped by spoonfuls onto baking sheets. During baking, the mounds of dough spread and flatten.	Chocolate chip cookies, oatmeal cookies, macaroons
Rolled	Made from a stiff dough that is rolled out using a rolling pin and cut into shapes with a cookie cutter	Gingerbread men, some sugar cookies, any cookie made with a cookie cutter
Foam cookies	Made with large percentage of egg whites foam in which sugar is added. Later on other ingredients are added.	Macaroons and meringue

Molded, hand shaped	A stiff dough is rolled between the hands to form a ball and/or shaped using a mold or other shape or tool (fork, cookie stamp, bottom of a glass)	Peanut butter cookies, snicker doodles, almond crescents, some biscotti cookies
Pressed	Stiff dough is forced through a cookie press into decorative shapes.	Spritz, Spritzgebäck
Refrigerator or icebox	Made from stiff dough that is rolled into a log, chilled, sliced and baked.	Pinwheels, shortbread, some sugar cookies, some biscotti cookies
No Bake	Mixture may or may not be cooked on a range but these cookies are not baked in an oven.	Chocolate No Bake Cookies, Rice Krispies Treats, rum balls, oatmeal clusters
Filled	Made from rolled cookie dough filled with a fruit or confectionery filling before baking.	Hamantash
Bar	Dough or batter is baked in a cake or sheet pan and cut into bar shapes after cooling. Many varieties of drop cookie dough can be baked this way.	Brownies, chocolate chip bar cookies
Sandwich	These are rolled or pressed cookies that are assembled as a sandwich with a sweet filling. Fillings include marshmallow, jam, and icing.	The Oreo cookie, made of two chocolate cookies with a vanilla icing filling
Fried Cookies	These are fried dough, often dusted with powdered sugar. Fried dough is becoming increasingly popular, with chocolate chip cookie dough, oatmeal cookie dough and others all headed to the fryer	Jewish/Polish krusczyki and the Italian zeppole.

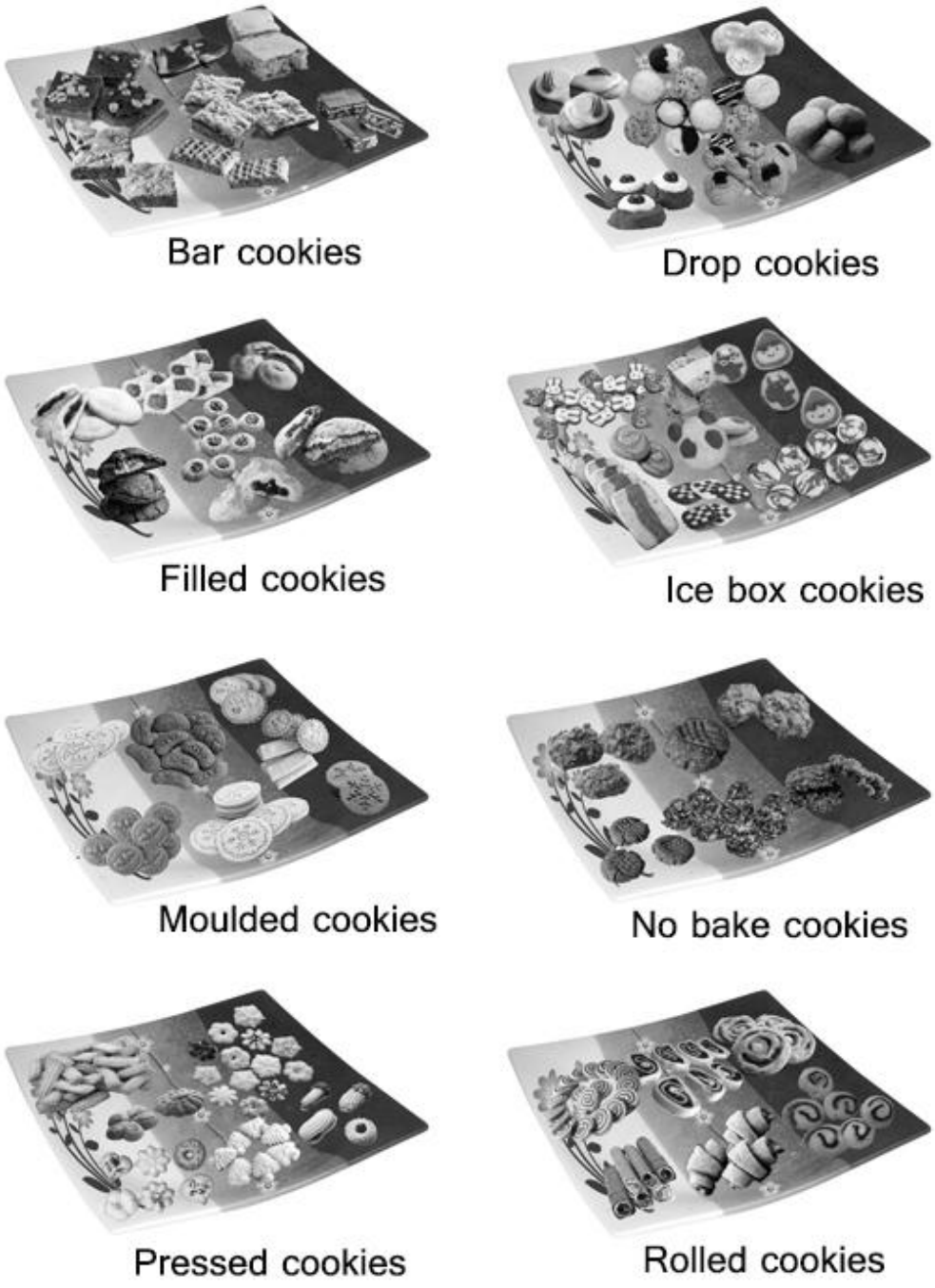

Fig.5A Classification of Cookies

5.4 INGREDIENTS

Cookies contain many of the same ingredients as cakes except that they have a lower proportion of liquid with a higher proportion of sugar and fat to flour.
The three main ingredients present in nearly every type of cookie are wheat flour, sugar, and fat, but you'll see other ingredients such as leaveners, eggs, liquids, such as milk, perhaps some chocolate, coconut, spices or nuts. As in all other areas of baking, using fresh, high-quality ingredients is critical to success.

1. **Flour:** The type of flour determines the structure of the cookie, and is the main binding agent. Each type of flour has an individual protein profile suitable almost exclusively for specific uses. All-purpose flour is generally used in most cookie recipes, but other flour types are found, as well. The addition or substitutions of other flours, such as bread or cake flour are sometimes added to get different results in a recipe. For example, bread flour can be used instead of all-purpose flour; it can absorb much more liquid because of its higher protein content, more moisture will stay in the cookie and it will be chewier. Replacing a few tablespoons of all-purpose flour with cake flour will give you a tenderer cookie. However, each cookie recipe is different and a successful outcome cannot be determined.

   Cake flour is made with soft wheat, so you get less protein (7.5%) in your flour, less gluten in the mixture, and a very tender, potentially puffy, cookie. With bread flour, made from hard wheat, you have an increase in protein (to 12%), an increase in gluten and, therefore, a chewy cookie. To lesser the strength, corn starch can be added.

2. **Sweeteners:** These are some form of sugar is used in all cookie recipes. It is a tenderizing agent, adds sweetness and affects the spread of the cookie. Apart from this it also imparts volume to the product. It gives a typical sweet taste when caramelizes and so increases the colour and flavour.
   a. Granulated sugar or brown sugar is used frequently in cookie making, but honey, molasses, corn syrup and other sugars can be used, sometimes in combinations.
   b. Honey and corn syrup provides moisture and chewing quality, apart from softness and crispiness.
   c. Molasses if added should be mixed and adjusted with baking soda to neutralize the effect of acidity.
   d. Brown sugar if added gives good colour and taste to cookies and biscuits.

3. **Eggs:** Use only fresh eggs and they need not be at room temperature. If the recipe is simply written with the word "eggs", use large which have a volume of about 1/4 cup (50 grams) each. They are used as both tenderizing, toughening and flavouring agents for cookies. Egg yolk contains large amount of fat, known Lecithin, which tenderize the cookies. The liquid from

the egg forms steam and gets trapped in the cookie, puffing it up, giving the cookie structure. In addition, they emulsify the dough, bringing the water and fat phases together in a recipe for a creamier, smoother texture. On the other hand, egg whites have a drying effect and but also contribute to the structure or shape of a cookie. Whole egg powder can also be used. Always fresh eggs are to be used.

4. **Liquids:** Liquids are essential to cookie recipes, but they typically have very little. When flour is moistened and stirred, gluten is formed from the proteins present. Gluten strands form the structure of the cookie, but they also have a toughening effect. Fats, such as stick butter and shortening, shorten the strands, and give you a tenderer cookie. If you add too much liquid, like milk or water, your cookie dough is going to be like a very thick pancake batter which won't bake like cookie dough.

    a. **Dairy :** Unless you are making low-fat or fat-reduced recipes, choose full-fat dairy products. Always use solid cream cheese and not the whipped variety.

    b. **Cream-** Whipping cream (30% to 36% butterfat) and heavy cream (36% to 40% butterfat) are the skimmed creams that rise to the top of milk. Both can be whipped and mixed into batters.

    c. **Half-and-Half-** As the name suggests, this is half cream and half milk. It is used to add richness to batters. In a pinch, it can be made by mixing equal parts milk and cream.

    d. **Milk-** Fresh whole or reduced-fat (2%) cow's milk works best for cookies, with no noticeable difference in results. Originally, buttermilk was the liquid drained from churned butter. Evaporated milk is canned, concentrated milk from which 60% of the water has been removed through heating and evaporation. It can be used as is in recipes or reconstituted with water as a substitute for fresh milk. Sweetened condensed milk is a shelf-stable canned cow's milk-and-sugar blend that has been reduced to a thick, syrupy-sweet mixture and is often used in desserts.

    e. **Water-** It is used in small quantities, only needed to moisturize the dough to attain desired structure. Water helps in attaining the right consistency of the dough and control the temperature. Cold water should always be used so that the fat do not melt during mixing and processing. Water dissolves baking soda so that carbon dioxide can be formed. It also dissolves other ingredients also.

5. **Shortenings:** When they are beaten, air cells are incorporated and helps in giving tenderness and softness to cookies.

a. **Oils-** like vegetable, canola, and corn oil are good bets for baking and have a high smoke point and neutral flavor. Avocado and coconut oils also have high smoke points, but they impart a distinctive flavor and major hit to your wallet. Other options to try include peanut oil, sunflower oil, and safflower oil.

b. **Butter**- Butter contains 80% milk-fat and comes unsalted, salted, and whipped. Avoid whipped butter which has too much air incorporated to get an accurate measure for baking.

c. **Vegetable Fat**- Solid shortening is 100% vegetable fat with no water content. It gives tenderness to baked goods but lacks butter-rich flavor.

d. **Margarine and Lard**- They are also used and provide definite flavour, texture and taste to cookies.

6. **Leavening Agents**: Baking soda, baking powder and Ammonium bicarbonate are the classic leaveners in cookie recipes and they are mixed with dry ingredients. Used together and separately, these components affect the puffiness to some degree (baking powder), but they also affect the color of the cookie (baking soda). Mostly baking powder is used as it is a blend of baking soda and tartaric acid. It is a double-acting leavening agent that first reacts when combined with wet ingredients and then a second time with the heat of the oven. Ammonium bicarbonate decomposes completely when heated, producing carbon dioxide, ammonia and water. The reaction is rapid at around 60°C and therefore the expansion of the dough takes place during the initial stages of baking. Other leaveners that are widely used include: Yeast (cream crackers), Acid calcium phosphate, Sodium Acid Pyrophosphate.

7. **Salt:** Sodium chloride, used as a taste and flavour enhancer and also to control the rate and extent of fermentation. Only very small amount to be used and it becomes much lesser if salted butter is used.

8. **Flavorings:** Cocoa, nuts, extracts, and other flavorings, all contribute to the character, colour and taste of a cookie. It is recommended using only pure vanilla extract, never imitation, as the taste of imitation vanilla is immediately detected, and is exaggerated if the dough or cookies are frozen. A touch of almond extract in a plain sugar-cookie recipe (add about 1/2 teaspoon at the same time you add the eggs to the dough), or a good dash of cardamom in spicy applesauce bars (add 1/2 teaspoon cardamom along with the other spices) makes a subtle but significant difference. Spice powders (Jeera, Methi, ajwain, pepper) can also be used. Cocoa powder or artificial butter flavour is also be used, but in small quantity.

9. **Colours:** Only permitted colours can be used for making cookies. Golden brown colour is mostly favoured.

10. **Others:** It includes:

    a. **Cornstarch-** This fine powdery starch is made from finely ground corn kernels and is used primarily as a thickening agent. It is often added to flour to lighten its texture and it lasts indefinitely sealed in a cool, dry place.

    b. **Oatmeal-** means uncooked rolled oats, either old-fashioned or quick, but not instant. Instant will get too mushy in the recipe.

    c. **Coconut-** means the shredded or flaked and sweetened kind. If you have fresh coconut, grate it and soak it in milk, refrigerated, for about 6 hours, then drain. This will give it about the same moisture content as the packaged kind.

    d. **Fruits-** Dried fruits are more concentrated than fresh ones, and has very less moisture. Hence does not affect the moisture content in the cookies. Raisins, currents, pears, figs, apples, apricot are widely favoured. Candies and crystallized fruits can also be used as they also do not have much moisture. Prior to using them, they have to soaked in hot water for 15 or 20 minutes, and then drained.

    e. **Nuts and seeds** can mean walnuts, pecans, and almonds, water melon seed plus others. They can become rancid quickly (in just a week or two, depending on conditions) at room temperature, and should be stored in the refrigerator or freezer. When a recipe calls for chopped nuts, it usually means walnuts or pecans. Almonds, with their delicate flavor, and peanuts, which are more assertive, should be used only when specified.

    f. **Grated orange and lemon rind** (known as "zest") - refers to the outer colored portion of the rind.

    g. **Chocolate-** may be specified as unsweetened, sweetened or bittersweet chocolate, semi-sweet (such as the chocolate chips commonly used in Toll House cookies), or sweet. Cocoa (the unsweetened powder, not a mix) is also called for in some recipes. Be sure to use the type of chocolate specified, as substitutions may not be successful. Chocolate burns easily, so the best way to melt it is in a double boiler over hot water, in a microwave oven or in an oven as it preheats for the recipe. Experienced cooks sometimes place chocolate

in a heavy saucepan over direct low heat, but that method carries the risk of scorching.

h. **Cream of Tartar**- This refined byproduct of wine making is used to stabilize whipped egg whites and also acts as a leavening agent. It lasts indefinitely.

i. **Spices-** Whole spices last twice as long as ground, so buy spices whole and grind them as needed. Sealed in a cool, dark place, whole spices last 2 to 3 years, while ground spices begin to lose their potency within a year or two.

j. **Syrups-** Corn syrup, maple syrup, honey, molasses, or sorghum all impart sweetness to recipes. Store at room temperature, and they will last forever.

k. **Sodium Metabisulphite** - A reducing agent for the modification of the strength of the gluten in doughs. It causes the gluten to become more extensible and less elastic and so reduces shrinkage of the dough pieces during baking.

l. **Proteolytic Enzyme**- Proteinases break down and modify the gluten in doughs, giving softer, less elastic dough.

m. **Lecithin-** Lecithin is an emulsifier produced from soya beans and available in liquid or powder form. It may be added to the fat or directly into the dough mix.

How ingredients impact a cookie recipe: Understanding cookie chemistry comes in handy -- you can tinker and fool around to your heart's content to get cookies exactly the way you want them. Fiddling with one or two ingredients does change a recipe, but you may not like the results. It is found that in 99.99% of the time, for good results, others have to be changed, as well and it takes lots of trial and error.

1. High-protein flour: All-purpose flour. Makes cookies darker in color and flatter.
2. Low-protein flour: Cake flour. Making cookies pale, soft and puffy.
3. Fat with sharp melting point, like butter: Makes cookies spread.
4. Fat that maintains same consistency over a wide temperature range, such as solid vegetable shortening: Makes cookies that do not spread as much.
5. Corn syrup (or molasses): Makes cookies browner.
6. Brown sugar and honey: Makes cookies that soften the longer you keep them.
7. You want the cookies to spread more: use all butter or add 1 to 2 tablespoons liquid (water, milk or cream -- not egg) or use bleached all-purpose (but not one that is chlorinated) or add 1 to 2 tablespoons sugar.

8. You want the cookies to spread less: use solid vegetable shortening or substitute some solid vegetable shortening for an equal amount of butter or use cake flour or cut the sugar by a few tablespoons or switch from baking soda to baking powder or chill the dough before baking it.
9. You want the cookies to have a chewy quality: melt the butter instead of simply using it at room temperature.
10. You want the cookies to have a cakey quality: use the butter at room temperature or use equal parts butter and solid vegetable shortening.
11. You want the cookies to be tenderer: use cake flour or add a few tablespoons of sugar or add a few tablespoons of fat.
12. The cookies are too tender and you want them to be more substantial: substitute a few tablespoons of bread flour for an equal amount of all-purpose flour or cut the sugar by a few tablespoons or cut the fat by a few tablespoons
13. You want the cookies to brown better: substitute 1 to 2 tablespoons of light corn syrup for an equal amount of sugar or substitute a few tablespoons of unbleached or bread flour for equal amounts of the all-purpose flour.
14. The cookies are browning too much, despite the correct oven temperature: substitute water for an equal amount of liquid ingredients or use cake flour or bleached all-purpose flour.

5.4.1 TOOLS AND EQUIPMENTS REQUIRED FOR MAKING COOKIES AND BISCUITS

The Chief equipments and tools that are required for making cookies and biscuits are given below. The descriptions of these have been already discussed in chapter 1.

- Oven-
- Baking pan
- Spatula
- Cookie scoops
- Rolling pins
- Cookie cutter
- Cooling rack
- Gloves
- Dough kneader or Planetary mixture
- Mixing bowl
- Measuring tools
- Pastry brush
- Kitchen towel or plastic wrap

5.5 MIXING METHODS

Cookie mixing methods are much like cake mixing methods. The major difference is that less liquid is usually incorporated, so mixing is somewhat easier. Less liquid means that gluten is less developed by the mixing. Also, it is a little easier to get a smooth, uniform mix. There are four basic cookie mixing methods:

1. One-stage
2. Creaming
3. Sanding
4. Sponge

These methods are subject to many variations due to differences in formulas. The general procedures are as follows, but always being sure to follow the exact instructions with each formula. Most cookies are made from rich dough that is mixed by the creaming method used for quick breads and cake batters. However, because most cookie dough contains less liquid than these batters, the liquid and flour need not be added alternately.

1. **The one-stage method-** is the counterpart of the one-stage cake-mixing method. As just noted, cookie doughs contain less liquid than cake batters do, so blending the ingredients into uniform dough is easier. Because all the ingredients are mixed at once, the baker has less control over mixing with this method than with other methods. Therefore, the one-stage method is not frequently used. When over-mixing is not a great problem, as with some chewy cookies, it can be used.

2. **Creaming Method-** The creaming method for cookies is nearly identical to the creaming method for cakes. Because cookies require less liquid than cakes, it is not usually necessary to add the liquid alternately with the flour. It can be added all at once.

3. **Sanding Method**- The sanding, or sablage, method is used for rich tart pastries and pâté brisée. There are two basic steps in this method: (1) mixing the dry ingredients with fat until the mixture resembles sand or cornmeal, and (2) mixing in the moist ingredients. In the case of cookies, the sanding method is used primarily with formulas that contain only egg and no other moist ingredient.

4. **Sponge Method**- The sponge method for cookies is similar to the egg-foam methods for cakes. The procedure varies considerably, however, depending on the ingredients. Batches should be kept small because the batter is delicate.

5.6 TYPES AND PROCESS

It is important to note that while making cookies and obtaining good results, each steps has to be followed very carefully. Collection of raw ingredients- the raw materials are collected and weighed according to the formula or recipe. Keep in

mind to take only fresh high quality ingredients. All the mis-en place must be done beforehand to avoid any confusion or problem. Trays to be greased, fruits to be cut, flour sieved twice, oven to be heated etc.

The ingredients are mixed to a homogeneous mixture to for dough. Planetary mixture or dough kneader can be used. Over mixing to be avoided at this might ruin the dough and avoid gluten formation. Under mixing will result in improper blending of ingredients and the dough will break while rolling. Temperature during mixing should be cool to prevent fat being getting melted and oozing out of the dough.
The general process adopted is:
Sieve flour with the leavening twice, then cream the sugar, shortening, salt and flavour, and then add egg, moisture.

Make-up methods:
Because their mixing is simple, it is better to classify cookies and biscuits according to their makeup.

1. **Bagged**: Also, called pressed cookies are made from soft dough. The dough must be soft enough to be forced through a pastry (piping) bag, but stiff enough to hold its shape. For stiffer doughs, you may want to double-bag the dough (for example, put a disposable bag inside a cloth bag) for extra strength. Fit a pastry bag with a tip of the desired size and shape. Fill the bag with the cookie dough. Press out cookies of the desired shape and size directly onto prepared cookie sheets. Example: Butter Buttons.

2. **Dropped**: these cookies are made from soft dough. In this method, the batter is deposited on a sheet for baking with a spoon or a scoop. Usually, using a pastry bag is faster, and gives better control over the shape and size of the cookies. When the dough contains pieces of nuts, dried fruits or chocolate bits or chips, this method is used. Also, when you want the cookie to have a rough homemade look. Drop the cookies onto the prepared baking sheets. Allow enough space between cookies for spreading. Rich cookies spread by themselves, but if the formula requires it, flatten the mounds of dough slightly with a weight dipped in sugar. Example: peanut macaroons.

3. **Rolled:** Cookies rolled and cut from stiff dough are not made as often in bakeshops and food service operations as they are made in homes because they require excessive labor. Cookies are rolled and then cut with cutters. Bakeshops and 5 star operations do not make these types of cookies because of the labour involved. Also, after cutting the scraps, these are re rolled, making tough and inferior cookies. The only advantage is that you can make different shapes and sizes and according to the occasion. Example: Tricolor biscuits.

4. **Moulded**: In this method, each piece of dough is moulded into the desired shape. This is the accurate of dividing cookie dough into equal portions. For some traditional cookies, special molds are used to flatten the dough and, at the same time, stamp a design onto the cookie. The pieces may

also be shaped by hand into crescents, fingers, or other shapes. Example: Shrewsbury Biscuits (from Kayani, Pune).

5. **Icebox:** Also called refrigerated cookies. This method is ideal for operations that wish to have freshly baked cookies on hand at all times. Rolls of dough are made in advance and kept in the fridge. They are then cut and baked as needed. This method is also used to make multi colored cookies in various designs. Example: chequered and pinwheel.

6. **Bar**: Here the dough is baked in long narrow strips which are then cut cross wise into bars. It should not be confused with sheet cookies (see next procedure), which are also called bars by many cooks. Example: Chocolate Chip Cookie Bars, Glazed Cappuccino Bars, Peanut Butter Bars

7. **Sheet**: Sheet cookies vary so much that it is nearly impossible to give a single procedure for all of them. Some are almost like sheet cakes, only denser and richer; they may even be iced like sheet cakes. Others consist of two or three layers that are added and baked in separate stages. Example: Almond Tuiles, Chocolate Chip Sheet, Raisin Sheet Cookies.

8. **Stencil:** The stencil method is a special technique used with a particular type of soft dough or batter. This batter is often called stencil paste. It is used not only for making this type of cookie but also for making ribbon sponge cake for decorative work. It is possible to cut a stencil in nearly any shape for making decorative pieces or special desserts.

9. **Foam cookies or macaroons:** These are special cookies made with whipped egg to soft peak stage. While whipping cream of tartar or lemon juice is added, followed by sugar. The mixture is whipped enough to stand upright without spreading. It is then very gently folded with chopped nuts and fruits . Then the desired quantity is poured on dusted baking sheet and then baked.

10. **Meringue:** are light, airy and sweet confections. In this egg whites and sugar are beaten to stiff peak stage, then while whipping cream of tartar or lemon juice is added. The binding agents may be corn starch, or gelatin.

No matter what method is used, one important rule to follow is – the cookie should have a uniform size and thickness. This is essential for even baking. If the cookies are to be garnished, they must be done immediately on panning. Press them gently when still fresh. If you wait, the surface dries up.

PANNING, BAKING, COOLING AND PACKAGING

Preparing the Pans

- Use clean, unwrapped pans.
- Lining the sheets with parchment or silicone paper is fast, and it eliminates the need to grease the pans.

- A heavily greased pan increases the spread of the cookie. A greased and floured pan decreases spread.
- Some high-fat cookies can be baked on ungreased pans.
- Baking
- Most cookies are baked at a relatively high temperature for a short time.
- Too low a temperature increases spreading and may produce hard, dry, pale cookies.
- Too high a temperature decreases spreading and may burn the edges or bottoms.
- Even a single minute of over baking can burn cookies, so watch them closely. Also, the heat of the pan will continue to bake the cookies if they are left on it after being removed from the oven.
- Doneness is indicated by color. The edges and bottom should just be turning a light golden color.
- Excessive browning is especially undesirable if the dough has been colored. The browning of the surface hides the color.
- With some rich dough, burned bottoms may be a problem. In these cases, double-pan the cookies by placing the sheet pan on a second pan of the same size.

Cooling

- Most cookies baked without parchment paper must be removed from the pans while they are still warm, or they may stick.
- If the cookies are very soft, do not remove them from the pans until they are cool enough and firm enough to handle. Some cookies are soft when hot but become crisp when cool.
- Do not cool cookies too rapidly or in cold drafts, or they may crack.
- Cool completely before storing.
- After the cookies have been baked, check them for defects.

Packaging: It plays an important role in improving the self life of the product. Sealed moisture-proof package will keep the cookies crisp and more over it will prevent the cookies and biscuits from getting rancid. Therefore cookies are to packed in air-tight containers or foil, so that they are protected from outside moisture and pressure. In modern packaging technique the containers are made air-free or filled with nitrogen gas. This improves the keeping quality for many days.

Biscuit making: It remains a useful rule of thumb that the properties of good biscuit flour and good bread flour are opposite. Bread flours are made from hard wheat with high protein content, where as Biscuit flours are made from low protein content. The most important dough property in biscuit dough's is extensibility. Resistance is undesirable. The only type of flour that cannot be used to make sweet biscuits is the sort of high protein hard wheat bread flour that is preferred for bread. Biscuits made from this sort of flour have a bread-like texture.

Most types of biscuits contain a considerable amount of fat. The traditional fat for biscuits was butter and some all-butter biscuits are made. As biscuits are a long-

life product any fat used in them has to be stable under the conditions of storage. Most biscuits contain vegetable fats. It is common to use hydrogenated fat in biscuits because vegetable oils were too soft physically and too unsaturated to be stable against oxidation, and thus reduces rancidity.

Apart from the obvious function of adding sweetness, sugars affect the structure of biscuits. Biscuits made from short doughs contain the most sugar while semi-sweet biscuits contain less and crackers least. All reducing sugars present can undergo the Maillard reaction and produce attractive colour and flavours.
While liquid milk is little used in biscuit manufacture for practical reasons to do with lack of stability, skimmed milk solids are used. The preferred ingredient is skimmed milk powder.

A few other cereal-based ingredients go into some biscuits. The most important is oats in the form of oatmeal or oat bran.

MIXING BISCUITS DOUGH

While all biscuit doughs need to be mixed the other requirements of the mixer depend on the type of dough involved. Biscuit doughs are normally classified as hard developed doughs, semi-sweet doughs, short doughs and batters. The needs of each type are considered separately below.

1. **Hard Developed Doughs**. These doughs are used to make crackers. The mixing action has to develop the dough as in bread. Indeed some crackers are fermented with yeast like bread. Crackers are made from dough that is low in fat and sugar but relatively high in water. Cracker doughs are mixed in an all in one process that involves kneading the dough to develop the gluten and then the dough is left for subsequent fermentation. The dough would be mixed to a final temperature of 26–301C, which is obtained by controlling the energy input and the temperature of the ingredients. After fermentation some cracker doughs are remixed with more flour and water.

2. **Semi-sweet Doughs**. These contain more sugar and fat than crackers. Mixing should be to 410C if sodium metabisulfite is used and to 450C if it is not used. Mixing time is not critical. Semi-sweet doughs are normally mixed on an all-in-one basis.

3. **Short Doughs**- Gluten development is not desirable in these doughs. The level of sugar is so high in these products that it cannot all dissolve in the water. These doughs are mixed in a two-stage process by forming an emulsion of the fat in the water and then adding the flour. Energy input can be high in the first stage as this helps the dispersion and there is no gluten present to develop. The second stage mixing, where the flour is added, is very short to avoid developing the gluten. In some cases some of the sugar is added with the flour.

4. **Batters-** A few biscuits are made from dough so soft that it is really a batter. These products sometimes contain eggs. As these products are

nearly cakes they are made in a cake-type mixer with a high sheer rate to incorporate air.

Shaping Biscuits: If biscuits are made by hand the shaping process would be to roll out the dough and use a cutter to cut the biscuits to shape. The scrap dough is then re-rolled and more pieces are cut with the excess being re-rolled and the process repeated until there is insufficient dough to make any more biscuits. It is also possible to shape biscuits by a mechanized system that does the same process. The different mechanized systems may be sheeting gauging and cutting, extruding wire cutting and depositing or rotary moulding

Baking Biscuits: While biscuits can be and are baked in almost any type of oven, including deck ovens, rack ovens and travelling ovens, most biscuits are baked in travelling ovens. These ovens suit large plant bakeries. The throughput of these systems is measured in terms of kilos per hour. One of their advantages is that it is possible to arrange the oven in a series of zones so that the product passes first into the hottest part of the oven and is moved to cooler regions as cooking proceeds.

PRECAUTIONS TO TAKE WHILE MAKING COOKIES/BISCUITS

1. A major precaution to be observed while making cookie mixture is that they should be quickly mixed and never over processed.
2. For hard to handle soft doughs, roll the dough directly on to the baking sheet. Cut into the desired shapes and remove the scraps from around.
3. If cookies should stick to the pan, put the pan back into the oven for a few seconds. This usually loosens the cookies easily.

Cookies may be iced, sandwiched with filling or dusted with confectioners' sugar. They make an excellent finger food dessert or can be used as a garnish for a dessert. Cookies are one of the most profitable items produced by the baker. An important factor in the production is the use of high grade ingredients. Butter is the preferred shortening. It has a better flavor and a melt in the mouth quality. Careful selection of the purest spices, extracts and flavorings will assure delicious cookies. The type of flour used for cookies can vary from flours of medium strength to soft texture. Strong flours are not recommended for making cookies.

CHARACTERISTICS OF COOKIE OR BISCUIT

The following characteristics are important:

- **Shape-** shape to be uniform with tidy and well finished edges.
- **Colour** – suitable and uniform colour.
- **Texture** – open, flaky, short, and crisp -depending on the product. Some cookies are chewy in nature due to high flour content.
- **Density/volume** – low density gives more volume and a lighter bite
- **Bite/Mouth Feel** – crispiness, softness, smoothness, crunchiness...
- **Flavour** – many flavours and fillings are heat susceptible and the protection of the flavours and texture of the fillings needs consideration for the baking process. For example, for a variety of soft doughs and cookies, a preference will be given for radiant heat, a longer baking time at a lower temperature.

- **Fillings-** uniformly distributed and un-burnt.

COOKIES AND BISCUIT FAULTS

1	**Lack of spread**.	• Too fine granulation of sugar • Adding sugar at one time • Excessive mixing • Too hot oven temperature • Too much of acidity in the dough • Too much flour or flour too strong • Not enough sugar • Not enough leavening • Not enough liquid • Insufficient pan grease
2	**Excess of spread**	• Excessive sugar • Too soft a batter consistency • Excessive pan grease • Too low an oven temperature • Excessive or improper type of shortening • Not enough flour • Too much leavening (chemical leaveners or creaming) • Too much liquid
3	**Tough cookies**	• Insufficient shortening • Flour too strong • Over handling
4	**Too dry**	• Not enough liquid • Not enough shortening • Baked too long or baking temperature too low • Too much flour
5	**Too crumbly**	• Improper mixing • Too much sugar • Too much shortening • Too much leavening • Not enough eggs
6	**Did not rise**	• Not enough baking power • Over-mixing of dough • Oven too hot
7	**Not light and fluffy**	• Dough was not wet and sticky enough • Over-mixing of dough • Used blunt biscuit cutter
8	**Not Flaky/crumbly**	• Not enough fat in dough • Too much butter and not enough shortening or lard • Over-mixing of dough

9	**Too hard**	• Baked too long or baking temperature too low • Too much flour • Flour too strong • Not enough shortening • Not enough liquid
10	**Not browned enough**	• Baking temperature too low • Under-baked • Not enough sugar
11	**Too brown**	• Baking temperature too high • Baked too long • Too much sugar
12	**Poor flavor**	• Poor-quality ingredients • Flavoring ingredients left out • Dirty baking pans • Ingredients improperly measured
13	**Sugary surface or crust**	• Improper mixing • Too much sugar
14	**Not even and smooth**	• Used blunt biscuit cutter • Biscuit cutter twisted while cutting
15	**Sticking to pans**	• Too soft a dough • Excessive egg content • Unclean pans • Pans improperly greased • Too much sugar • Improper mixing
16	**Black spots and harsh crumbs**	• Excessive ammonia- Sometimes we want some cookies to be crisp, others to be soft, some to hold their shape and others to spread. In order to produce characteristics we want, and to correct faults, it is useful to know what causes these basic traits.
17	**Light centers with dark edges**	• Edged baking pan used. • Abnormal oven temperature
18	**Not cooked within the mentioned time**	• Oven door might be open or opened frequently • Abnormal oven temperature • Too crowded oven • Oven temperature too low
19	**Bottom browning**	• Baking sheet too thin and dark • Baking sheet too large • Oven not pre-heated • The pans are too close to each other or the oven walls. • Oven rack set low
20	**Too crisp**	• Low proportion of liquid in the mixture, so stiff dough • High sugar and fat content

		• Baking long enough to reduce moisture • Small sizes or thin shapes • Proper storage
21	**Too Soft**	• High proportion of liquid • Low sugar and fat • Use of honey and molasses • Short baking times • Large size or thick shapes. • Proper storage
22	**Chewy texture**	• High sugar and liquid content • High proportion of egg • Strong flour used

Wafers: Wafers are an unusual product. They are often incorrectly included with biscuits, possibly because they are both made from soft wheat flour. Wafers, unlike biscuits, are a low fat, low sugar product. They normally consist almost entirely of flour. There is a very wide difference between the various sorts of wafers. Some wafers are made to serve with ice cream others are made to cover in chocolate and sold as confectionery. All wafers have in common that they are baked to low moisture content, as are biscuits.

Wafers can be either yeast raised or chemically raised, e.g. by baking powder. Yeast raised wafers do not contain much sugar after fermentation.
Wafers are normally made from a low to medium protein soft wheat flour. Too high a protein flour produces too hard a wafer. Conversely, too low a protein content will give very fragile wafers. Depending on the colour and use of the finished wafer some wafers are made from brown flours.

Making of wafers: Obviously the process is slightly different depending on whether the wafer is yeast or chemically raised. In essence the ingredients are mixed into a batter then baked. There is no need to develop the gluten, indeed gluten development is unhelpful. One particular problem in wafer batters is the separation of strings of gluten. This can be avoided either by mixing the batter cold or by careful selection of the flour used.
If the product is handmade on a small scale the flour used is less critical than if the product is made on a large scale on an automated plant. Mixing cold and baking the product before the gluten separates may be a useful small scale solution but on a large scale where the batter has to be pumped to the ovens to be baked it will not work

Baking wafers: On a small scale, wafers are baked by pouring the batter on a heated metal plate and bringing a second plate that is hinged down on the first, trapping the batter between the two plates. The plates are likely to have been treated with a releasing agent and may have a pattern inscribed on them. The plates will be equipped with a system for venting the steam produced in cooking. The heat is then applied and the wafer cooks very quickly.

Large-scale wafer ovens are essentially the small-scale system scaled up. One problem with the mass production of some wafers is that they are too delicate to use mechanical handling and must be moved manually.

Maturing wafers: Maturing is important practically because the wafers change dimensionally. If wafers are just cooled and covered with chocolate they will subsequently crack the chocolate. This can be avoided by first maturing the wafers. The process can be accompanied by two ways-

1. By storing wafer sheets in a hot cabinet at a temperature of 40-45^{0}C for some hours or preferably overnight.
2. By storing in rooms with relative humidity and controlled temperature.

CHECK YOUR PROGRESS-I

1. Classify cookies by names.

2. What are the chief ingredients required for making cookies and biscuits?

3. What is Ice box cookies?

5.7 FROZEN DESSERTS

Frozen dessert is the generic name for desserts made by freezing liquids, semi-solids, and sometimes even solids. They may be based on flavored water (shave ice, ice pops, sorbet, snow cones, etc.), on fruit purées (such as sorbet), on milk

and cream (most ice creams), on custard (frozen custard and some ice creams), on mousse (semifreddo), and others. Frozen desserts come in many forms that are often unknown to many consumers:

In present times, frozen desserts have become so popular that they are now a major profit - making item on the menu in many commercial outlets such as fast foods and coffee shops. It also has an advantage that they can be prepared in advance and can be stored for long periods of time. The character of a frozen dessert is determined by the freezing method used and the selection and ratio of ingredients.

Ingredients used in Ice cream making and their function: Each type of ingredient used in a frozen mixture has a specific effect.

- **Sugar** often dissolved in water as syrup, white or brown sugar adds smoothness by hindering the formation of ice crystals. Sugar also lowers the freezing point of a mixture, so it takes longer to stiffen. With too little sugar, a mixture may be grainy; with too much sugar, it may scarcely stiffen.

- **Honey, maple syrup** and other sweeteners act like sugar when frozen, though the flavour may be different.

- **Artificial sweeteners** lack sugar's capacity to produce smoothness in the mixture.

- **Cream and milk**: The butterfat content, that is, the proportion of cream in frozen mixtures, has an important effect on their consistency:
    - The **higher the butterfat**, the **smoother** the ice cream. Cream with a high fat content (whether it is whipped first or not) may curdle or form granules of fat.

    - **Milk** is the usual base for ice-cream custards, often with some **cream** added halfway through churning.

    - **Evaporated or condensed milk** is an inexpensive alternative to cream, but adds a flavour.

    - **Creme fraiche, soft cheese and yogurt** add a pleasant bite to ice creams and frozen desserts, and fresh cream cheeses like French *fromage frais* and Italian ricotta give body. Yogurt **r**etains its characteristic flavour when frozen and may be used alone or with milk

- **Liqueur and wine**: Many traditional sorbets are based on wines; and frozen desserts may be flavoured with liqueurs. However

alcohol sharply lowers the freezing point of a mixture, so strong liqueurs or spirits must be used in moderation**.**

- **Fruit**: Fruit are often used for sorbet and to flavour ice cream. Fruit juices, particularly lemon, are important in sorbets in adding acid to balance sugar and heighten flavour.

- **Nuts:** Chopped walnuts or almonds offer a contrasting crunch and are classic in ice cream.

- **Corn flour, potato flour and other thickeners:** Thickeners make ice cream heavy, sacrificing quality for economy.

- **Eggs:** Whole eggs and egg yolks are indispensable for thickening custard, ice creams and bombe mixtures.

Note: Raw egg yolk can harbor bacteria that are not killed by freezing. Therefore, in any frozen mixture that is to be stored, the egg yolk must be cooked, either as custard or by whisking with sugar over heat.

5.7.1 FROZEN DESSERT TYPES

Classification of Frozen Desserts: Frozen desserts come in many forms. Each of the following types has its own characteristics and definition and is standardized by standard regulations and moreover they are categorized by the freezing method employed.

A. CHURNED FROZEN DESSERT

These include ice creams and sherbets. They are mixed constantly while being frozen. If they were not churned, they would freeze into solid blocks of ice. The churning keeps the ice crystals small and incorporates air into the dessert, resulting in smooth texture and raised volume. Churned frozen desserts may be dairy based, made from milk or custard, or non-dairy, made from fruit, chocolate or other flavorings combined with sugar. Ice cream, gelato, sorbet and sherbet are all churned. Overrun is a way to indicate the amount of air churned into a churn-frozen product. Overrun is expressed as a percentage, which reflects the increase in volume of the ice cream greater than the amount of the base used to produce the product.

Churned frozen desserts include the following:

1. **ICE CREAM:** Technically, ice cream may be defined as the partly frozen foam with an air content of 40-50% air by volume. The continuous phase of the foam contains dissolved and colloidal solids such as sugars, proteins and stabilizers. The fatty phase is in the emulsified form. Some of the milk proteins are structurally related to the fat globules of the emulsion.

Today, ice cream is made from a blend of dairy products (cream, condensed milk, and butter fat), sugar, flavorings, and government approved additives. Eggs are added for some flavorings, particularly French vanilla. The broad guidelines allow producers to use ingredients ranging from sweet cream to nonfat dry milk, cane sugar to corn-syrup solids, fresh eggs to powdered eggs. Government regulations do stipulate that each package of ice cream must contain at least 10% butterfat. The additives, which act as emulsifiers and stabilizers, are used to prevent heat shock and the formation of ice crystals during the production process. The most common additives are guar gum, extracted from the guar bush, and carrageenan, derived from sea kelp or Irish moss.

Ice cream flavors have come a long way from the standard vanilla, strawberry, and chocolate. By the 1970s, the International Association of Ice Cream Manufacturers had recorded over 400 different flavors of ice cream. In an ever-expanding array of combinations, fruit purees and extracts, cocoa powder, nuts, cookie pieces, and cookie dough are blended into the ice cream mixture. Air is added to ice cream to improve its ability to absorb flavorings and to facilitate serving. Without air, ice cream becomes heavy and soggy. On the other hand, too much air results in ice cream that is snowy and dry. The federal government allows ice cream to contain as much as 100% of its volume in air, known in the industry as **overrun**. Makers of high-quality ice cream (sometimes known as gourmet ice cream) use fresh whole dairy products, a low percentage of air (approximately 20%) between 16-20% butterfat and as few additives as possible. By law, ice cream must contain at least 10 percent milk fat, before the addition of bulky ingredients, and must weigh a minimum of 4.5 pounds to the gallon.

Imitation ice cream is known as ***Mellorine*** and is made now in many parts of the world. Mellorine is cheaper than ice cream because inexpensive vegetable fats and oils are substituted for the more expensive dairy fats. Other than this, mellorine has almost the same composition as ice cream. There is still no cheap substitute for milk protein, although some vegetable proteins, particularly from soy bean, with improved flavors are used to prepare *lactose free* ice creams.

Prevention of food adulteration Act (PFA) Rule A (11.02.2008), defines ice cream and kulfi as under:

The frozen food obtained from cow or buffalo milk, or a combination thereof, or from cream and /or milk product with or without the addition of cane sugar (dextrose, liquid glucose and dried liquid glucose), eggs, fruit and fruit juices, preserved fruits, nuts, chocolate, edible flavors and permitted food colours. It may contain permitted stabilizers and emulsifiers not exceeding.5% by weight. The mixture should be suitably heated before freezing. The product must contain not less than 10% milk fat, not less than 36% total solids, except when the aforesaid preparation contains fruits, nuts or both, the content of the milk fat shall not be less than 8% by weight. Starch may be added to a maximum extent of 5% under the declaration on the label. The standards of ice cream shall also be applied to softee.

Ice cream is a complex system in which the stable mixed emulsion of four phase system of fat-water-ice-air, must be balanced and protected from breaking and separating. The blend of milk fat and non fat solids with sugar must result in a product of pleasing taste and one which is smooth and creamy. Composition of the mix is important, but the most critical stage of ice cream manufacture is the mechanical blending, freezing and hardening of the ice cream.

Why churning is so important? Churning becomes a crucial step in preparing churn-frozen desserts, ensuring that they have a smooth and creamy texture. Churning contributes a great deal to texture by preventing large ice crystals from forming and incorporating air into the base as it freezes. (The effect of air being incorporated into the base during churning is discussed later in this chapter.) When water is frozen, ice is the result. Because frozen dessert bases very often contain some water-based ingredients (even milk and cream contain a certain percentage of water), how they are frozen will affect their final texture.

Smaller ice crystals feel better on the tongue than larger, grittier ones. This is where churning becomes very important. Rotating and stirring the base ingredients as they are being frozen results in smaller, finer ice crystals that are barely noticed on the tongue. When tasting an ice cream, for example, a sensation of creaminess should be felt and not iciness.

Composition of ice cream: The ingredients used in ice cream manufacture are milk, skim milk powder, cream, butterfat, sugar, stabilizers, emulsifiers, food grade flavors and permitted colors. Chocolate, dried fruits and nuts, honey, fruit pulps and other such ingredients are also added to give variety. Normal ice creams will have a milk fat content of 10-14% but richer ice cream will have a dairy fat content of up to 20-24%. Proteins are usually between 3.5-4%, sugar 14-15%, stabilizers .3-.5% and emulsifiers .1-.2%

Stabilizers bind the water and increase the mixture's ability to trap air and expand during churning. Commercially, stabilizers are added to ice creams, sorbets and sherbets to improve their texture and freezing abilities. Stabilizers include the eggs used in a formula as well as gums (guar or locust bean), carageenan, gelatin, pectin and other vegetable-derived ingredients. Inexpensive and mass-produced ice cream products often rely on excessive amounts of stabilizers or gelatin to create texture and aid in the overrun process. Stabilizers are less commonly used in the restaurant industry, where frozen products are made more frequently and in small batches.

Manufacture of ice cream: The following are the steps involved in the processing of ice cream:

1. **Collection of ingredients:** All the ingredients are collected according to the structure, mouth-feel, flavour and taste of the ice cream to be prepared. Fruits and nuts are prepared according to the need. Cream, fat or any other ingredients are collected, refrigeration temperature is controlled and the required utensils or pans are cleaned and sanitized.

2. **Blending:** The first step in producing frozen desserts is the production of a pasteurized "mix." In producing a mix, the liquid and dry ingredients such as stabilizers, emulsifiers, flavouring and colour along with nuts and chocolate etc. must be brought together in such a way that all ingredients are dispersed completely prior to heat treatment. There are several problems that must be overcome in this process. Each ingredient will sink or float depending upon their density, causing inconsistency in the final product. Some ingredients being hydroscopic tend to clump. If this happens, these ingredients may not be able to pass through filters or screens and will not be incorporated into the mix, causing quality and consistency issues. The blend of ingredients can have a tendency to form stable foams (this is desirable in the final product but undesirable in mixes). The order of addition and the equipment used for blending are designed to minimize or eliminate these problems. Blending is usually preceded by some method of measuring out the ingredients. This is accomplished, for the liquid ingredients, by weighing or metering the ingredients into a blend tank. This tank should not be violently agitated to prevent the development of rancidity in raw milk. The dry ingredients are most often weighed on scales. After the dry ingredients are weighed out, they are mixed with the liquid ingredients. As mentioned above, some dry ingredients are so hydrophilic that they form clumps, with very high viscosity or gelled outer layers and essentially dry powder in the interior. In order to keep this from happening, these materials need to be as widely dispersed as possible. There are four basic ways in which this can be done; the most popular and efficient way is using a high shear mixer. A small amount of liquid is brought into the blender, a high shear mixing head is started and the powder is fed, slowly, into the blender. Another method feeds the powder slowly into a stream of liquid; the powder is fed into the stream through an open funnel. Sometimes a modified pump further mixes the powder and liquid. Perhaps the oldest method and least efficient is to simply add the powder to the top of the tank of liquid ingredients with strong agitation. This tank is often provided with a recirculation pump to aid in distributing the powder while it hydrates. Hard-to handle products like stabilizer blends containing hydrocolloids can be first dispersed in an ingredient that does not tend to form clumps, like granulated sugar. The mixture can then be added to the blender slowly; the sugar helps keep the particles of the viscous ingredient separated, keeping them from forming clumps. A similar method used is to disperse the powder in liquid sugar in a high shear blender. Since the amount of water in liquid sugar is low, the particles are able to disperse within the syrup before they hydrate. In each case the strategy is to keep the individual particles of dry ingredients far apart from one another in order to wet the entire surface of each particle separately and therefore to disperse all the particles as uniformly as possible in the blend before they fully hydrate. It is important to be aware that during blending and subsequent storage before pasteurization, many of the ingredients are not dissolved in the liquid but are only dispersed. If given the chance (insufficient agitation, for instance), they will segregate at the top and bottom of the blend tanks. This can prevent important components from

being included in the final product. If this problem exists, the final product will be inconsistent. It may also cause the mistaken conclusion that the settled component is under dosed, which in turn may cause loss of money due to adding too much of that ingredient in the future. As blending is the first step in making ice cream, it is very important that it be carried out correctly.

3. **Pasteurization:** Pasteurization is the biological control point in the system, designed for the destruction of pathogenic bacteria. The mix is then pasteurized, a process that kills any harmful bacteria through high temperature heating. There are basically three methods used to pasteurize milk: vat pasteurization (or low-temperature, long-time (LTLT) 63^0C (145^0F) for 30 minutes; high-temperature, short-time (HTST) pasteurization at 72^0C (161^0F) for 15 seconds; and ultra-pasteurization (or ultra high-temperature pasteurization (UHT) if aseptically packaged at 138^0C (280^0F) for 2 seconds. The conditions used to pasteurize ice cream mix are greater than those used for fluid milk because of increased viscosity from the higher fat, solids, and sweetener content, and the addition of egg yolks in custard products.

4. **Homogenization:** The mix is then rapidly cooled to a temperature of +5°C or under and left for some hours to let the fat cool and form into crystals. The speed and the extent of this process depend on the type of fat used. Fats with higher saturated content tend to crystallize faster and to a greater extent than less saturated. During Homogenization, the mix is converted into a true emulsion with a fat globule size of less than 2 gms. For efficient homogenization, the fat phase should be completely liquid and hence a temperature near pasteurization temperature is preferred. Homogenization of the ice cream mix is normally carried out at a pressure of 140-210 kg/cm2. At the end of this treatment, it is often found that individual small fat globules cohere in clumps, resulting in a viscous mix with poor processing properties in subsequent stages. A second homogenization at lower pressure of 35kg/cm^2 is used to break up the clumps.

   In addition to the basic ingredients mentioned above, emulsifiers are also added in this phase to obtain a smoother texture and create a stable, homogeneous, smooth emulsion.

5. **Cooling:** The mix is then rapidly cooled to a temperature of +5°C or under and left for some hours to let the fat cool and form into crystals. The speed and the extent of this process depend on the type of fat used. Fats with higher saturated content tend to crystallize faster and to a greater extent than less saturated fats. Then, depending on the product, coatings, inclusions, toppings and sauces are added to the semi-frozen mixture.

   The mix is then again pumped through very cold cylinders (-30°C) with rotating blades, cooling the ice cream to -5°C. This process freezes some of the water in the ice cream whilst whipping air into it at the same time, giving the ice cream a soft creamier texture.

6. **Ageing:** Ice cream mix is aged at 40°F (5°C) for at least 4 hours or overnight. Aging is performed in insulated or refrigerated storage tanks, silos, etc. Mix temperature should be maintained as low as possible without freezing, at or below 5^0C. An aging time of overnight is likely to give best results under average plant conditions. This allows time for the fat to cool down and crystallize, and for the proteins and polysaccharides to fully hydrate. Aging improves whipping qualities of mix and body and texture of ice cream by providing time for fat crystallization, so the fat can partially coalesce; allowing time for full protein and stabilizer hydration and a resulting slight viscosity increase; allowing time for membrane rearrangement and protein/emulsifier interaction, as emulsifiers displace proteins from the fat globule surface, which allows for a reduction in stabilization of the fat globules and enhanced partial coalescence.

7. **Churning and freezing to soft serve consistency:** Now the mixture must be churned and frozen. It is churned and pumped into continuous freezers that can freeze up to 700 gal (2,650 L) per hour. The temperature inside the freezers is continuously kept at -40°F (-4°C), using liquid ammonia or solid carbon-dioxide as a freezing agent. While the ice cream is in the freezer, air is injected into it. When the mixture leaves the freezer, it has the consistency of soft-serve ice cream.

8. **Particulate addition (optional):** Addition of any other fruit, nut, colour or flavour and other eatables can be added.

9. **Freezing:** There are two basic types of machines that are used to accomplish freezing while churning: batch and continuous freezers. Batch freezers, as indicated by their name, freeze a measured amount of mix and air to completion, after which the contents of the freezer are emptied. With continuous freezers, mix and air are pumped into the freezer and frozen product is extracted from the freezer in continuous streams. The freezer consists of a barrel within barrel and the space between is filled with coolant like ammonia, carbon-dioxide or Freon. The inner barrel contains series of blades which churn the ice cream mix and break the ice crystals into minute pieces. The temperature at this point should be continuously maintained to -4 to -6^0C.

10. **Packaging:** For ice cream, the packaging process needs to be rapid. The ice cream may be at -6°C as it is discharged into the containers, and the exposure to warmer environmental temperatures in the manufacturing facility may result in melting. The equipment used to package ice cream varies, but most are based on a weight fill control mechanism that is automated, with an automatic closure/lid machine either incorporated or detached. The objective is to fill the ice cream container as quickly as possible, with minimum disruption of the air cells and ice crystals in the product.

11. **Hardening:** After packaging, approximately half of the water in the product is not frozen. In this state the product is semisolid and vulnerable to damage. Hardening is the process of continuing freezing without

agitation until the temperature is -18^0C to -25^0C (-4^0F to -13^0F). This process should be done as quickly as possible to avoid the growth of large ice crystals in the product. This process should be done as quickly as possible to avoid the growth of large ice crystals in the product. If hardening is done slowly or is delayed, the smaller (more numerous) ice crystals will have disappeared and ice will form on the larger crystals. The result will be product with larger ice crystals, which are more noticeable (cold, coarse) on the tongue. If hardening is done quickly there will be many smaller ice crystals, resulting in a smoother product.

12. **Storage:** Storage at -13°F (-25°C) will help to stabilize the ice crystals and maintain product quality. At this temperature there is still a small portion of liquid water. If all the water present in the ice cream were frozen, the ice cream would be as hard as an ice cube.

13. **Transportation and delivery:** To ensure the stability of the quality of the ice cream through transport, frozen transport fleet which maintains the ice cream at temperature -20 to -25^0C during transport right to the customer/concessionaire.

ICE CREAM QUALITY

Quality implies a clearly produced ice cream of acceptable flavor, taste, body and texture. The composition of the product and the ingredients used should be within the parameters and the limits set by the food laws. The desirable physical properties of ice cream should be defined mainly in terms of the texture as it is eaten. The consistency should be smooth and creamy and the air content should be finely distributed. There should be a quick melting effect on the palette, without greasiness or gumminess and with no gritty icy sensation. As the ice cream warms up, it should have a tendency to retain its shape, and as it melts, a creamy and not a watery serum should be formed. Flavor acceptability is governed by the quality of the ingredients that are used as well. Fruits, nuts, chocolate as well as the added flavors should be of a good quality. However, the basic flavor must come from high quality of milk and cream.

2. **Frozen Custard or French Ice Cream:** Frozen Custard or French Ice Cream must also contain a minimum of 10 percent milk fat, as well as at least 1.4 percent egg yolk solids.

3. **Sherbets:** Sherbets have a milk fat content of between 1 and 2 percent, and slightly higher sweetener content than ice cream. Sherbet weighs a minimum of 6 pounds to the gallon and is flavored either with fruit or other similar ingredients.

4. **Gelato:** Also known in the singular as "gelato", this Italian version of ice cream contains less air than its North American counterpart and therefore has a denser texture. It is also characterized by an intense flavor and is served in a semi-frozen state. Gelato contains sweeteners, milk, cream, egg yolks and flavoring**.**

5. **Sorbet and Water Ices:** These are ices based on sweetened fruit juice or puree. Similar to Sorbets (sometimes the words are used interchangeable) but sherbets usually have more ingredients, such as milk, egg whites or gelatin. Supermarket brands must have a milk fat content of between 1% and 2%, and slightly higher sweetener content than ice cream. Sherbet weighs a minimum of 6 pounds to the gallon and is flavored either with fruit or other characterizing ingredients. Recipes can be varied in infinite ways by changing the fruits used. Sorbets can be turned into sherbets if you add a beaten egg white to the mixture after it is partially frozen. Water ices are similar to sherbet, but contain no egg or milk.

6. **Frozen Yogurt:** Frozen Yogurt consists of a mixture of dairy ingredients such as milk and nonfat milk which have been cultured, as well as ingredients for sweetening and flavoring.

7. **Novelties:** Novelties are separately packaged single servings of a frozen dessert (e.g. ice cream sandwiches, fudge sticks and juice bars) that may or may not contain dairy ingredients.

8. **Freezies /Smoothies/Whip:** Generally speaking, these are made from whole frozen fruit (frozen bananas, strawberries, peaches, etc.) which are then whipped in a blender or food processor till smooth.

9. **Italian Ice: A**lso known as Water Ice is a dessert treat that has been around for centuries. It is a delicious, non-dairy, frozen dessert made from a mixture of water, fruit (often from concentrates, juices or purées), and sweeteners, much like a sorbet. It is made by the same process by which ice cream is made; the mixture is slowly churned and has air incorporated into it at a gradual rate, giving it a seemingly "creamy" and smooth texture.

10. **Ice Cream Roulade (Rolls):** The Jelly Roll Cake, also known as a Biscuit Roulade, is typically made from a thin sponge or foam-type cake, that is baked and then rolled into a tube-like or log shape around a filling, such as ice cream, and sliced to display the ingredients swirled into the rolled base of food. Ice cream is used as the filling.

B. STILL FROZEN DESSERTS

Still-frozen desserts, known as semifreddi, are made from custards or mousses that are frozen without churning. These include frozen soufflés and parfaits as well as desserts assembled with ice cream such as baked Alaska and Vacherie or bombes, molds lined with cake and filled with ice cream, sorbets and frozen mousses and parfaits. Granita is a grainy type of frozen dessert made with fruit juice, wine or other liquids and sugar. The air incorporated into the base of a frozen dessert gives it a light, smooth, spoonable texture. With still-frozen desserts, the air is incorporated before freezing rather than during, as it is for churned frozen desserts. Air is incorporated into these frozen desserts as is done for the preparation of a mousse. Aerated ingredients such as whipped cream, meringue, or beaten egg yolks are folded into a flavored base mixture just before it is deposited into containers and frozen.

1. **Frozen Mousse** : Frozen mousse is usually fortified with gelatin to make it stand up well to the strenuous beating required to give it its characteristic frothiness. It's a rich, airy dessert usually containing fruit puree or syrup, plus some egg.

2. **Parfait, Torte and Bombes: A parfait** is based on essentially the same mixture as a bomb. It may be frozen on its own in a parfait glass (a stemmed glass thick enough to withstand freezing) or layered with macerated fruits, crushed macaroon crumbs and other fillings. The traditional flavour for a parfait is coffee, but popular alternatives include chocolate, praline, maple, liqueurs and fruit purees

   A torte (from Italian torte) is a rich, usually multilayered, cake that is filled with whipped cream, buttercreams, mousses, jams, or fruits. These are frozen in their own container.

   Bombes are always made using a pâté à bombe (egg yolks cooked over heat as they are beaten with sugar until they are light in color and texture). The pâté à bombe is then incorporated with meringue (with or without whipped cream) and a flavoring. The term bombe, however, has to do with the classic domed shape of this dessert.

3. **Granita:** Something like a sorbet, this dessert-cum-beverage is usually more granular in nature and often made from whole fruits rather than just the juices. It is made with fruit or other flavorings but with less sugar than sorbet. This produces a mixture that will freeze harder than sorbet. Instead of being churned, the granita mixture is frozen in a shallow stainless steel container, and then scraped with a fork or spoon to obtain grainy flakes or, as the mixture freezes and ice crystals form, the mixture is periodically stirred until granulation is complete. Granita made with thick fruit purées, such as mango or raspberry, or with wine and liqueurs requires very cold temperatures to obtain proper granulation.

4. **Slush, Slushy, or Slushy:** "Slush" is the common term given to frozen carbonated beverages. These beverages are frozen while being constantly churned in a machine that doubles as a dispenser. Slushies are also known as Slurpees, frozen Cokes, or ICEEs and are a popular item sold in convenience stores

5. **Snow Cone**: Snow cones are a popular summertime treat in the Southern United States. They consist of a ball made from finely shaved ice topped with a flavored syrup and sometimes sweetened condensed milk.

6. **Frozen Soufflé:** This airy mixture of fruit pure egg yolk sauce and stiffly-beaten egg whites is less fragile when frozen (compared to baked soufflé, which is very delicate). Frozen soufflés (also known as soufflés glacés) contain whipped cream, meringue, and a flavoring such as a liqueur, juice, or chocolate. They are traditionally served in ramekins, as are hot soufflés. To mimic the look of a hot soufflé, the ramekins for frozen soufflés are prepared with a "collar," a piece of parchment paper or aluminum foil attached to the ramekin that extends an inch or two above its top. The soufflé mixture is then piped in and leveled off with the top of the collar. The parchment "collar" is removed before service, creating the look of a hot soufflé.

7. **Fruit Ice**: Similar to granita, this is usually made from fruit juices, frozen and then chopped in a blender to form coarse granules.

8. **Ice Milk** : Can mean low-fat, light or both. Ice milk is made in much the same way as ice cream, except for the fact that it contains less milk fat and milk solids. This is a frozen dessert with less than 10 per cent butterfat, if a supermarket brand. The result, other than a lowered calorie count, is a lighter, less creamy texture. The more butterfat, generally, the smaller the ice crystals formed, and the smoother the taste, so ice milk must be beaten more than ice cream for smoothness.

9. **Quiescently Frozen Confection**: A Quiescently Frozen Confection is a frozen novelty such as a water ice novelty on a stick (e.g. Popsicles).

10. **Neapolitan:** A three-layered loaf or cake of ice cream; each layer is a different flavor and a different color, a typical combination is chocolate, vanilla and strawberry

11. **Tofulati**: This is a frozen tofu confection's name registered to Mario's Gelati, a Vancouver-based company, making ice cream and sorbet treats the old-fashioned, old world way.

12. **Tofuti:** Originally invented in New York just a few years ago, this is a frozen dessert made with tofu substituted for cream or milk.

13. **Tofutti :** Tofutti is dairy-free ice cream made from tofu (soybean curd).

CLASSIC FROZEN DESSERTS

Christmas Ice pudding A frozen version of Christmas pudd1ng containing rum-soaked dried fruits mixed into a chocolate chestnut-flavoured egg custard,

lightened with whipped cream or sugar content that prevents hard freezing, thus creating the illusion that it is less cold than ice cream. The name of the dessert in Italian means "half cold". The mixture is frozen in a lined pudding basin and unmolded to resemble a traditional Christmas pudding.

Cassata - The typical Italian version of bombe; a mixture of Italian meringue, whipped cream and candied fruit, surrounded by layers of ice cream.

Biscuit glace - A variation of bombe mixture that uses Italian meringue in addition to the usual mousse and whipped cream. A biscuit glace is moulded in a square or round mould to resemble a cake. The basic mixture can also be used to make frozen soufflés.

Baked Alaska - (Fr. Omelette a la norvegienne) Ice cream set on a layer of cake, encased in meringue and baked to serve with a warm coating of browned meringue. Italian meringue is preferred so that the dessert can be assembled long in advance and frozen; it is then browned in the oven just before serving.

Ice-cream layer cake - Alternating layers of ice-cream and sponge cake frozen to resemble a layer cake and cut in wedges, often with a hot fudge sauce. Popular flavour combinations are chocolate sponge with mint chocolate chip ice cream, or vanilla sponge with coffee or praline ice cream.

Sundae - a great and gooey concoction of ice cream, sauces (hot fudge, marshmallow and caramel, for example), toppings (nuts, candies and fresh fruit, to name a few) and whipped cream.

Cones - Edible hollow cone in which ice cream is poured. After the invention of ice cream cones in 1904, this type of ice cream became absolute most favorite of them all.

Floats - Liquid desert that uses carbonated bubbles to ensure that one scoop of ice cream floats on the top of the glass.

Faloodah- is an Iranian cold dessert consisting of thin vermicelli-sized noodles mixed in semi-frozen syrup made from sugar and rose water that is similar to a sorbet. The noodles are made from either potato starch, corn starch, rice starch or arrowroot starch. Often served with lime juice and sometimes ground pistachios, it is a traditional dessert in Iran.

Fig.5B Churned Frozen dessert

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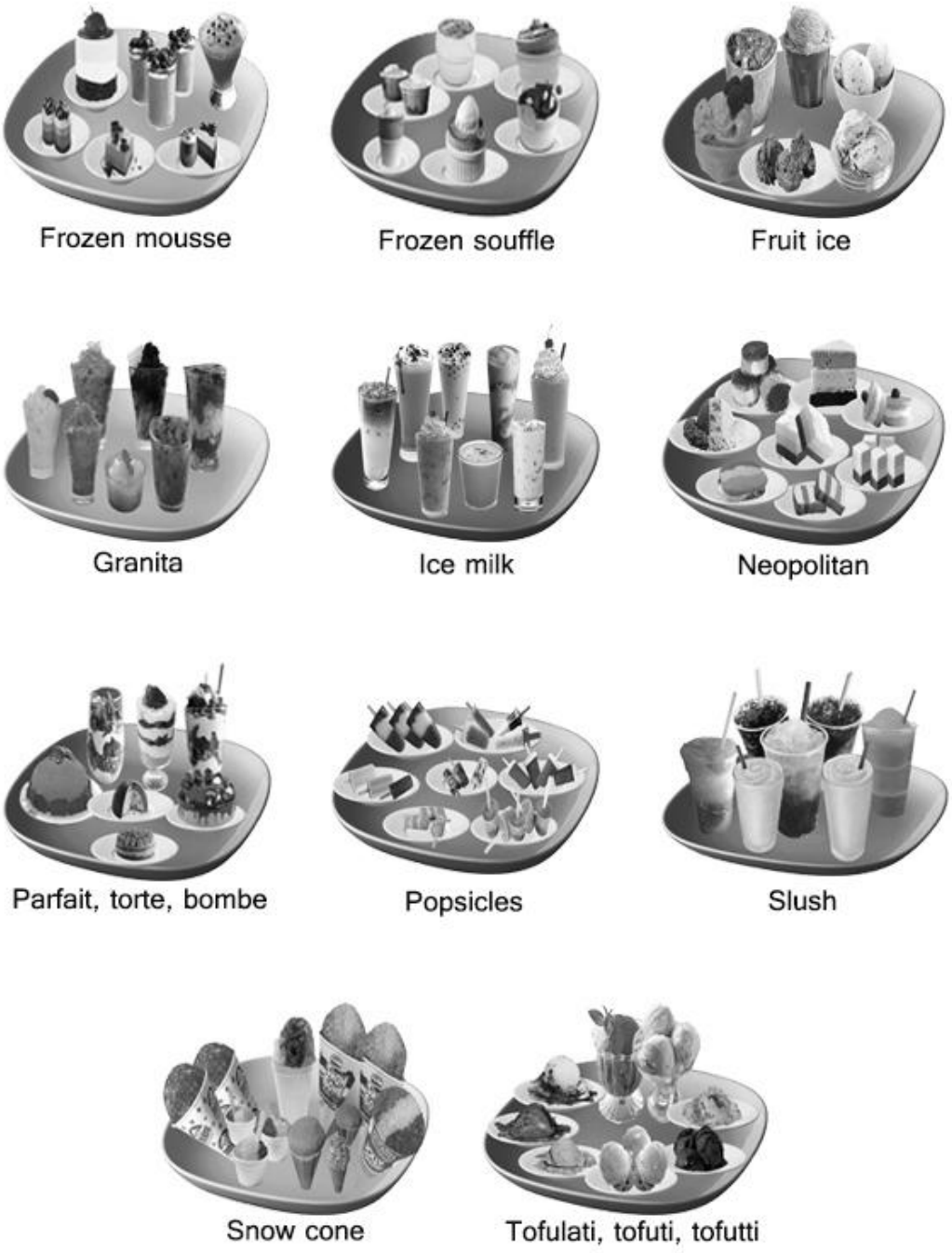

Fig. 5C Still frozen desserts

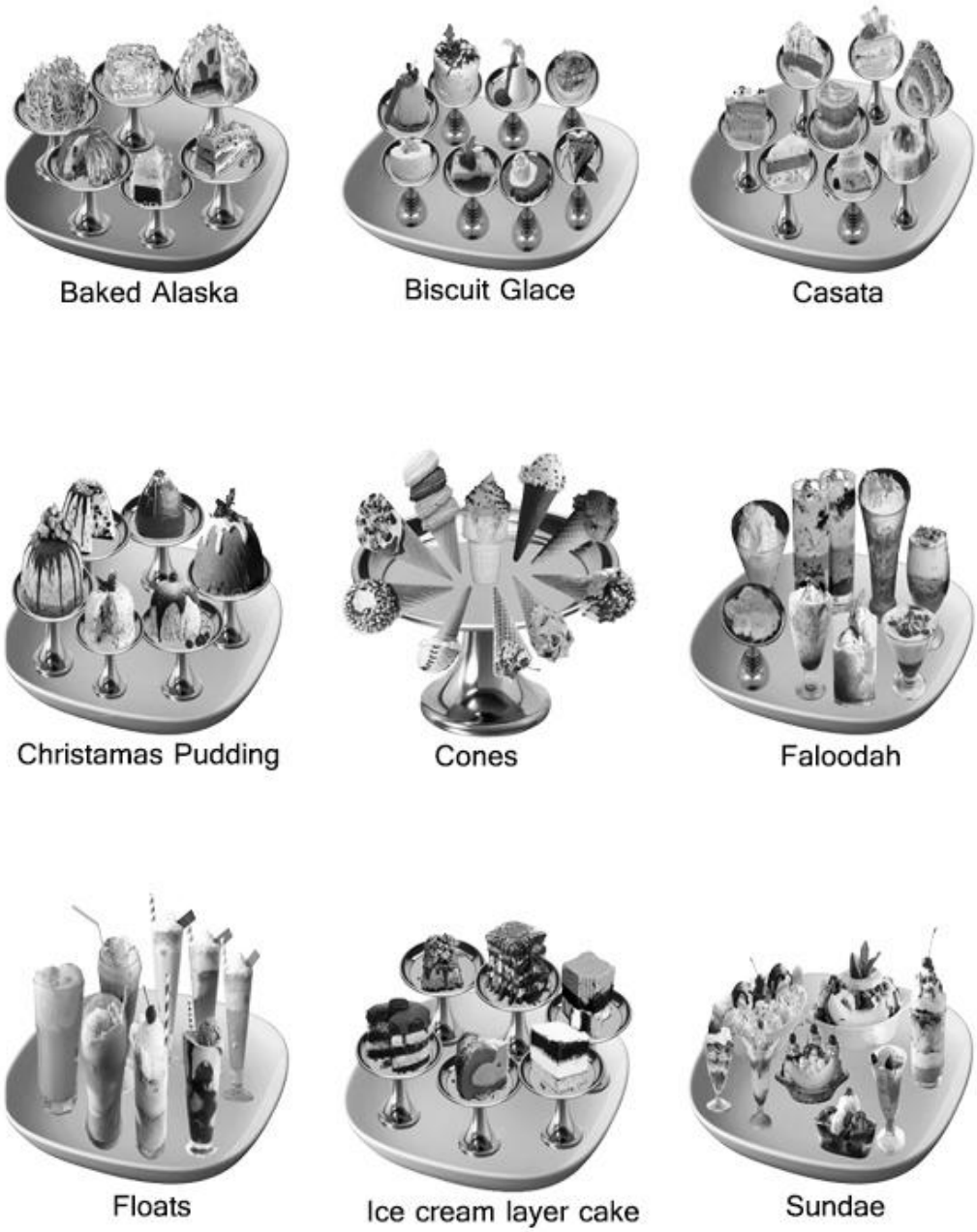

Fig. 5D Classic Frozen Dessert

CHECK YOUR PROGRESS-II

1. Classify frozen desserts.

2. What are Novelties?

3. What is Torte?

5.8 SUMMARY

- Biscuits or cookies is a sweet or savory dry flat cake with a high calorie content (420-510 / 100 gm) The raw materials used for biscuit manufacture is flour, sweeteners, shortening, milk, leavening agents and other miscellaneous products.
- Both, cookies and biscuits mean the same, while the difference lies in the places where they are known differently, i.e. the word 'cookies' is often referred to biscuits and cookies in the American countries, whereas the term, 'biscuits' is generally used is in the British countries.
- Cake flour is made with soft wheat, so you get less protein (7.5%) in your flour, less gluten in the mixture, and a very tender, potentially puffy, cookie. With bread flour, made from hard wheat, you have an increase in protein (to 12%), an increase in gluten and, therefore, a chewy cookie. To lesser the strength, corn starch can be added.
- Sweeteners are some form of sugar is used in all cookie recipes. It is a tenderizing agent, adds sweetness and affects the spread of the cookie. Apart from this it also imparts volume to the product. They are Granulated sugar, molasses, brown sugar and also saccharine, glucose or lactose may be added.

- Baking soda, baking powder and Ammonium bicarbonate are the classic leaveners in cookie recipes and they are mixed with dry ingredients. Used together and separately, these components affect the puffiness to some degree (baking powder), but they also affect the color of the cookie.
- Cocoa, nuts, extracts, and other flavorings, all contribute to the character, colour and taste of a cookie.
- Sodium metabisulphite is a reducing agent for the modification of the strength of the gluten in doughs. It causes the gluten to become more extensible and less elastic and so reduces shrinkage of the dough pieces during baking.
- Lecithin is an emulsifier produced from soya beans and available in liquid or powder form. It may be added to the fat or directly into the dough mix.
- The mixing methods for making cookie or biscuits are: One-stage method, Creaming method, Sanding method and Sponge method
- Cookies are to packed in air-tight containers or foil, so that they are protected from outside moisture and pressure.
- Different doughs are prepared for making biscuits, like: Hard Developed Doughs, Semi-sweet Doughs, Short Doughs and Batters
- Wafers, unlike biscuits, are a low fat, low sugar product. They normally consist almost entirely of flour.
- Wafers are baked by pouring the batter on a heated metal plate and bringing a second plate that is hinged down on the first, trapping the batter between the two plates. The plates are likely to have been treated with a releasing agent and may have a pattern inscribed on them.
- Overrun is the term used when there is an extra increase in volume of ice cream. lnmitation ice cream is known as Mellorine , which is cheaper than ice cream because inexpensive vegetable fats and oils are substituted for the more expensive dairy fats.
- Churning of ice creams contributes a great deal to texture by preventing large ice crystals from forming and incorporating air into the base as it freezes.
- Pasteurization is a process of heat processing a liquid or a food to kill pathogenic bacteria to make the food safe to eat. It involves heating the food to kill most harmful microorganisms.
- Homogenization- is a process that gives milk its rich, white color and smooth texture. Milk that has not been homogenized contains a layer of cream that rises to the top of a glass.

5.9 GLOSSARY

Absorption: The amount of water a flour can take up and hold while being made into a simple dough. Absorption is based on a predetermined standard dough consistency or stiffness; expressed as a percentage of the weight of flour.

Air cell: A tiny bubble of air, created by creaming or foaming that assists in leavening a dough or batter.

Bagged: A cookie makeup method in which the dough is shaped and deposited on the pan or sheet using a pastry bag.

Baked Alaska: A dessert consisting of ice cream on a sponge cake base, covered with meringue and browned in the oven.

Bar: A cookie makeup method in which the dough is shaped into flattened cylinders, baked, and sliced crosswise into individual cookies; also, a cookie made by this method.

Bavarian cream: A light, cold dessert made of gelatin, whipped cream, and custard sauce or fruit.

Biscuit method: A mixing method in which the fat is mixed with the dry ingredients before the liquid ingredients are added.

Bombe: A type of frozen dessert made in a dome-shaped mold.

Cassata: An Italian-style bombe, usually with three layers of different ice creams, plus a filling of Italian meringue.

butter: A white or yellowish fat found in natural chocolate.

Cocoa: The dry powder that remains after cocoa butter is pressed out of chocolate liquor.

Cookie: North American name for a small, flat, baked treat, usually containing fat, flour, eggs, and sugar. Known in England and other English speaking countries as "biscuit."

Dough conditioner: Any of a variety of ingredients added by the baker during production of yeast products to improve gluten development, aid yeast fermentation, and delay staling. Also called dough improver.

Dried whole milk: A powdered form of whole milk with the water content removed.

Drop batter: A batter that is too thick to pour but will drop from a spoon in lumps.

Foaming: The process of whipping eggs, with or without sugar, to incorporate air.

French meringue: Egg whites and sugar whipped to a foam; also called common meringue.

French-style ice cream: Ice cream containing egg yolks.

Frozen mousse: A still-frozen dessert containing whipped cream.

Frozen soufflé: A frozen mousse served in a soufflé dish or ramekin so that it resembles a baked soufflé.

Frozen yogurt: A frozen dessert similar to ice cream but made with yogurt instead of or in addition to milk.

Gelato: Italian ice cream.

Granité : A coarse, crystalline frozen dessert made of water, sugar, and fruit juice or another flavoring.

Half-and-half: A kind of high-fat milk or low-fat cream containing 10 to 18 percent milk fat.

Ice cream: A churn-frozen mixture of milk, cream, sugar, flavorings, and, sometimes, eggs.

Icebox: A cookie makeup method in which the dough is shaped into cylinders, refrigerated until firm, and then sliced.

Italian meringue: A meringue made by whipping a boiling syrup into egg whites.

Macaroon: A cookie made of eggs (usually whites) and almond powder, almond paste, or coconut.

Meringue: A thick, white foam made of whipped egg whites and sugar.

Milk chocolate couverture: Couverture consisting of chocolate liquor, sugar, and milk solids.

Overrun: The increase in volume of ice cream or frozen desserts caused by the incorporation of air while freezing.

Parfait: A still-frozen dessert made of egg yolks, syrup, and heavy cream.

Philadelphia-style ice cream: Ice cream containing no eggs.

Sanding method: A pastry- and cookie-mixing method involving blending the fat with the dry ingredients and then adding in egg.

Scone: A type of biscuit or biscuit like bread.

Sherbet: A frozen dessert made of water, sugar, fruit juice, and, sometimes, milk or cream.

Soufflé: A still-frozen dessert made in a soufflé dish so it resembles a baked soufflé.

Stencil paste: A type of thin cookie or wafer dough used to make cookies in decorative **shapes**; also used to make decorative patterns in ribbon sponge.

Sundae: A dessert consisting of ice cream in a dish, with various sauces and toppings.

Swiss meringue: Egg whites and sugar warmed, usually over hot water, and then whipped to foam.

Weak flour: Flour with low protein content.

White couverture: A confection consisting of cocoa butter, milk solids, and sugar. Sometimes erroneously called white chocolate.

5.10 REFERENCE/BIBLIOGRAPHY

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5.11 TERMINAL QUESTIONS

Short answer type questions:

1 What is the difference between:
   a. Rolled cookie and drop cookie
   b. Moulded cookie and pressed cookie
   c. Bar cookie and sandwich cookie
   d. No bake cookie and fried cookie
2 Discuss the role of flour in making of cookies and biscuits.
3 How ingredients impact on cookie recipe?
4 Write the name of 5 major equipments used in cookie making. Explain the role of each.
5 What are the steps that are followed after the cookie have been baked?
6 Why cooling is important in cookies and biscuits making?
7 What are the Characteristics of good cookie or biscuit?
8 Why churning is important in frozen dessert making?
9 Write a brief note on Classic frozen desserts.
10 What might be the possible reason for cookies getting:
   a. Bottom browning
   b. Chewy texture
   c. Lack of spread
   d. Not smooth
   e. Sticking to the pan
   f. Too crumbly
   g. Too hard
   h. Too soft
   i. Tough
   j. Under-cooked

Long answer type questions:

1. Classify cookies in detail.
2. What role do liquids play in making cookies and biscuits?
3. Elucidate the different ingredients used in making cookie and biscuits.
4. What are the mixing methods used in the preparation of cookies and biscuits?
5. Classify cookies and biscuits according to their make-up.
6. Discuss the precautions to be taken while making cookies/biscuits.
7. Write in detail the making of wafers.
8. Classify frozen desserts in detail.
9. How ice-cream is manufactured? Explain in detail.
10. Write in detail about the quality of different types of Ice creams.