



ACADEMIC WORLD SCHOOL™
BEMETARA

Class -VI
Subject- Science

1

Food – Where Does It Come From?

Let us Learn about

- Variety of food
- Ingredients of food
- Sources of food
- What animals eat
- How to avoid wastage of food



Previous Connect

All living things need food to stay alive, grow and get energy. Plants and animals are the two main sources of food. Animals are grouped as herbivores, carnivores, omnivores, scavengers and decomposers according to the food they eat.

Food is a basic necessity of all living things.

- It provides energy to do work.
- It helps in the growth of the body.
- It repairs worn-out cells.
- It gives strength to the body to protect itself from diseases.

Food is a 'fuel' for the body. Like a car cannot run without petrol, living things cannot survive for long without food. It is not only necessary for humans but also for plants and animals.



A boy eating food

VARIETY OF FOOD

We eat different types of food – like eggs and bread for breakfast; rice, dal, chapatti, vegetables, fish and fruits for lunch and dinner. Each meal consists of different food items.



Different types of food





Activity 1

Make a list of food items you eat during the day. Distribute them into different meals. Food items eaten

Meal	Food items
1. Breakfast	
2. Lunch	
3. Dinner	



Dal

INGREDIENTS OF FOOD

Your mother cooks different dishes for you. To prepare them she uses different food materials.

Many food items that you eat contain more than two materials. Food materials that are used to prepare a dish are called **ingredients**. For example, the dal you eat, consists of pulses, water, salt, oil and spices. Khmer is prepared using rice, milk and sugar.

Various types of dishes can be prepared by cooking same ingredients in different ways. For example, wheat flour and sugar, can be used to prepare biscuits as well as halwa.



Khmer



Activity 2

Given below are the names of five food items. Write the ingredients used to prepare them.

Food items	Ingredients
• Roti	
• Idli	
• Vegetable curry	
• Sandwich	
• Boiled rice	

SOURCES OF FOOD

We derive our food from two main sources— plants and animals.



Plants as a Source of Food

You have learnt that green plants are the only living things that can prepare their own food by the process of **photosynthesis**. Hence, they are called **producers**.

Plants use only a part of the food prepared by them for their own growth and survival. The rest of the food is stored in different parts of the plant. We eat these parts. The parts of the plant that we eat are called **edible parts**.

Some food items that are obtained from plants are as follows:

- **Cereals:** Wheat, rice, maize are called cereals. Cereals constitute the major part of our diet and are a rich source of carbohydrates.



Paddy (Rice)



Wheat



Maize

- **Pulses:** Grams, peas, beans are collectively called pulses. These are a rich source of proteins.



Beans



Peas



Grams

- **Sugar:** It is obtained from sugar cane and sugar beet. It is a rich source of carbohydrates.



Sugar cane



Sugar beet



Tea leaves

- **Beverages:** Tea and coffee are called beverages. Tea is made from tea leaves. Coffee is made from coffee beans.
- **Oils:** These are obtained from mustard seeds, groundnut seeds, coconut etc. Oils are rich in fats and provide energy.
- **Spices:** Chilli, turmeric, fennel seeds (saunf) are some spices added to the food to make it tasty. Spices add flavour to the food. Some spices also have medicinal values.

Fruits and vegetables are a rich source of vitamins, minerals and roughage. We get a variety of fruits and vegetables from plants.



Spices



Fruits



Vegetables

Different Parts of Plants also Serve as Sources of Food

- **Root:** Carrot, radish, turnip are the roots of the plants that are eaten as food.
- **Stem:** Potato, onion, ginger, sugar cane are the stems of the plants that we eat as food.
- **Leaf:** Spinach, lettuce, cabbage and coriander are some leaves that we eat as food.
- **Flower:** Banana flower, broccoli, cauliflower are the examples of some flowers that are eaten as food.
- **Bud:** Cloves are the buds that are added in food to give it an attractive smell and taste. Bauhinia (Kachnar) is another bud that is eaten as food.
- **Seed:** Kidney beans, corn, wheat are examples of seeds that we eat.

Some plants have more than one edible parts. For example, both the seeds and leaves of mustard plant are edible. Both the fruit and flower of banana plant are also eaten as food.



Spinach



Cabbage

Leaves that are used as food



Cauliflower



Broccoli

Flowers that are used as food



Activity 4

Given below are names of some plants. Write the edible part(s) of each of these in the space provided.

Plants	Edible part(s)
• Pumpkin	
• Garlic	
• Sunflower	
• Fenugreek	



Sprouted green gram or moong

Sprouts

Germinated seeds which are eaten raw or cooked are called sprouts. The practice of germinating seeds by soaking them in water for a few hours and then tying them in wet cloth for a few days (3-4 days) is called **sprouting**. You must have seen your mother making a salad of sprouted seeds of moong, bean or chickpea. Sprouts are very nutritious.



Activity 5

Take half a bowl of green gram and soak it overnight in water. Drain the water and tie the gram seeds in a wet muslin cloth. Keep the bundle moist by sprinkling water. You will see tiny white sprouts growing from them after a few days. Wash the sprouts, add some chopped cucumber, tomatoes, salt and lemon juice to it. Your healthy salad is ready.



Sprout salad



Time to Answer

Fill in the blanks.

- Germinated seeds are called _____.
- Cloves are the _____ of plants.
- _____ are a rich source of proteins.
- Tea and coffee are called _____.
- _____ add flavour to our food.



Activity 3

Collect specimens of spices that are used by your mother in the kitchen. Put them in small transparent plastic pouches. Staple them on a drawing sheet and write the name of the spice below each pouch.



Animals as a Source of Food

A variety of food is obtained from animals.

- Goat, chicken, fish are some of the sources of **meat**. Meat is highly rich in proteins.
- Hens and ducks provide us **eggs**. Eggs are called **poultry products**. They are rich in proteins and vitamins.



Hen

Eggs

Fish



Milk

Curd

Cheese

Dairy products

- Cows, goats, buffaloes are sources of **milk**. Milk contains all the nutrients – fats, proteins, carbohydrates, vitamins and minerals. It is also rich in calcium. Curd, butter, ghee, cheese are made from milk. They are called **dairy products**. Milk is said to be a complete food.



A beehive

- Honey is made by honeybees from the nectar of flowers. It contains sugar, minerals and enzymes. Honeybees transform nectar into honey by a process of **regurgitation**, and store it as a primary food source in honeycombs inside a beehive. Rearing of honeybees for collecting honey on a large scale is called **apiculture**.

In the cold weather or when the fresh food sources are scarce, bees use the stored honey as their source of energy.

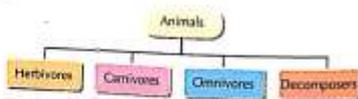
Honey has medicinal value. It is used to cure diseases like sore throat. It is also eaten with bread and used in cooking.

FACT FILE
The animals which eat only fruit diet are called frugivores.

WHAT ANIMALS EAT

Animals are living things and also require food. Unlike plants, they cannot prepare their own food. They are called **consumers**, as they depend on plants or other animals for their food.

Based on the kind of food they eat, animals can be classified as follows:



A herbivore

Herbivores ['herbi'-plant; 'vore'-eater] are plant-eating animals, like cow, deer and graffe.

regurgitation: bring swallowed food up again to the mouth

They have sharp front teeth (incisors) to bite and pull of plants from the ground and broad molars to grind them.



A carnivore

Carnivores ['carni'-meat; 'vore'-eater] are flesh-eating animals, like lion, tiger, eagle, snake and spider. They have sharp canines to tear flesh and strong molars to grind flesh and bones. Flesh-eating birds like eagle have sharp hooked beaks and sharp claws. Some carnivores, such as snakes, swallow their food without chewing, cutting or grinding it.

Animals like jackals and vultures, that eat the flesh of dead animals are called **scavengers**. Due to their feeding habits, they help in keeping the environment clean.



An omnivore

Omnivores ['omni'-all; 'vore'-eater] are animals that eat both plants and animals. Bear, crow, raccoon and humans are examples of omnivores.

Decomposers are very tiny living organisms, like bacteria and fungi that feed on dead plants and animals and decompose them. Along with scavengers, they help to keep the earth clean.



Bacteria



Mushroom - A type of fungus

Time to Answer

Write True or False.

- Bacteria and fungi are called scavengers. _____
- Curd is a dairy product. _____
- Rearing of honeybees is called apiculture. _____
- The animals which eat only plants are called omnivores. _____

Activity 6

Complete the following table based on the food habits of animals.

Animals	Food eaten	Herbivore/Carnivore/Omnivore
Lizard
Dog

Food - Where Does It Come From?

Animals	Food eaten	Herbivore/Carnivore/Omnivore
Cow
Rat
Snake
Cat



Food left uneaten

HOW TO AVOID WASTAGE OF FOOD

Remember, food is very important for all of us and it should not be wasted. People in many countries are facing food shortage. We can avoid wastage of food in the following ways:

- Do not leave food uneaten in your plate.
- Food should be stored properly so that it is not spoiled by microorganisms, rats, etc.
- We should only eat that much food which is required by our body. Eating in excess will make us obese.

Key-Terms

- Ingredients:** materials used to prepare a dish
- Edible part:** part of the plant that can be eaten
- Herbivore:** plant-eating animal
- Carnivore:** flesh-eating animal
- Omnivore:** animal that eat both plant and flesh
- Decomposers:** microorganisms (very tiny living organisms) that decompose dead plants and animals

Now I Know

- All living things need food to stay alive and perform life activities.
- Plants and animals are the two main sources of food.
- Different parts of some plants, like the roots, stems, leaves, flowers and seeds are eaten as food.
- Animals provide us with milk, eggs, honey and meat.
- Based on what animals eat, they can be grouped as herbivores, carnivores, omnivores and decomposers.
- Scavengers and decomposers feed on dead plants and animals and hence play an important role in keeping the earth clean.
- Food is precious and should not be wasted.

Exercise

FIND THE ANSWERS OF EVERY QUESTION GIVEN BELOW FROM THE TEXT ABOVE:-

A. Answer the following questions in one word:

1. Which living beings are called producers?
2. Give one example of beverages.
3. Which is the largest carnivore?
4. Which is the largest herbivore?
5. What is the rearing of honey bees on large scale called?
6. Which animals eat only flesh of other animals?
7. Name the animals that eat plant products and flesh both.
8. Mention the process by which green plants make their own food.
9. Which part of banana flower is edible?
10. Write one energy giving food.

B. Answer the following questions in short in 25 to 30 words:

1. Draw the diagram of photosynthesis.
2. Why are animals called consumers?
3. Why is milk said to be a complete food?
4. What are sprouts? How sprouts are prepared?
5. Explain which food items are obtained from plants along with two examples.
6. Take two food items and write names of ingredients that are used to prepare them.
7. How are scavengers different from carnivores?
8. Explain how decomposers and scavengers help to keep earth clean.
9. Name 5 plants and their part that we eat?
10. Which food items are obtained by animals? Give two examples of each?

C. Answer the following question in detail in 45 to 50 words:

1. What is food? Explain the importance of food in human body?

2. Write the types of animals on the basis of food taken by them?
3. Explain how honey is made?
4. Suggest ways to avoid wastage of food.
5. Differentiate between herbivores and omnivores on the basis of their food habit.
6. Describe the animals as sources of food?

D. Think and give answer of the following questions:

1. Vegetarian food is considered best. Why?
2. Is there any food item whose source is neither plant nor animal?

2

Components of Food

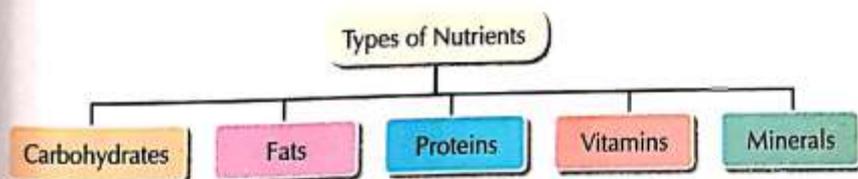
Let us Learn about

- Significance of nutrients
- Eat healthy, stay healthy
- Deficiency diseases

Previous Connect

The food we eat has useful substances called nutrients. It is important for us to eat a balanced diet to grow well. If we do not eat a balanced diet, we can suffer from deficiency diseases.

We have learnt in the previous chapter that food is essential for the body as it keeps us healthy. Food also helps in the growth of our body. Food contains some useful substances that organisms need to live and grow. These useful components are called nutrients. The food we eat contains five main nutrients as shown in the flow chart given below:



A food can contain one or more than one nutrient. For example, meat is a rich source of proteins but it also contains fats and vitamins. Our body needs some nutrients in large quantities and some in small quantities.

SIGNIFICANCE OF NUTRIENTS

1. **Carbohydrates:** They are the source of energy. The food items containing carbohydrates are called **energy-giving foods**.

FACT FILE

Cellulose is a form of carbohydrate that cannot be digested by humans. It is present in the cell wall of plant cells.

They are present in our food in mainly two forms – starch and sugar. Potatoes, bread, rice are rich sources of starch. It is easily utilised by the body to release energy. It is for this reason that glucose is given to patients who require energy urgently. Fruits, honey, table sugar are rich in glucose.



Potato

Bread

Rice

Honey

Sources of carbohydrates

Activity 1

To test the presence of starch in a food sample

Take the food sample that needs to be tested and put it in a test tube. If it is a solid, crush it and add a little water to it. Mix it well. (You can even perform this test by simply cutting a potato in two parts.) Add a few drops of iodine solution to it. If the sample turns blue-black, it contains starch.



Testing starch in Potato

Activity 2

To test the presence of sugar in a food sample

Take the food sample. If the food sample is solid, crush it and add a little water to it. Add a few drops of Benedict's solution to it. (Benedict's solution is blue in colour). Heat it for a few minutes. After heating, if the food sample turns brick-red, the food sample is rich in sugar. If it has medium sugar content, it will turn yellow. In case it has low sugar content, it will turn green in colour.



Sources of fats

2. Fats: They also provide us energy. In fact, they give us twice the energy than carbohydrates give us. Food items containing fats are also called **energy-giving foods**.

Coconut oil, nuts, almonds, butter, cream are rich in fats. On the basis of the source from which fats are obtained, they are classified into two types –

- (i) Animal fats
- (ii) Plant fats

Milk products like butter and ghee are sources of animal fats. Vegetable oils are a source of plant fats.

Fats keep the body warm. Extra fats are stored in the body and if stored in excess, it causes obesity.

Activity 3

To test the presence of fats in a given food sample

Take the food sample. Rub it on a piece of white paper. Allow the paper to dry. Observe the paper in light, the oily portion becomes translucent.

3. Proteins: They help in building new cells and repairing worn-out cells. The food items containing proteins are called **body-building foods**. They also regulate body functions and protect the body from infections. On the basis of the source from which proteins are obtained, they are classified into two types –

- (i) Animal proteins
- (ii) Plant proteins

Proteins which are obtained from animal products are called **animal proteins**. Meat, fish, egg and milk are some sources of animal proteins.

FACT FILE

Our hair is made up of a type of protein called keratin.



Sources of animal proteins

Proteins which are obtained from plant products are called **plant proteins**. Pulses, soya beans, grams, cashews are sources of plant proteins.



Sources of plant proteins

Activity 4

To test the presence of proteins in a food sample

Take the food sample in a test tube. Crush it and add some water to it. Shake it well. Add two drops of copper sulphate and then ten drops of sodium hydroxide or caustic soda to it. Shake the test tube well. If the colour of the solution changes to purple or violet, it confirms the presence of proteins in the food sample.

4. Vitamins: Vitamins protect our body from diseases. They also help to keep our bones, teeth, gums and eyes healthy. Food items containing vitamins are called **protective foods**.

Though vitamins are required by the body in very small quantities, they are very important for the proper functioning of the body. Vitamins are of different types—A, B, C, D, E and K.

- Vitamin A, D, E and K are **fat-soluble vitamins**.
- Vitamin B and C are **water-soluble vitamins**.

Sources and functions of some vitamins

Vitamin	Sources	Functions
Vitamin A	Carrots, papaya, fish oil, mango	Keeps the eyes and skin healthy
Vitamin B	Whole cereals, eggs, meat, milk	For proper functioning of the nerves, muscles and digestive system
Vitamin C	Citrus fruits	For healthy teeth and gums
Vitamin D	Panier, fish, liver oil, egg yolk, sunlight	To make bones and teeth strong
Vitamin E	Pear, eggs, nuts	To keep the skin healthy
Vitamin K	Spinach, cabbage, cauliflower	For clotting of blood

Activity 5

To test the presence of Vitamin C in a food sample

Make a paste of any food item containing starch. Boil it and add a few drops of iodine solution to the food sample. It will turn blue-black. To this add a few drops of lemon juice. The blue colour will disappear. This shows that the lemon juice contains Vitamin C. The lighter the colour becomes, more is the Vitamin C content in the food sample.

5. Minerals: Like vitamins, minerals are also required by the body in very small quantities but are essential for the proper functioning of the body. Food items containing minerals are also called **protective foods**.

Sources and functions of some minerals

Mineral	Sources	Functions
Iron	Spinach, legumes, jaggery, liver, banana	Essential for the formation of haemoglobin
Calcium	Eggs, milk, cheese, meat	Essential for bones and teeth
Phosphorus	Cheese, milk, nuts, ragi	To keep bones and teeth strong
Iodine	Iodised salt, fish, seafood	To prevent goitre and keep the body healthy

Time to Answer

Give two examples of each.

(a) Food rich in Vitamin C

(b) Food rich in animal protein

(c) Food rich in plant fat

(d) Food rich in Vitamin K

(e) Food rich in starch

Other than these five nutrients, roughage and water are also essential for the body.

Roughage—For proper digestion: The fibre present in the food we eat is called **roughage**. Vegetables like cabbage, carrots, spinach; fruits like apple, orange, peach; whole grains and pulses are rich sources of fibre. Roughage has no nutritive value but is essential for our body.

- It assists in the process of digestion.
- It helps the body to get rid of undigested food.
- It regulates bowel movement and helps food to pass down the alimentary canal properly.



Sources of roughage

Haemoglobin: a red protein responsible for transporting oxygen in the blood

FACT FILE

Water loss from the body causes dehydration. During dehydration, blood becomes thick and causes muscle pain and cramps.

Water-To prevent dehydration: It is impossible for living things to survive without water. About 70 percent of the human body is made up of water. It plays an important role in the digestion of food.

- Water is needed to transport nutrients in the body.
- Water helps to maintain a constant body temperature.
- Water also helps to eliminate wastes out of the body in the form of urine and sweat.

We get water from the liquids we drink like milk, juices, tea, etc., fresh fruits and vegetables that we eat also contain water. Our body requires 2-3 litres of water every day. Thus, it is essential to drink 6-8 glasses of water every day.



Living things cannot survive without water.

A balanced diet varies with age, sex and the kind of work a person does. For example, a growing child and a pregnant woman require a diet rich in proteins as proteins help in building new cells. A labourer doing physical work requires more carbohydrates, as he needs more energy.

Cooking Food Properly - To Prevent Loss of Nutrients

Other than eating a balanced diet, it is important to cook food properly so that the nutrients present in it are not lost or destroyed in the process.

- Food should be cooked in just enough water, so that excess water does not have to be thrown away, as it contains vitamins and minerals.
- Food should not be heated repeatedly, as the nutrients in it get destroyed by too much of heating.
- Vegetables and fruits should not be washed after peeling their skins or cutting them because the nutrients will be washed away.

Overeating Leads to Obesity

Some people tend to overeat delicious food items like ice creams, burgers, etc. Excessive intake of food containing fats and especially junk foods lead to a condition called **obesity**. Obesity is a condition of the body in which the person gains a lot of weight. An obese person becomes lazy and inactive and can suffer from heart-related problems. So, always say 'No' to junk food. Eat a balanced diet and exercise regularly to remain healthy.



An obese person

Undernutrition and Malnutrition

Undernutrition is the condition that results due to lower intake of food than the amount required by the body. The lack of essential nutrients in the diet results in a condition called **malnutrition**.

Time to Answer

Answer the following questions.

- What is roughage?
- Give four examples of fibres.
- Write one function of roughage.
- Write any one important role of water in our body.

EAT HEALTHY, STAY HEALTHY

To stay healthy, it is very important to eat healthy food.

Balanced Diet

The food items that we eat during the day are called 'diet'. To grow well and stay healthy, it is essential to eat food items from all major food groups in adequate quantities. A diet that contains all the nutrients, water and roughage in proper proportions is called a **balanced diet**.



Balanced diet

Four food groups are part of a balanced diet. These are shown in the table below:

Food Group	Food Item	Main nutrients
Milk	Milk and milk products like cheese and curd	Fats, proteins, minerals, carbohydrates and water
Vegetable and fruit	Vegetables and fruits	Carbohydrates, vitamins, minerals, water
Cereal	Rice, bread, chapatis, etc.	Carbohydrates
Protein	Pulses, meat, beans, peas, etc.	Proteins and fats

Time to Answer

Write True or False.

- Roughage has a high nutritive value. _____
- Water helps to eliminate wastes from the body. _____
- A growing child requires more fats in his diet. _____
- A balanced diet is the same for all age groups. _____
- Vegetables and fruits should be washed after peeling their skin. _____

FACT FILE

The Government of India has started the Midday Meal Scheme in schools. In this scheme, school-going children are provided with free nutritious food. It helps to solve the problem of malnutrition among poor children and also encourages children to come to school. This scheme was introduced in 1992 in Madras (now Chennai). Until now, 12 crore children have been covered under the Midday Meal Scheme.

DEFICIENCY DISEASES

Many people in our country are not able to eat a balanced diet and hence suffer from several diseases.

Deficiency diseases are caused due to the lack of some nutrients in the diet. If the deficiency of the nutrients continues for a long time, it results in diseases. Deficiency diseases are **non-communicable diseases** as they cannot be transmitted from one person to another. They can be cured by eating a balanced diet. Deficiency diseases are also called **nutritional disorders**.

Diseases caused due to deficiency of proteins

Kwashiorkor is a disease caused due to the deficiency of proteins in the diet.

It is common among children between the ages of one and five years. Such children show stunted growth, have thin limbs, scaly and dry skin, reddish hair and a protruding belly.

Diseases caused by deficiency of proteins and carbohydrates

Marasmus is a disease that occurs due to the deficiency of proteins and carbohydrates in the diet. It generally affects the children below the age of one year. A child suffering from **Marasmus** becomes very thin and lean, has dry and wrinkled skin, sunken eyes and his ribs become very prominent.

Diseases caused by deficiency of vitamins and minerals

Deficiency of vitamins and minerals in the body also results in several diseases. Some diseases that occur due to the deficiency of vitamins and minerals are listed in the table given below:



A child suffering from Marasmus (left), and from Kwashiorkor (right)

Vitamin/Mineral	Deficiency disease/Disorder	Symptoms
Vitamin A	Night blindness	Inability to see in dim light
Vitamin B	Beriberi	Weak muscles, loss of weight and appetite
Vitamin C	Scurvy	Bleeding gums, loose teeth
Vitamin D	Rickets	Bowed legs, bending of bones, development of pigeon chest
Iron	Anaemia	Pale look, tiredness, loss of appetite
Iodine	Goitre	Enlargement of thyroid gland, retarded growth
Calcium	Decay of teeth and bones	Bones become weak and teeth decay
Sodium and potassium	Body and muscles become weak; paralysis	Weakness in the body and dehydration
Flourine	Tooth decay	Increase in tooth decay
Phosphorus	Rickets	Bones become soft and bent

Exercise

FIND THE ANSWERS OF EVERY QUESTION GIVEN BELOW FROM THE TEXT ABOVE:-

A. Answer the following questions in one word:

1. Name any two nutrients found in food.
2. Name any two protective foods.
3. Write any one function of carbohydrate.
4. Name the deficiency disease caused by lack of iodine.
5. Which carbohydrate is called simplest carbohydrate?
6. Which solution is used to detect presence of starch in food?
7. Which vitamins are water soluble vitamins?
8. Which nutrients are called protective nutrients?
9. Write the name of disease caused due to lack of iron.
10. Which solution is used to detect presence of sugar in food?

B Answer the following questions in Short in 25 to 30 words:

1. What are symptoms of rickets?
2. Distinguish between malnutrition and under nutrition.
3. What are nutrients? Write their functions.
4. What do you understand by balanced diet?
5. What are the functions of roughage in body?
6. What are the symptoms of marasmus?
7. Why a young child needs more protein in comparison to an adult?
8. Write the functions of water in human body.
9. What is protein? What are its types and sources?
10. What are fats? Write their functions and sources.

C. Answer the following question in detail in 45 to 50 words

1. How you can test the presence of sugar in food?
2. Describe an experiment to detect the presence of starch in food.
3. List the symptoms of a child suffering from kwashiorkor.

4. Name the deficiency diseases caused due to deficiency of :

(i) vitamin A (ii) vitamin B (iii) vitamin C.

Also write symptoms of these.

5. Describe the experiment to test the presence of protein in food.

6. What is obesity? How is it caused?

D. Think and give answer of the following questions.

1. Rahul is four years old. He only drinks milk. Will this help him to grow well?

2. Ajay has a sample of glucose water and some boiled rice. What results will they give when tested with Iodine solution and why?

3

Separation of Substances

Let us Learn about

- Need for separation of substances
- Methods of separation
- Water – A universal solvent
- Temperature and solubility



Previous Connect

We use many substances in our daily lives. Many of them have impurities and require some processing before being used. Water can contain both soluble and insoluble impurities that can be separated from it.

In our daily lives, we come across many situations where we need to separate a substance from a mixture.

- **Mixtures** are the substances that consist of two or more types of particles or substances. For example; air, seawater, a cup of tea.
- **Pure substances** consist of particles of only one kind. For example; silver, gold.

You must have seen your mother separating stones from pulses. Similarly, tea leaves are separated out from the liquid using a strainer. In all these examples, a separation can be done easily because the substances we have to separate are of different sizes and shapes which are easy to identify. But sometimes, when all the components in a mixture are of same colour, size and shape it is difficult to separate the desired component from the mixture.



Tea leaves being strained from tea

For example, the separation of salt from a mixture of salt and chalk powder is a very difficult task. It is because both of them are white in colour and their particles are too small to be picked by hand.



Activity 1

A list of some substances is given in the table. Categorise them as a mixture if it contains more than one type of substance otherwise categorise it as a pure substance.

S.No.	Substance	Mixture (Contains more than one type of substance)	Pure substance (Contains only one type of substance)
1.	Sugar		
2.	Wheat grains		
3.	Soil		
4.	Kheer		
5.	Tomato soup		
6.	Tea leaves		

The components of a mixture do not lose their identity and can be separated by various physical methods. In this chapter, we will learn about the need to separate substances of a mixture and the methods of separation.

NEED FOR SEPARATION OF SUBSTANCES

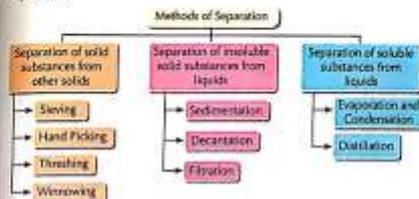
Separation means to remove one thing from the other, it usually involves the removal of an unwanted component of a mixture. The main reasons for separation of substances of a mixture are given below:

To remove undesirable substances – Separation is done to remove the unwanted components from a mixture. Your mother removes stones from pulses and rice before cooking. While pouring tea in the cup, tea leaves are removed from tea. Here, both stones and tea leaves are undesirable substances.

To obtain useful components – Separation is also used to obtain useful component from a mixture. For example, petrol and diesel are separated out from petroleum which is a complex mixture of many substances.

METHODS OF SEPARATION

The flow chart given below, clearly mentions some of the methods of separation.



The method adopted to separate components of a mixture depends on the properties of all the components of the mixture, like size of the particles, solubility, etc.

Separation of Solid Substances from other Solids

1. Hand picking

In this method, the undesirable solid substance is separated from the useful substance by hand. It is used to separate components of mixtures when the undesirable solid differs from the useful component in shape, size or colour.



Stone being hand-picked from rice

This method is applicable only when the undesirable solid is present in small quantities and the quantity of the mixture is also not very large. For example, your mother hand-picks stones from pulses before cooking.

2. Sieving

This method is used to separate the components of a mixture which differ in size. A sieve with appropriate hole size is used in this method. The size of the holes in the sieve depend on the size of the components to be separated. For example, sieves with bigger pores are used at construction sites to separate stones and pebbles from sand. Sieves with fine pores are used to separate the bigger particles in flour. Your mother uses a sieve to separate wheat bran from flour.



Sieving stones from sand

The size of the holes in the sieve depend on the size of the components to be separated. For example, sieves with bigger pores are used at construction sites to separate stones and pebbles from sand. Sieves with fine pores are used to separate the bigger particles in flour. Your mother uses a sieve to separate wheat bran from flour.

Separation of Substances



Activity 2

Take a handful of rice in a plate. Hand-pick the undesirable components like stones. What difference in the property of rice and stones enables you to separate them?

2. Sieving

This method is used to separate the components of a mixture which differ in size. A sieve with appropriate hole size is used in this method.

The size of the holes in the sieve depend on the size of the components to be separated. For example, sieves with bigger pores are used at construction sites to separate stones and pebbles from sand. Sieves with fine pores are used to separate the bigger particles in flour. Your mother uses a sieve to separate wheat bran from flour.

Separation of Substances



Activity 3

Take a bowl of wheat flour. Put a handful of pulses in it. Put this mixture on a sieve. Move the sieve back and forth. You will observe that the wheat flour passes through the sieve and the pulses are left behind on the sieve.

3. Threshing

It is the process of separating grains from their stalks by beating the stalks with sticks or by allowing bullocks to trample the stalks, or by using machines.

This method is particularly used in agricultural fields. In big fields, threshing is done by using threshers or combine harvesters. Using threshers or combine harvesters is an economical and a more efficient way.



Manual threshing



Threshing using thresher



Threshing using combine harvester

4. Winnowing

It is a method of separating lighter components in a mixture from the heavier ones with the help of the force of wind or air.

The threshed grains still contain lighter fibrous mass called husk, in which the grain was covered inside the stalk. Grain and husk are separated by winnowing.

While winnowing, the husk particles, being lighter, are carried away by the wind and form a separate heap at a short distance and the heavier grains fall below and form a heap.



Winnowing



Activity 4

You can separate pieces of paper from cardboard pieces by winnowing. Take a sheet of a newspaper and a cardboard cut them into small pieces of nearly the same size. Put these small pieces in a tray and mix them. Switch on a table fan. Raise the tray to the height of your shoulder under the fan and tilt the tray so that the pieces start falling down. You will observe that the pieces of cardboard fall closer to you and the pieces of paper fall away from you.

trample: to step heavily on something so that you crush it



Time to Answer

Circle the correct word among the two words given in bold to make a meaningful sentence.

- Grains are separated from stalks by **winning**/threshing.
- In big fields, threshing is done using **bullocks**/threshers.
- Pure substances**/Mixtures consist of particles of one kind.
- Salt/Soil** is a pure substance.
- Hand-picking**/Evaporation is a method for separating solid substances from solids.

Separation of Insoluble Solid Substances from Liquids

1. Sedimentation and Decantation

This method is used to separate an insoluble solid substance from a liquid. Though by this method, complete separation is not possible.

You must have seen your mother soaking rice grains in water before cooking them. The method used by her is sedimentation and decantation. She does this to separate rice grains from the lighter solids like tiny pieces of straw, insects, etc.

Sedimentation is a process in which the heavier particles of an insoluble solid in a liquid settle down at the bottom. This mass of solid particles that settle down at the bottom is called **sediment**.

Decantation is a process that follows sedimentation. It involves pouring out the liquid without disturbing the sediment. The liquid that is poured out still contains some insoluble solid particles.



Sedimentation

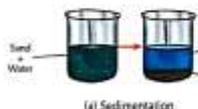


Decantation



Activity 5

Take a glass tumbler and fill it half with water. Put some sand in it and stir it. Leave it undisturbed for half an hour. You will notice that the insoluble sand particles form a sediment at the bottom of the tumbler as shown in fig. (a). Now, carefully pour the water above the sediment into another container without disturbing the sediment. The water collected in a separate container will not contain sand particles.

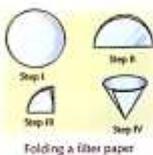
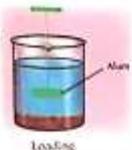


(a) Sedimentation



(b) Decantation

Separation of Substances



During sedimentation, the heavier particles settle down very quickly but finer particles take longer time. Finer particles can be made to settle faster by dissolving a small quantity of alum to the muddy water. This method is called **loading**.

2. Filtration

It is the process of separating insoluble solid substances present in a liquid using a filter. For example, your mother uses a strainer to filter tea leaves from the prepared tea. Some people tie a thin muslin cloth to the mouth of a tap to filter the mud in the water. **Filtration** is also used to separate pulp from fresh juice and for preparing cottage cheese (paneer) at home.

In the laboratory, filtration is done using a filter paper placed in a funnel. A filter paper is a circular paper with millions of tiny holes in it, which are not visible to naked eyes. For filtration to be carried out, the filter paper is folded into the shape of a cone (as shown in the diagram) and placed in the funnel.

FACT FILE

Liquid medicines are generally mixtures. The heavier component settles down if the medicines are kept standing in the same position for a long time. It is due to this reason that doctors often recommend to us to shake the bottle containing liquid medicine before use.



Time to Answer

Write True or False.

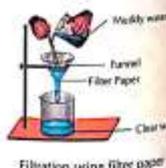
- The process of decantation is followed by the process of sedimentation.
- Alum is used for faster settling of soil particles.
- A filter paper has big holes in it.
- Muslin cloth helps in the process of loading.



Activity 6

To separate mud and water from muddy water by using a filter paper

Take a glass funnel and fix it to a clamp stand. Place a glass beaker under it. Take a circular filter paper and fold it twice to form a cone. Place the cone-shaped filter paper inside the funnel. Now, pour some muddy water inside the filter paper placed in the funnel. You will observe that clear water collects in the beaker and mud particles, called residue, are left on the filter paper.



Filtration using filter paper

Separation of Soluble Solid Substances from Liquids

1. Evaporation

A soluble solid can be obtained from the liquid it is dissolved in by the process of evaporation. The process of converting a liquid into its vapour by heating is called **evaporation**. As a result of heating, the liquid evaporates leaving behind the solid component.

FACT FILE

The change of state of a substance directly from solid to vapour is called **sublimation**.



Evaporation of sea water to obtain salt

The process of evaporation is used to obtain salt from sea water. Sea water is collected in shallow pits or ponds and is allowed to stand there. The water evaporates completely due to the heat of the sun, leaving salt behind. This salt is then purified to obtain common salt.



Activity 7

To separate salt from the salt solution by evaporation

Take some water in a china dish. Dissolve a spoonful of common salt in it and stir it well. Place the china dish on a tripod stand with a burner placed below it. Boil the water till it evaporates, leaving behind the common salt.



Separation of common salt from salt-water

2. Condensation

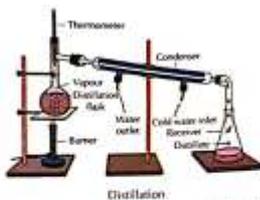
The process of changing vapour into its liquid form on cooling is called **condensation**. This method is used when the liquid component of the mixture is desirable. When water vapour comes in contact with a cold surface, it changes into drops of water due to condensation.



Activity 8

To separate both salt and water from salt solution

Take some salt solution in a kettle. Place this kettle on a tripod stand and light a burner below it. Heat the kettle till you see steam coming out from its spout. Hold a frying pan containing some ice above the steam in a slanting position. As the steam comes in contact with the frying pan, it condenses to drops of water. These droplets trickle down on the underside of the frying pan and can be collected in a beaker. Salt is left behind in the kettle.



Distillation

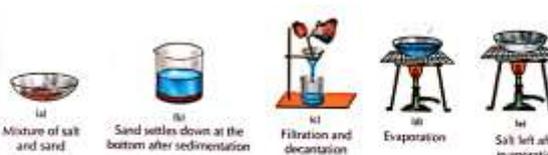
1. Distillation

It is a process of obtaining both the dissolved soluble substance and the liquid in which it is dissolved.

In this method, the mixture is heated in a flask. The liquid in the flask evaporates and is collected in another beaker with the help of a condenser as shown in the picture. The solid component is left behind in the flask.

Separation of Liquid from mixture of Immiscible Liquids

Immiscible liquids are those that cannot be mixed together. For example, oil does not dissolve in water. It forms a layer above the surface of water. Hence, oil and water are **immiscible liquids**. Oil floats on water. It can be separated from water using a separating funnel.



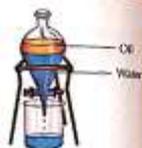
Thus, using the processes of sedimentation, decantation or filtration and evaporation, we can separate sand and salt from their mixture.



Activity 9

To separate oil from water

Pour a mixture of oil and water in a separating funnel. Leave it undisturbed for some time. You will see a clear layer of oil over water. Turn on the stopper of the separating funnel and allow the water to flow out into the beaker placed below it. Stop the flow as soon as the layer of oil reaches the stopper.



Separation of oil and water using separating funnel

Separation of Mixtures by using more than one Method

Very often, a single method of separation is not sufficient to separate different components in a mixture. In this case, two or more methods of separation are used one after another.



Activity 10

To separate the components of a mixture of sand and salt

Add the mixture of sand and salt in a beaker containing water and stir it. Leave it undisturbed for some time. You will observe that the sand settles at the bottom of the beaker as shown in Fig. (b). Now use the process of filtration or decantation to separate the salt water from sand as shown in Fig. (c). To separate salt from water, use the method of evaporation. By doing this the salt is left behind in the dish as shown in Fig. (e).



Time to Answer

Fill in the blanks.

- The process of converting a liquid into vapour by heating is called _____.
- The process of changing vapour into liquid on cooling is called _____.
- Oil and water are _____ liquids.
- Immiscible liquids can be separated by using a _____ funnel.

WATER—A UNIVERSAL SOLVENT

- Water is called a universal solvent because it can dissolve many things in it.
- When a substance is dissolved in water, it forms a **solution**.
- The substance that is dissolved in water is called **solute**.
- The substance in which the solute is dissolved is called the **solvent**.



Sugar (Solute) + Water (Solvent) → Sugar Solution



Sand (Solute) + Water (Solvent) → Solution does not form



Adding salt to saturated solution

Added salt settles down

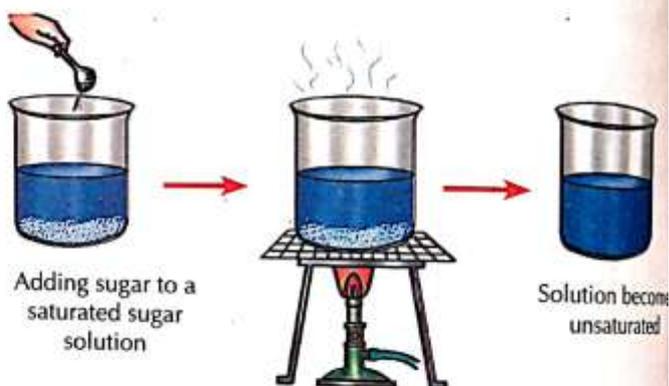
TEMPERATURE AND SOLUBILITY

You must have experienced that if you keep dissolving and more salt in a glass of water, after some time no salt can dissolve in it. Any more salt added is left undissolved at the bottom of the glass. This is because the solution has become saturated. A solution in which no more solute can be dissolved in a solvent at a given temperature is called a **saturated solution**. However, more solute can be dissolved in a saturated solution by heating the solution.



Activity II

Take half a glass of water. Add a small quantity of sugar to it and keep stirring it with a spoon. The sugar will dissolve in the water. Keep on dissolving more and more sugar until no more sugar dissolves and it starts settling at the bottom of the beaker. Thus, the solution has become saturated. Next, heat this saturated solution. You will now observe that the undissolved sugar dissolves in it. Thus, raising the temperature makes the saturated solution unsaturated.



Time to Answer

Circle the correct word among the two given in bold to make a meaningful sentence.

- Loading is a process used to increase the rate of **sedimentation**/**decantation**.
- A filter paper is used during the process of **filtration**/**sedimentation**.
- Salt is obtained from seawater by the process of **evaporation**/**condensation**.
- The process of evaporation involves **heating**/**cooling**.
- On **heating**/**cooling**, water vapour changes to water.
- In a sugar solution, sugar is the **solute**/**solvent**.

Exercise

FIND THE ANSWERS OF EVERY QUESTION GIVEN BELOW FROM THE TEXT ABOVE:-

A. Answer the following questions in one word:

1. Name the process of picking out undesirable solids from other solids.
2. How a saturated solution can be converted into unsaturated solution?
3. What method will you use to separate grains from chaffs?
4. Which method is used for separating insoluble particles from a liquid?
5. In which separating method force of wind is used?
6. Which chemical is used for loading during sedimentation?
7. What is the process by which an insoluble solid is separated from a liquid by passing it through a filter paper?
8. Which substance has only one kind of particles?
9. Which liquid is called universal solvent?
10. Give one example of immiscible liquid.

B. Answer the following questions in short in 25 to 30 words

1. What is threshing? Which equipments are used for threshing?
2. What is saturated solution? How it vary with temperature?
3. Describe the methods to separate the components of mixture of two solids?
4. What are pure substances? Describe with example?
5. What is sieving? On which physical property it works?
6. Define winnowing? In which kind of mixture it is used?
7. Draw the diagram of sedimentation and decantation.
8. Define (i) Filtration (ii) Evaporation (iii) Decantation
9. Describe handpicking? In which condition this method is applicable?
10. Give two reasons why separation is needed.

C. Answer the following question in detail in 45 to 50 words

1. Describe the experiment to obtain both salt and water from salt solution.
2. Explain the process of sedimentation. Why is alum added to the beaker of muddy water?
3. What do you understand by the terms – solution, salt, and solute?

4. Why can a mixture of salt solution not be separated by filtration? What method is used to separate the components?
5. Draw a mind map to show various methods of separation?
6. Draw the diagram to show the process of distillation.

D. Think and give answer of the following questions.

(i) Why do you think Bournvita or coffee dissolve faster in hot milk than cold milk?

(ii) When you made lemonade, what should you add first to the water- Sugar or ice cube? Why?