

- Gain knowledge on the types of baked products, ingredients needed for baking and method of baking.
- Obtain the skill of baking and setting up his/her own bakery unit.
- Understand the techniques used to prepare products that are easy to bake and sell.

A bakery is an establishment that produces flour- based food like bread, cookies, cakes and pies. The first evidence of baking occurred when humans took wild grass soaked in water and mashed it into a paste. The mashed paste was poured on flat, hot rocks to produce a bread like substance. Later when fire was invented the paste was roasted on hot embers, which made baking easier. Baking began in Greece around 600 B.C. The art of baking was developed early during the Roman empire. Due to the fame and desire the art of baking received importance around 300 B.C. So, baking was introduced as an occupation and respectable profession for the Romans.

Baking needs an enclosed space for heating called **an oven**. The oldest oven was discovered in Croatia dating back 6,500 years ago. Asian cultures have adopted steam baskets to produce the effect of baking. The heat can be supplied by wood, coal, gas or electricity. An oven mitt (an insulated glove) or a peel (a longhandled tool) is used to add or remove items from the oven. Baked goods are served during religious festivals and are also a fundamental part of everyday food consumption in many cultures.

# 5.1 Types of Bakery Products

**Classification:** Bakery products (Table 5.1) can be classified into four categories according to the way in which the products are leavened.

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## Margarine -

It is a hydrogenated, hardened fat from vegetable oils, which involves chemical reaction converting the unsaturated fatty acids into saturated fatty acids

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| Table 5.1 Types of Bakery Products |                     |  |   |  |  |  |  |  |
|------------------------------------|---------------------|--|---|--|--|--|--|--|
| No                                 | Method of Leavening | Examples of Bakery Products            | Leavening Agent   |  |  |  |  |  |
| I.                                 | Yeast raised        | Breads and sweet doughs                | Leavened by a rbon-di-oxide   |  |  |  |  |  |
| П                                  | Chemia Ily leavened | Layer a kes, Doughnuts and<br>Bisa its | Leavened by a rbon-di-oxide<br>from baking powders and<br>b emia I agents       |  |  |  |  |  |
| 111                                | Air-leavened        | Angel a kes and Sponge a kes           | Ino rporating air into egg,<br>sugar and flour mixture<br>without baking powder |  |  |  |  |  |
| IV                                 | Partially leavened  | Pie c usts and e rtain c ak ers        | No leavening agents are used  |  |  |  |  |  |

#### Types:

| 1. Bread    | 2. Cakes   | 3. Bun       | 4. | Pastr | ies |
|-------------|------------|--------------|----|-------|-----|
| 5. Bisa its | 6. Cookies | 7. Doughnuts | 8. | Crak  | ers |

# 5.2 Baking Ingredients

- 1. Wheat flour / Maida
- 2. Leavening agents
- 3. Yeast
- 4. Baking powder
- 5. Eggs
- 6. Shortenings
- 7. Sugar

## 1. Wheat Flour / Maida

- Wheat is used principally for baking.
- Wheat contains 6–18 per cent protein.
- Wheat flour contains glutelin and gliadin as proteins which are commonly known as gluten (functional protein).
- The strength of the wheat flour is based on the quality of gluten used.
- The quality of baking is related to the strength of wheat.
- Maida is the refined wheat flour which is commonly used.

**Structure of Wheat:** Wheat grains are composed of outer bran coats, a germ and starchy endosperm.

## a. Bran

• Bran is the outer layer of the kernel and constitutes 5 percent of the kernel.



Plate 5.1: Struc ure of Wheat

- During milling the bran is discarded.
- Bran is rich in fibre, minerals, thiamine and riboflavin.

## b. Aleurone Layer

- This is located just under the bran.
- It is rich in protein, phosphorous, thiamine and also contains moderate amount of fat.
- The aleurone layer makes up about 8 percent of the whole kernel and is lost in the milling process along with bran.

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## c. Endosperm

- This is the large central part of the kernel and constitutes 84-85 percent of the kernel.
- The endosperm consists mainly of starch and protein. But low in mineral matter, fibre, fat and vitamins.

## d. Germ

- This is a small structure at the lower end of the kernel and is separated from the endosperm by the scutellum.
- It makes up 2-3 percent of the whole kernel.
- It is rich in protein, fat, vitamins and minerals.
- Germ serves as a store of nutrients for the seed during germination. During milling some of the germ is lost along with the bran and aleurone layer.

#### **II.** Types of Wheat

**a. Hard Wheat:** Hardness is related to the degree of adhesion between starch and protein. Hard wheat yields coarse flour and is a good source of gluten. It is used to make bread flour.

**b. Soft Wheat:** Soft wheat gives very fine flour and contains less amount of good quality protein. It is used for making cakes, cookies and pastries.

**c. Strong Wheat:** Strong wheat is used to make good quality bread because it produces large loaf volume, good crumb structure and product with good keeping qualities. It has a high protein content.

**d. Weak Wheat:** Low protein content in weak wheat produces only a small loaf with coarse crumb structure. The flour of weak wheat is good for biscuits and cakes.

## **III. Types of Wheat Flour**

Some of the types of flours used for baking are as follows:

## a. Bread Flour:

- It is milled from blends of hard wheat.
- The moisture content, protein content, and starch quality can be controlled.
- It is used mainly for making products leavened with yeast.

**b. Soft Flour:** It is used for making all types of high quality cakes and sponge cakes.

#### c. Self-Raising Flour:

- A mixture of wheat flour and sodium carbonate is known as self-raising flour.
- This flour is used for making puddings, cakes, pastries etc.

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## **Proofing** -

It is the final rise of shaped bread dough before baking (Also called as proving or blooming)

## d. All-Purpose Flour:

- It is made from a blend of hard and soft wheat and has a moderate protein content.
- It is suitable for use in the yeast and quick breads, biscuits, pastries and cakes.

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## e. Biscuit Flour

- Biscuit flour is made from weak wheat of low protein content.
- The flour should make a dough having more extensibility, but less spring (resistance) than bread dough.
- The extensibility of biscuit flour dough may be increased by the addition of sodium metabisulphite to the dough.
- Dough pieces should retain the size and shape after being stamped out.

## f. Cake Flour

- Cake flour is a medium strength flour ground from soft low protein wheat of fine structure.
- This flour allows the aerated structure to be retained after the cake has been built up.

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# Bleaching -

A chemical or enzymatic process employed to destroy the natural yellow colour of the flour due to plant pigments namely carotenoids.

Eg: Maida is bleached refined wheat flour

**g. Pastry Flour:** Pastry flour is made of soft wheat which is fairly low in protein.

#### 2. Leavening Agents:

Leavening agents are substances that cause expansion of dough and batters by releasing gases. It produces porous structure in the baked products. The important leavening agents are as follows:

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- a) Yeast
- b) Baking powder
- c) Steam obtained from heating of the dough in the oven
- d) Air in a dough or batter expands in the oven while heated
- e) Carbon-di-oxide from fermentation.

**3. Yeast:** Two forms of yeast used in baking are

- moist compressed yeast
- active dry yeast

In the bread making process yeast ferments simple sugars and produces carbon-di-oxide and alcohol. The increase in fermentation rate with time is due to two conditions in a dough.

- a) Yeast cells are multiplying and the enzymes are becoming more active while the dough is prepared and held.
- b) Sugar for fermentation is gradually being liberated from starch in the dough by the action of natural flour enzymes.

**4. Baking Powder:** Baking powders are related foods that contain particles of sodium-bi-carbonate. Baking powders are of three kinds:

- Fast acting
- Slow acting and
- Double acting powders (contain both fast and slow acting in combination with sodium bi-carbonate).

#### 5. Egg:

- Egg acts as principle structure builder.
- It adds flavour, colour and increases the nutritive value of the baked product.

 Egg white contains protein. When whipped it forms films and entraps air. On heating it coagulates to produce rigidity.

## 6. Shortenings:

- Shortenings are fats and oils.
- Butter, margarine and hydrogenated oils are the most common shortenings used in baking.
- It acts as tenderizers.
- It melts and releases air bubbles which will help in the leavening action of baking powder and expanding steam.

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## Transfat -

A fat resulting from the partial hydrogenation process that converts the cis form of unsaturated fats into trans form of unsaturated fats.

Transfats are found in Margarine and Baked goods.

## 7. Sugar:

- Sugar is a tenderizer in baked foods.
- It is necessary for yeast growth and indirectly aids the fermentation process.

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## **Caramelisation** -

It is a non-enzymatic browning process resulting due to the heating of foods containing sugar into a nutty flavor and brown colour

Sugar caramelizes at 180°C-210°C

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- Brown colour of the crust is due to the Maillard reaction between the protein and sugar which occurs during baking.
- Sugar influences the tenderness and the volume of baked products. Honey and glucose are also used in baked products.

## 8. Other Ingredients:

Milk powder and skimmed milk are used in bread and bun making. It increases the nutritive value of bread. It improves flavour and gives a brown crust.

Oxidising agents like potassium bromate, potassium iodate and calcium peroxide are used to improve the handling characteristics of the dough and specific volume and texture of the finished products.

Salt has a retarding effect on yeast fermentation. Salt is used as a taste enhancer and as a preservative.

Water is important for gluten formation. It dissolves sugar and salt and serves as a dispersion media for yeast cell.

# 5.2.1 Principles of Baking

Baking is a heating process in which many reactions occur at different rates. Some of these reactions include the following:

- 1. Evolution and expansion of gases.
- 2. Coagulation of gluten and eggs.
- 3. Gelatinization of starch.
- 4. Partial dehydration from evaporation of water.
- 5. Development of flavours.

- 6. Changes of colour due to Maillard browning reactions between milk, gluten and egg proteins with reducing sugars, as well as other chemical changes.
- 7. Crust formation.
- 8. Crust darkening from Maillard browning reactions and caramelization of sugars.

# 5.3 Preparation of Biscuits and Cookies

# 5.3.1 Biscuit

A small baked unleavened cake, typically crisp, flat and sweet.

**Ingredients Needed:** The main ingredients in most types of the biscuits are as follows:

- 1. Flour
- 2. Sugar
- 3. Fat

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- 4. Water and milk
- 5. Baking powder
- 6. Essence

The relative proportions in which these ingredients are used differ according to the variety of biscuits being made. Aeration in biscuits is accomplished by means of baking powder.

## **Types of Biscuits**

According to the methods of preparation, biscuits are divided into the following types:

## 1. Rubbed in Biscuits:

It is prepared by rubbing in the fat into the flour. This is done by placing the flour in a large mixing bowl, then adding butter which has been cut into pieces then rubbing both the ingredients together between the fingertips until the mixture resembles breadcrumbs.



▲ Figure 5.1 Types of Bisa its

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The following is a basic recipe using the rubbing in method which makes around 12 small biscuits.

Quantity

| Plain flour(maida) | : | 100g    |
|--------------------|---|---------|
| Butter, cubed      | : | 50g     |
| Caster sugar       | : | 50g     |
| Egg yolk           | : | 1       |
| Vanilla essence    | : | 1g      |
| Salt               | : | a pinch |
|                    |   |         |

Ingredients



A Plate 5.2 Rubbed in Bisa its

## Method

- Heat oven to 190°C.
- Place the flour in a large mixing bowl, add the butter cubes and rub in with fingertips until the mixture resembles breadcrumbs.
- Stir in the sugar then add the egg yolk and vanilla extract and mix to a firm dough. Add a little milk if the dough is too thick.

- Although the dough is firm, it often benefits from a short time chilling in the refrigerator or in the freezer.
- It can be rolled out to around 1cm or ½ inch thickness before being cut into shapes or can be moulded into a log, chilled or frozen well, then cut into slices
- Bake for 10–15 minutes until slightly risen and just golden. Cool on a wire rack.

## 2. Creamed Biscuits:

Fat and sugar should be creamed. This is done by placing softened butter in a large mixing bowl, then adding the sugar, and beating the ingredients together with a wooden spoon or electric whisk, until the mixture is well blended, light and fluffy.

Depending on the type of biscuit being made, wet ingredients such as eggs or milk are stirred in before the flour or other dry ingredients are added. These doughs are often very soft, so small spoonfuls are dropped onto baking sheets.

## 3. Whisked Biscuits:

The name refers to the way in which the egg content is treated. Egg whites are



Plate 5.3 Creamed Bisa its

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whisked until firm. Egg yolks/whole eggs are whisked together with the sugar until thickened and lightened.

These types of biscuits range from straight-forward whisked egg whites with added sugar in the form of light as air, meringues to more substantial biscuits such as coconut macaroons.



A Plate 5.4 Whisked Bisa its

## 4. Melted Biscuits:

The recipes which include liquid sweeteners like honey, golden (corn) syrup or molasses. The biscuit is prepared after melting all sweeteners (including sugar) with fat and stirred until mixed well. The other ingredients are added to the melted ingredients and mixed in the saucepan. The mixture can be soft enough to easily drop from a spoon.

## 5.3.2 Cookies

Cookies are baked or cooked items that are small, flat and sweet. It is prepared using



A Plate 5.5 Melted Bisa its

flour, sugar and some type of oil or fat. Other ingredients such as raisins, oats, chocolate chips and nuts are added, to enhance the taste, appearance and variety.

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# Cookie -

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Place of origin – Persia 7<sup>th</sup> century. The Dutch word 'koeji' was Anglicized to cookie

## **Types of Cookies**

**1. Drop Cookies:** These are made from relatively soft dough that is dropped by spoonful on to the baking sheet. During baking, the mounds of



dough spread and flatten. Chocolate chip cookies, oatmeal cookies and rock cookies are popular examples of drop cookies.

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▲ Figure 5.2 Types of Cookies



A Plate 5.6 Drop Cookies

| Ingredients     | Quantity         |
|-----------------|------------------|
| Maida           | : 2½ cups        |
| Butter          | : 1 cup          |
| Sugar           | : 1 cup          |
| Egg             | :1               |
| Milk            | : 2 table spoons |
| Vanilla essence | : 1 teaspoon     |
| Salt            | : a pinch        |

## Method

- Preheat oven to 190°C.
- Lightly coat 2 cookie sheets with vegetable oil.

**Drop/short cookies** 

- Sift flour, baking powder and salt together.
- Beat egg yolks in a mixer bowl until pale and thick.
- In a clean mixer bowl, with clean beaters, beat egg whites to soft peaks.
- Beat in sugar 1 table spoon at a time, until stiff and glossy.
- Gently fold egg yolks into egg whites.
- Fold in dry ingredients and milk until just blended.
- Drop by level tablespoonfuls 2 inches apart onto prepared cookie sheets.
- Bake for 10 minutes or until golden.
- Carefully transfer to wire racks to cool.

2. Stiff Batter Cookies: These are prepared from a stiff dough. It is made stiffer by

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refrigerating before cutting and baking. Then rolled into cylinders which are sliced into round cookies before slicing. Pinwheel cookies are the best example.



Plate 5.7 Stiff Batter Cookies

**3. Meringue Cookies:** These are light, airy, sweet, and crisp because whipped egg whites and sugar are the base ingredients. It is a gluten – free sweet cookie, without flour.



▲ Plate 5.8 Meringue Cookies

**4. Sponge Cookies:** These are light and airy like the meringue cookies but whole egg is used instead of only egg whites.

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A Plate 5.9 Sponge Cookies

## Tips for baking Cookies and Biscuits

- 1. Make sure that ingredients are at room temperature before starting.
- 2. Make sure that the cookie dough is nice and cold before baking.
- 3. Do not over mix dough when baking cookies.
- 4. Use powdered sugar instead of flour to roll out dough.
- 5. Cool the cookies and biscuits completely before storing, otherwise the steam will soften it up.

# 5.4 Bakery Unit

A systematic way of setting up a smallscale bakery is as follows:

The following five points should be considered while deciding to start a Bakery unit.

- 1. The population and purchasing capacity of the people living in that area
- 2. Availability of raw materials,

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▲ Plate 5.10 Bakery Unit

- 3. Availability of electricity and other fuels.
- 4. Availability of potable water.
- 5. Transport and marketing.

#### 1. Location

Bakery unit can be located near industries, educational institutions and public transport services.

## 2. Government Procedures

The detailed information on the government procedure can be obtained from the office of the State Directors of Industries and Small Industries Service Institutes.

## 3. Arrangement for Finance

The financial planning of project is a very important factor in a country like India, where the prices of most of the raw materials are fluctuating heavily. The main problem which is faced practically by every entrepreneur is obtaining loans from banks and financial institutions on time. Proper precautionary measures must be taken for effective planning of the finances.

#### 4. Design of the Plan

The machinery layout can influence erection cost, operating and maintenance cost, safety and convenience.

The following points may be used as guidelines for layout planning.

- a. A flow chart indicating the flow of materials should be first prepared and then it should be arranged in a proper way.
- b. Sufficient distance must be kept between each process or storage equipment of the major type to provide enough space for the movement of men, material and machinery.
- c. The baking oven should preferably be located in one corner of the plant which is open from all sides rather than in the middle or centre of the plant.

## 5. Selection of Equipment

Type of equipment selected will depend on the type of products, the volume, the size and the profitability of the products to be manufactured.

## 6. Total Space Required for the Bakery

A minimum area of 1200 sq.ft.is required for the production of 3000 loaves of 400g each per day (i.e flour utilised will be approximately 900 kg) which can accommodate future expansion up to 5000 to 6000 loaves of 400g each per day.

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▲ Figure 5.3 Plant Layout of a Small Bakery

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## 7. Electricity

The electrical installations vary from place to place and therefore it is essential that data should be obtained from local electricity board regarding the approximate cost of the wiring and cable laying charges to be paid to the electricity board including deposits. The estimated cost of consumption varies from place to place.

## 8. Equipment Needed for a Bakery Unit

- 1. Bread kneading machine
- 2. Bread moulding machine

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- 3. Power operated slicer
- 4. Bread wrapper and sealing machine
- 5. Wooden tables of different sizes
- 6. Oven (Electrical)
- 7. Storage cabinets
- 8. Baking trays
- 9. Racks for cooling breads
- 10. Weighing scales and weights
- 11. Office tables and chairs
- 12. Bread tins
- 13. Cake moulds
- 14. Flour sieve equipment/Sifter
- 15. Egg beater (Small and big)
- 16. Vessels of different sizes
- 17. Spoons
- 18. Knives
- 19. Boards

**Maillard Reaction** (/mai'jɑ:r/my-**YAR**; French pronunciation: [majaʁ]) is a chemical reaction between amino acids and reducing sugar that gives browned food its distinctive flavor.

**Meringue** (/məˈræŋ/,<sup>[1]</sup>*m∂***-***RANG*; French pronunciation: [məʁɛ̃g])- An item of food made from a mixture of egg whites and sugar baked until crisp.

#### Linkages

https://www.youtube.com/watch?v=AWo9NcOTp0U- Rubbing method

https://www.youtube.com/watch?v=uJwekkbGPns-Classic Chocolate Chip Cookies

**Student Activity** 

- Collect recipes using yeast solution.
- Find recipes for each type of biscuit and cookie and prepare them.
- Sale of prepared products in school canteen
- Observe and evaluate a bakery near school or home, using questionnaire.

**Teacher Activity** 

- Demonstrate the preparation of yeast solution
- Demonstrate biscuit and cookies recipe.
- Prepare a questionnaire cum rating scale to evaluate a bakery.

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# Questions

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- I. Choose the correct answer
- 1. Yeast raised bakery products are leavened by .....
  - a. Carbon-di-oxide
  - b. Sodium-bi-carbonate
  - c. Incorporating air through whisking
  - d. Potassium iodide
- 2. Maillard reaction is due to
  - a. Coagulation of gluten and eggs
  - b. Caramelization of sugar
  - c. Reaction between amino acids and reducing sugars
  - d. Gelatinization of starch
- 3. Baking is a cooking method that uses prolonged .....
  - a. Moist heat
  - b. Microwave
  - c. Combination of dry and moist heat
  - d. Dry heat
- 4. ..... serves as a store of nutrients for the seed during germination.
  - a. Germ
  - b. Endosperm
  - c. Bran
  - d. Aleurone layer
- 5. ..... is refined wheat flour.
  - a. Maida c. bran
  - b. Semolina d. samba rava
- 6. ..... contains a good source of gluten.
  - a. Soft wheat c. Strong wheat
  - b. Hard wheat d. Weak wheat
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- 7. Weak wheat is used for making
  - a. Cakes
  - b. Bread
  - c. Biscuits and

- cookies
- d. Tarts



- 8. Bread flours should have high ..... content.
  - a. Vitamin c. Mineral
  - b. Carbohydrate d. Protein
- 9. Bread flour is usually leavened by
  - a. Chemical agents
  - b. Baking powder
  - c. Yeast
  - d. Incorporating air
- 10. ..... has a retarding effect on yeast fermentation.
  - a. Sugar
  - b. Baking powder
  - c. Ajinomotto
  - d. Salt
- 11. ..... is an oxidising agent used to improve the handling characteristics of the dough.
  - a. Potassium bromate
  - b. Potassium metabisulphate
  - c. Sodium-bi-carbonate
  - d. Potassium Iodide

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- 12. A ..... is a small baked unleavened cake, typically crisp, flat and sweet.
  - a. Cookie c. Tart
  - b. Biscuit d. Meringue

## 13. ....is a drop cookie.

- a. Pinwheel cookie
- b. Macaroon
- c. Short bread
- d. Oatmeal cookie

- 14. Aeration of biscuits is accomplished by means of .....
  - a. Baking c. Potassium powder iodide
    b. Yeast d. Salt
- 15. The total space to bake 3000 loaves of 400 g each per day is .....
  - a. 2000 sq.ft.c. 1500 sq.ft.b. 1200 sq.ft.d. 17000 sq.ft.

- II. Write in 3 lines (3 marks)
- 1. Indicate the uses of wheat.
- 2. Write a note on self- raising flour.
- 3. What are the leavening agents?
- 4. Enumerate the conditions for yeast fermentation?
- 5. Brief on baking powders.
- 6. How is egg used in baking?

## III. Write in a paragraph (5 Marks)

- 1. Draw the structure of wheat and explain.
- 2. State the principles of baking.
- 3. How are bakery products classified?
- 4. Explain the types of wheat.
- 5. Why tenderizers are used in baking? Explain
- 6. List the equipment needed for a bakery unit.
- IV. Answer in detail
- 1. What are the types of wheat flour? Explain
- 2. Explain biscuits in detail.
- 3. Give a detailed account on cookies.

- 7. Classify biscuits.
- 8. How are cookies classified?
- 9. Indicate the guidelines to be followed while setting up a bakery unit.
- 10. Write any 2 products made using a) baking powder b) yeast
- 7. Draw the Layout of a small bakery unit.
- 8. Write a recipe for preparing a cookie.
- 9. Give a standardized recipe for preparing a biscuit.
- 10. What are the types of yeast? How is yeast prepared?

- 4. How will you set up a bakery unit?
- 5. List the baking ingredients. Explain any 4.

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