



केन्द्रीय विद्यालय संगठन
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शिक्षा एवं प्रशिक्षण का आंचलिक संस्थान, चंडीगढ़
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विद्यार्थियों की शैक्षिक प्रगति को ध्यान में रखते हुए उपयोगी अध्ययन सामग्री उपलब्ध कराना हमारा महत्वपूर्ण उद्देश्य है। इससे न केवल उन्हें अपने लक्ष्य को प्राप्त करने में सरलता एवं सुविधा होगी बल्कि वे अपने आंतरिक गुणों एवं अभिरुचियों को पहचानने में सक्षम होंगे। बोर्ड परीक्षा में अधिकतम अंक प्राप्त करना हर एक विद्यार्थी का सपना होता है। इस संबंध में तीन प्रमुख आधार स्तंभों को एक कड़ी के रूप में देखा जाना चाहिए- अवधारणात्मक स्पष्टता, प्रासंगिक परिचितता एवं आनुप्रयोगिक विशेषज्ञता।

राष्ट्रीय शिक्षा नीति 2020 के उद्देश्यों की मूलभूत बातों को गौर करने पर यह तथ्य स्पष्ट है कि विद्यार्थियों की सोच को सकारात्मक दिशा देने के लिए उन्हें तकनीकी आधारित समेकित शिक्षा के समान अवसर उपलब्ध कराया जाए। बोर्ड की परीक्षाओं के तनाव और दबाव को कम करने के उद्देश्य को प्रमुखता देना अति आवश्यक है।

यह सर्वमान्य है कि छात्र-छात्राओं का भविष्य उनके द्वारा वर्तमान कक्षा में किए गए प्रदर्शन पर ही निर्भर करता है। इस तथ्य को समझते हुए यह अध्ययन सामग्री तैयार की गई है। उम्मीद है कि प्रस्तुत अध्ययन सामग्री के माध्यम से वे अपनी विषय संबंधी जानकारी को समृद्ध करने में अवश्य सफल होंगे।

शुभकामनाओं सहित।

मुकेश कुमार
उपायुक्त एवं निदेशक

अनुक्रमणिका / INDEX

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CLASS 7 SCIENCE (2022-23)

CHAPTER - 1

NUTRITION IN PLANTS

NUTRITION

The process by which an organism takes food and utilizes, it is called nutrition.

NEED OF NUTRITION

Organisms need energy to perform various activities. The energy is supplied by the nutrients. Organisms need various raw materials for growth and repair. These raw materials are provided by nutrients.

NUTRIENTS

Materials which provide nutrition to organisms are called nutrients. Carbohydrates, proteins and fats are the main nutrients and are called macronutrients. Minerals and vitamins are required in small amounts and hence are called micronutrients. Plants make their food themselves but animals cannot. Hence, animals depend directly or indirectly on the plant.

MODE OF NUTRITION IN PLANT

Autotrophic Nutrition

Auto means self and trophos means nourishment. Plants are called autotrophs because they make their food themselves. The making of food for themselves is called the Autotrophic nutrition. Autotrophic nutrition is found in green plants, and in some bacteria.

Heterotrophic Nutrition

The word Heterotrophic is the combination of two words i.e. Hetero + Trophos. Hetero means 'others' and 'trophos' means nourishment. If organisms depend on others for their food, such a mode of nutrition is called Heterotrophic Nutrition.

Animals cannot make their food themselves. They depend for food upon plants. Therefore, nutrition in animals is called Heterotrophic Nutrition. Animals are known as Heterotrophs.

Saprotrophic Nutrition

The uptake of nutrients by organism from dead and decaying matter in the form of solution is called the saprotrophic nutrition. The organisms which use saprotrophic mode of nutrition are called saprotrophs. For example: fungi.

PLANT NUTRITION

Green plants prepare their own food. They make food in the presence of sunlight. Sunlight provides energy, carbon dioxide and water are the raw materials and chloroplast is the site where food is made.

CELLS- All living organisms are made of tiny units are called Cells.

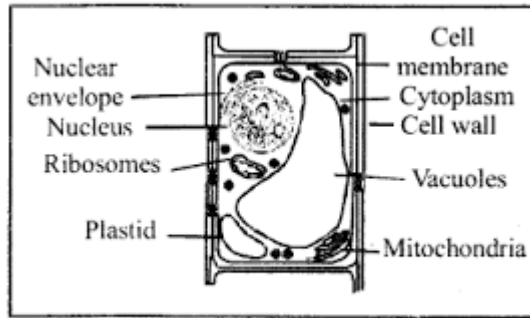


Fig. : Plant cell

CELL MEMBRANE- The cell is enclosed by a thin outer boundary , called the cell membrane

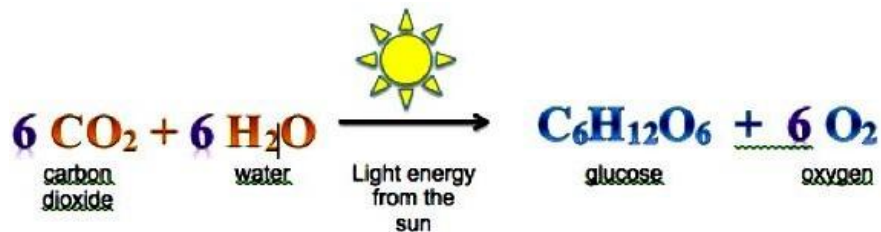
NUCLEUS- Most cell have a distinct, centrally located spherical structure called the nucleus.

CYTOPLASM - The nucleus is surrounded by a jelly- like substance called cytoplasm.

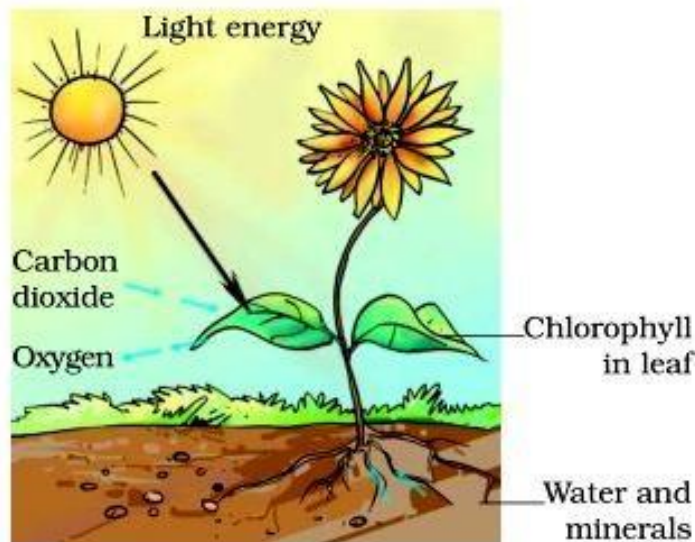
PHOTOSYNTHESIS

The synthesis of food occurs in the presence of sunlight, it is called photosynthesis. During this process;the solar energy is converted into chemical energy and carbohydrates are formed. Green leaves are the main sites of photosynthesis. The green portion of the plant contains a pigment chloroplast; which contains chlorophyll.

The whole process of photosynthesis can be shown by following equation:



The process of photosynthesis can be represented as:



- The process of photosynthesis takes place in the green leaves of a plant.
- The food is prepared by the green leaves of a plant in the form of a simple sugar called glucose.
- The extra glucose is changed into another food called starch. This starch is stored in the leaves of the plant.
- The green plants convert sunlight energy into chemical energy by making carbohydrates.

The photosynthesis takes place in the following three steps:

- Absorption of sunlight energy by chlorophyll.
- Conversion of light energy into chemical energy, and splitting of water into hydrogen and oxygen by light energy.
- Reduction of carbon dioxide by hydrogen to form carbohydrate like glucose by utilizing the chemical energy.

Conditions necessary for photosynthesis:

The conditions necessary for photosynthesis to take place are:

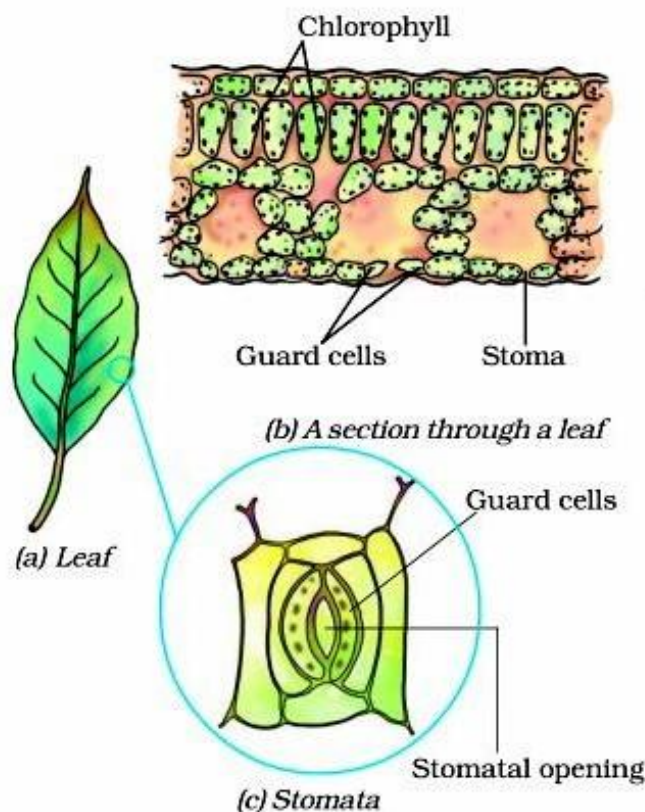
- Sunlight
- Chlorophyll
- Carbon dioxide
- Water

Raw materials for photosynthesis:

The raw materials for photosynthesis are:

- Carbon dioxide
- Water

How the plants obtain carbon dioxide?



- There are a large number of tiny pores called stomata on the surface of the leaves of plants.
- The carbon dioxide gas enters the leaves of the plant through the stomata present on their surface.
- Each stomata pore is surrounded by a pair of guard cells. The opening and closing of stomata pores is controlled by the guard cells.

How the plants obtain water for photosynthesis:

- The water required by the plants for photosynthesis is absorbed by the root of the plants from the soil through the process of osmosis.
- The water absorbed by the roots of the plants is transported upward through the **xylem**

vessels to the leaves where it reaches the photosynthetic cells.



The plants also need other raw materials such as nitrogen, phosphorus, iron and magnesium, etc., for building their body. The plants take these materials from the soil. Nitrogen is essential element used by the plants to make proteins and other compound. Site of photosynthesis: Chloroplasts

- Photosynthesis takes place in the leaves of the plants.
- Leaves have green pigment called chlorophyll
- It helps leaves capture the energy of the sunlight which is then used to prepare food from carbon dioxide and water.
- Here, you see that solar energy is captured by the leaves and is stored in the plant in the form of food.
- So, we can say that Sun is ultimate source of energy for all living organisms.

PHOTOSYNTHESIS IN ALGAE

Green patches in ponds or near the stagnant water can be seen easily. These green patches are living organism called **algae**. Algae are plants. Often algae grow near shallow waterlogged areas such as near tube-wells, taps, etc. One may slip over it. Algae look green because of presence of Chlorophyll. Algae prepare their own food by the process of photosynthesis.

SYNTHESIS OF PLANT FOOD OTHER THAN CARBOHYDRATES

Plants need proteins and fats besides the carbohydrate. Proteins are nitrogenous substances which contain nitrogen. Although nitrogen is present in abundance in atmosphere, but plant cannot absorb atmospheric nitrogen. Plant gets nitrogen from soil. Certain types of bacteria called **rhizobium**, are present in soil. They convert gaseous nitrogen into usable form and release it into the soil. Plants absorb these soluble forms of nitrogen along with water and other minerals through roots.

Sometimes farmers add nitrogenous fertilizer to their field to fulfill the need of nitrogen. In this way plants get fulfillment of nitrogen along with other nutrients. After the fulfillment of all nutrients plants synthesize proteins and fats.

MODES OF NUTRITION IN NON-GREEN PLANTS

Heterotrophic Mode of Nutrition in Plants

Some plants do not have the chlorophyll. Hence, they cannot synthesize their food by themselves. Such plants are known as non green plants. They depend on other organisms for food. Such plants use the heterotrophic mode of nutrition.

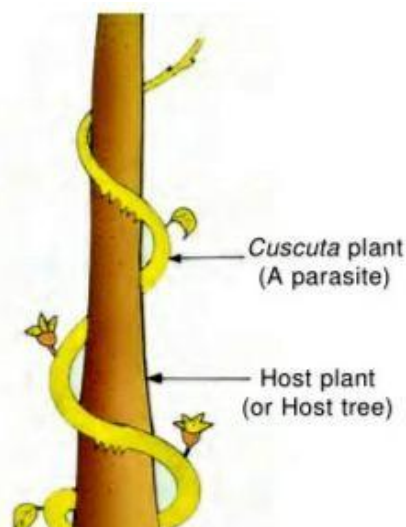
This type of nutrition can be categorized into

- Parasitic mode of nutrition
- Insectivorous mode of nutrition
- Saprophytic mode of nutrition
- Symbiotic mode of nutrition

PARASITIC MODE OF NUTRITION

Plants that do not have chlorophyll are called **non-green plants**. Plants, which live on other plants for food, are called parasitic plants.

Parasite (Parasitic Plant): Plants that get their food from other plants by living on them are called



parasite. Example; Cuscuta, mistletoe.

Cuscuta is a vine-like plant with yellowish stem. It twines around big trees, like banyan tree. **Cuscuta** gets nutrition from the tree on which it lives. The tree upon which it climbs and lives is called the host. Here, banyan is the host and cuscutea is the parasite.

The adjacent figure shows a parasite plant (Cuscuta) climbing on the stem of its host plant.

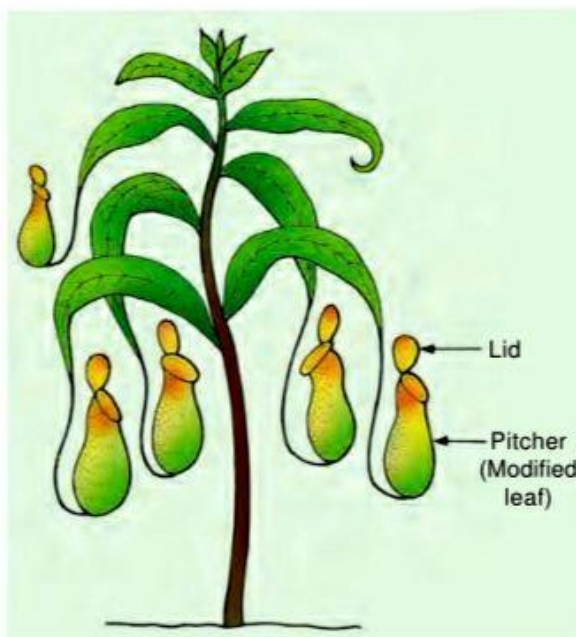
Some plants are total parasite while some are partial parasite.

A total parasite fully depends on other plants for their nutrition. For example - cuscutea.

Partial parasite: Partial parasite is a parasite that receives a part of its nutrients from host. For example; mistletoe bears green leaves. It synthesizes its own food, but receives water and mineral from the host plant.

INSECTIVOROUS MODE OF NUTRITION

Some plants eat insects. Such plants are called **insectivorous plants**. They trap and digest the insects. Pitcher plant is the example of an insectivorous plant. In pitcher plant the leaf is modified to form a pitcher like structure. The bright colour of the pitcher makes it very attractive to insects. Inside the pitcher; there are several hair-like structures. These hairs direct the trapped insects downwards. When an insect sits on the pitcher of the plant, the lid closes and the insect gets trapped inside the pitcher. The insect is then digested by the enzymes secreted by the cells of the plants.



Pitcher plant (an insectivorous plant).

Cause of eating of insects by plants:

The soil of marshy land is deficient in nitrogen. Plants living in marshy areas do not get nitrogen from the soil. Their nitrogen need is fulfilled by sucking the juice of insects. Venus flytrap, utricularia, drosera and Rafflesia are the other examples of insectivorous plants.

SAPROPHYTIC MODE OF NUTRITION

Saprotrophs are non-green plants e.g. Agaricus (Mushroom) fungi, yeasts and bacteria. Saprotrophs get their food from dead or decaying organic matters. They grow on decaying

organic matters such as cow-dung, wood, bread, etc.

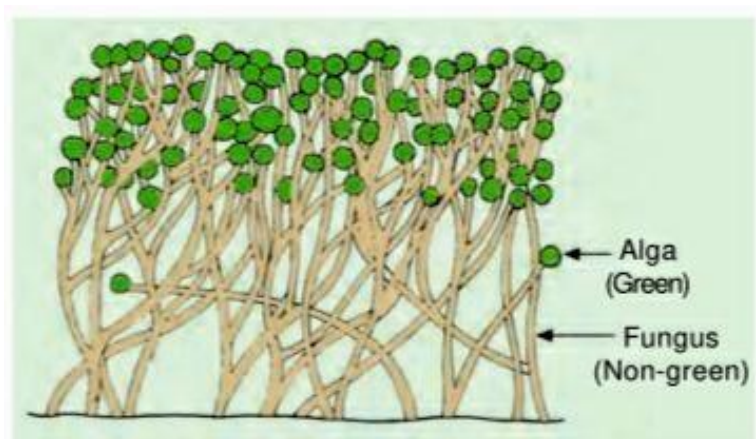
The below figure shows a fungus (mushrooms) growing on the rotting wood of a dead tree.



Saprotrophs secrete digestive juice over the decaying materials and absorb nutrients from them. This is called Saprotrophic Mode of Nutrition.

SYMBIOSIS MODE OF NUTRITION

Symbiosis is the combination of two Greek words 'Sym' means 'with' and 'biosis' means 'living', which means living together. In symbiosis or mutualism two different types of organisms live and work together for their mutual benefit from each other. They share shelter and nutrients, e.g. Lichens. Lichens are composite organisms composed of fungus and alga. Fungus is a saprophyte and alga is an autotroph. The Fungus supplies water and minerals to the cells of the alga while the alga supplies food; prepared by photosynthesis.



**Lichen (symbiotic plant)
(As seen through microscope).**

REPLENISHMENT OF NUTRIENTS IN SOIL

A bird sitting on the back of a rhino is an example of symbiosis. The bird gets worms to eat, while the rhino gets rid of those worms.

We know that plants continuously take nutrients from the soil in order to synthesize food. As a result of this, the amount of nutrients in the soil decreases.

Nutrients in the soil are replenished by adding fertilisers and manures. Fertilisers and manures contain plants nutrients and minerals like nitrogen, phosphorus and potassium.

Another way to replenish soil is to grow leguminous crops (for example gram, peas, pulses etc.) in the soil. The bacterium called Rhizobium can take atmospheric nitrogen and convert it into a soluble form. But Rhizobium cannot make its own food. So it lives in the roots of gram, peas, moong, beans and other legumes and provides them with nitrogen. In return plants provide food and shelter to the bacteria.

Thus plants and bacteria have a symbiotic relationship here.

NCERT EXERCISE QUESTIONS AND ANSWERS

1. Why do organisms need to take food?

Ans: All living organisms require food to survive. It gives them energy to perform various activities. All activities such as playing, running, walking, studying, etc. require energy. The various components present in our food such as carbohydrates, proteins, fats, vitamins, and minerals provide energy to our body.

2. Distinguish between a parasite and a saprotroph.

Ans:

Parasite (Parasitic Plant): Plants that get their food from other plants by living on them are called parasite. Example; Cuscuta, mistletoe. Cuscuta is a vine-like plant with yellowish stem. It twines around big trees, like banyan tree. Cuscuta gets nutrition from the tree on which it lives.

Saprotrophs: Saprotrophs are non-green plants e.g. Agaricus (Mushroom) fungi, yeasts and bacteria. Saprotrophs get their food from dead or decaying organic matters. They grow on decaying organic matters such as cow-dung, wood, bread, etc.

3. How would you test the presence of starch in leaves?

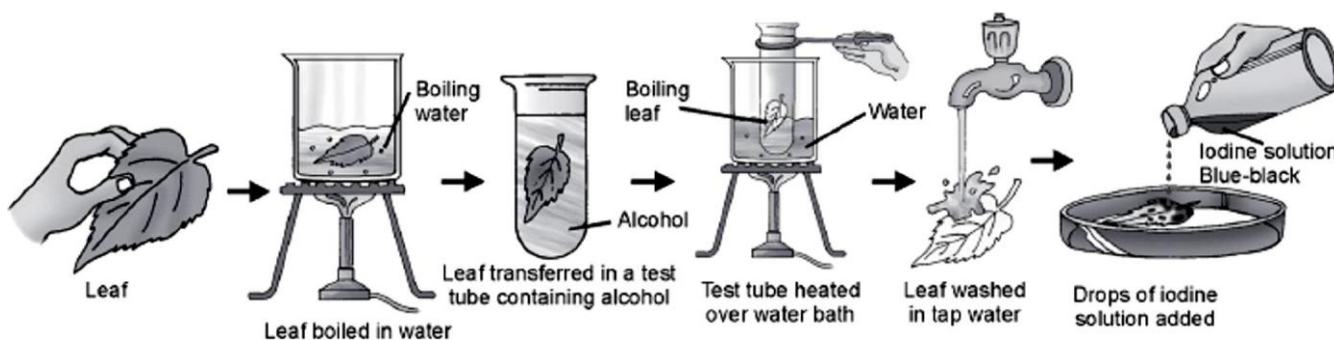
Ans:

Aim: To test for the presence of starch in leaf.

Materials Required: Green leaf, beaker, tripod stand, burner, test tube, alcohol, iodine solution, tap water and petri dish.

Procedure:

- Pluck a healthy green leaf of a plant which was kept in sunlight.
- Boil it in water contained in a beaker for about two minutes. This will make the leaf soft and stop any further chemical changes in it.
- Put the leaf in a test tube containing alcohol.
- Place the test tube in a beaker of boiling water.
- The alcohol will bleach the leaf and make it free from chlorophyll.
- Wash the leaf in water. Place it in a petri dish and add a few drops of iodine solution.



Observation : The leaf turns blue-black.

Conclusion : The leaf changes into blue-black colour due to presence of starch in it.

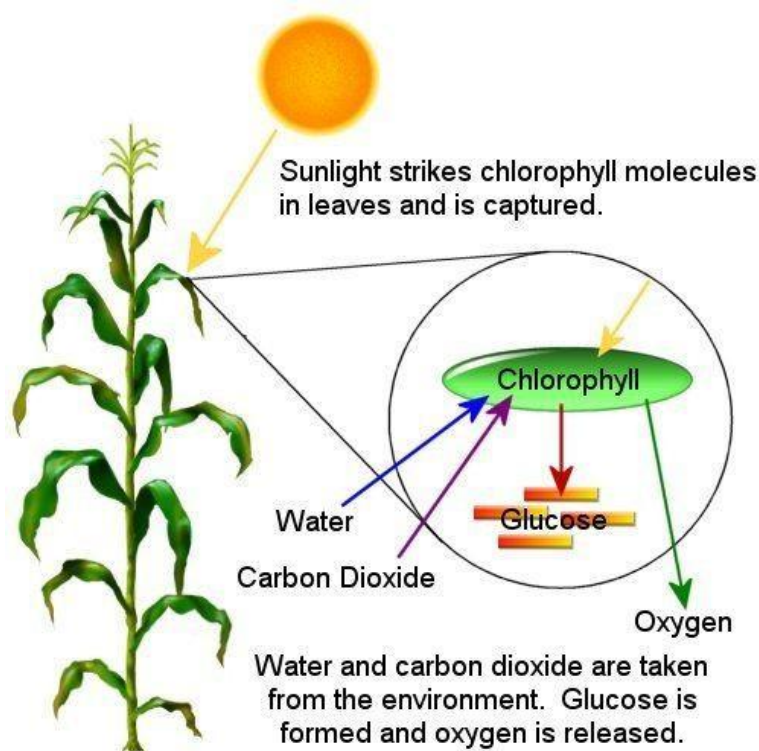
4. Give a brief description of the process of synthesis of food in green plants.

Ans: Photosynthesis is defined as the process in which the chlorophyll-containing plant cells synthesise food in the form of carbohydrates, using carbon dioxide and water in the presence of solar energy.

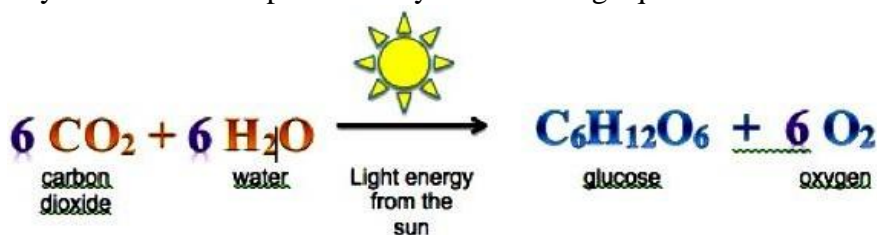
Photosynthesis

Sources of raw materials required for photosynthesis:

- (a) Water is taken in from the roots of the plant and is transported to the leaves.
- (b) Carbon dioxide from the air enters the leaves through the tiny pores called stomata and diffuses to the cells containing chlorophyll.
- (c) Solar energy is used to break water into hydrogen and oxygen. This hydrogen is combined with carbon dioxide to form food for the plants, which is ultimately used by the animals as well.



Thus, photosynthesis can be represented by the following equation.



5. Show with the help of a sketch that the plants are the ultimate source of food.

Ans: The mode of nutrition shows that the plant is the ultimate producer. Only plant can produce food and rest of other organisms are directly or indirectly dependent on it.

6. Fill in the blanks:

- (a) Green plants are called _____ since they synthesise their own food.
- (b) The food synthesised by the plants is stored as _____.
- (c) In photosynthesis solar energy is captured by the pigment called _____.
- (d) During photosynthesis plants take in _____ and release _____.

Ans: (a) Green plants are called autotrophs since they synthesise their own food.
(b) The food synthesised by the plants is stored as starch.
(c) In photosynthesis solar energy is captured by the pigment called chlorophyll.
(d) During photosynthesis plants take in carbon dioxide and release oxygen.

7. Name the following:

- (i) A parasitic plant with yellow, slender and tubular stem.
- (ii) A plant that has both autotrophic and heterotrophic mode of nutrition.
- (iii) The pores through which leaves exchange gases.

Ans: (i) Cuscuta (ii) Pitcher plant (iii) Stomata

8. Tick the correct answer:

- (a) Amarbel is an example of: (i) autotroph (ii) parasite (iii) saprotroph (iv) host

Ans: (ii) parasite

- (b) The plant which traps and feeds on insects is:

- (i) cuscuta (ii) china rose (iii) pitcher plant (iv) rose

Ans: (iii) pitcher plant

9. Match the items given in Column I with those in Column II:

Column I	Column II
Chlorophyll	Bacteria
Nitrogen	Heterotrophs
Amarbel	Pitcher plant
Animals	Leaf
Insects	Parasite

Ans: Chlorophyll – Leaf, Nitrogen – Bacteria, Amarbel – Parasite, Animals – Heterotrophs
Insects – Pitcher plant

10. Mark 'T' if the statement is true and 'F' if it is false:

- (i) Carbon dioxide is released during photosynthesis. (T/F)
- (ii) Plants which synthesise their food themselves are called saprotrophs. (T/F)
- (iii) The product of photosynthesis is not a protein. (T/F)
- (iv) Solar energy is converted into chemical energy during photosynthesis. (T/F)

Ans:

- (i) False (ii) False (iii) True (iv) True

11. Choose the correct option from the following:

Which part of the plant gets carbon dioxide from the air for photosynthesis.

- (i) root hair (ii) stomata (iii) leaf veins (iv) sepals

Ans: (ii) stomata

12. Choose the correct option from the following:

Plants take carbon dioxide from the atmosphere mainly through their:

- (i) roots (ii) stem (iii) flowers (iv) leaves

Ans: (iv) leaves



QUESTION BANK

1. Organisms which prepare food for themselves using simple naturally available raw materials are referred to as
(a) heterotrophs (b) autotrophs (c) parasites (d) saprophytes
2. In the absence of which of the following will photosynthesis not occur in leaves?
(a) Guard cells (b) Chlorophyll (c) Vacuole (d) Space between cells
3. Which of the following statements is/are correct?
(i) All green plants can prepare their own food.
(ii) Most animals are autotrophs.
(iii) Carbon dioxide is not required for photosynthesis.
(iv) Oxygen is liberated during photosynthesis.
Choose the correct answer from the options below:
(a) (i) and (iv) (b) (ii) only (c) (ii) and (iii) (d) (i) and (ii)
4. Pitcher plant traps insects because it
(a) is a heterotroph. (b) grows in soils which lack in nitrogen.
(c) does not have chlorophyll. (d) has a digestive system like human beings.
5. The term that is used for the mode of nutrition in yeast, mushroom and bread-mould is
(a) autotrophic (b) insectivorous (c) saprophytic (d) parasitic
6. When we observe the lower surface of a leaf through a magnifying lens we see numerous small openings. Which of the following is the term given to such openings?
(a) Stomata (b) Lamina (c) Midrib (d) Veins
7. Two organisms are good friends and live together. One provides shelter, water, and nutrients while the other prepares and provides food. Such an association of organisms is termed as
(a) saprophyte (b) parasite (c) autotroph (d) symbiosis
8. Which of the following raw material is available in the air for photosynthesis?
(a) Oxygen (b) Carbon dioxide (c) Nitrogen (d) Hydrogen
9. Small aerating pores present in the leaf are known as
(a) chlorophyll (b) lentil (c) stomata (d) vessels
10. Which of the following is the type of heterotrophic nutrition in plants?
(a) Saprotrophic (b) Symbiotic (c) Parasitic (d) All of these
11. Mushroom, yeast, mould and bacteria are the examples of
(a) symbionts (b) parasites (c) decomposers (d) autotrophs
12. The process by which plants lose water in the form of water vapour is
(a) respiration (b) transpiration (c) photosynthesis (d) nutrition
13. Organisms need nutrition to —
(a) Grow (b) Get energy
(c) Fight against diseases (d) All of the above

14. Products of photosynthesis are —

- (a) Protein, oxygen and carbon dioxide
- (b) Carbon dioxide and oxygen
- (c) Carbohydrate and oxygen
- (d) Protein, fat and carbohydrate

15. _____ is used in starch test .

- (a) Safranin
- (b) Blue ink
- (c) Iodine
- (d) Litmus

16. To which of the following category does a pitcher plant belong ?

- (a) Herbivore
- (b) Carnivore
- (c) Insectivore
- (d) Both (b) and (c)

17. Parasites —

- (a) Prepare their own food
- (b) Live on other living beings
- (c) Live on dead organisms
- (d) Eat insects

18. Water reaches the leaves from root by _____.

- (a) Stomata
- (b) Phloem
- (c) Xylem
- (d) All of the above

19. One should not sleep under the trees at night because —

- (a) Plants make food during the night
- (b) Trees also sleep at night
- (c) Carbon dioxide ratio is higher under the trees at night
- (d) One can catch a cold

20. Which of the following is used from the atmosphere during photosynthesis?

- (a) Oxygen
- (b) Hydrogen
- (c) Minerals
- (d) Carbon dioxide

21. Fill in the blanks.

- (a) Carbon dioxide is used from the atmosphere during _____.
- (b) Sundew plant is an example of _____ plants.
- (c) _____ is an example of a total stem parasite.
- (d) Mineral nutrients like nitrogen and phosphorous are used by plants for their _____ and development.
- (e) _____ are chemical substances present in food.
- (f) Starch gives a blue-black colour with a solution of _____.
- (g) _____ is the site of photosynthesis in plants.
- (h) Autotrophs are all _____ plants.
- (i) _____ is a plant parasite.
- (j) During photosynthesis, the chlorophyll traps the energy from _____.
- (k) Plant food is stored in the form of _____.
- (l) Plants get nitrogen in the form of _____ from soil.
- (m) _____ depend on dead and decaying organic matter for food.
- (n) Mode of nutrition in algae is _____.

(o) _____ is an example of symbiotic association.

(p) A fungus we like to eat is _____.

22. Differentiate between:

(a) Autotrophic and heterotrophic mode of nutrition.

(b) Total parasites and partial parasites

23. Why are green leaves called ‘the kitchen of the plant’?

24. Name all the nutrients present in food.

25. Define nutrition.

26. Define photosynthesis and write its chemical reaction.

27. What are the raw materials used in photosynthesis ?

28. Write a difference between chlorophyll and chloroplast.

29. What type of relationship is shown by lichens ?

30. How does water reach the leaves for synthesising food ?

31. How are nutrients taken up by the plants ?

32. Explain the process of nutrition in mushroom.

33. ‘In the absence of photosynthesis, there would be a barren place; justify the statement.

34. Explain symbiotic nutrition with the help of an example.

35. Although being a green plant, the pitcher plant traps insects. Why?

36. Plants use nitrogenous compounds to synthesize proteins. Mention the methods by which atmospheric nitrogen is converted into usable forms.

37. Chlorophyll is necessary for photosynthesis. Explain with the help of an activity.

38. Explain the presence of starch in the green leaves with the help of labelled diagrams.

39. Explain the following insectivorous plants with diagrams. Also, explain the modification of their leaves to trap the insects.

(i) Pitcher plant (ii) Venus flytrap (iii) Sundew plant

40. Draw a labelled diagram of stomata and explain its structure.

41. How will you prove that starch is formed during photosynthesis?

42. Explain the types of heterotrophic nutrition in plants.

43. Draw a pitcher plant and describe its modifications to trap insects.

44. Explain symbiotic nutrition in lichens.

45. What are plant nutrients ? How are they replenished in the soil ?

.....

SOME IMPORTANT QUESTIONS

- 1.** What are the components of food?
Answer: Carbohydrates, proteins, fats, vitamins and minerals are the components of food.
- 2.** What is nutrition?
Answer: The process of utilization of food by a living organism to obtain energy is called nutrition.
- 3.** Why is need of nutrition?
Answer: Animals do not make their food themselves which plants do. Animals eat plants or plant eating animals. Hence, animals are directly or indirectly depend on plants.
- 4.** What is autotroph?
Answer: Organisms that make their food themselves are called autotrophs.
- 5.** What is autotrophic mode of nutrition?
Answer: The mode of nutrition in which the organism makes its own food is called autotrophic mode of nutrition.
- 6.** Give some example of autotrophs.
Answer: All green plants, such as grass, mango, bougainvillea, etc. are the examples of autotrophs. Some bacteria also show autotrophic nutrition.
- 7.** What is photosynthesis?
Answer: The process of making food in green plants in the presence of sunlight is known as photosynthesis.
- 8.** What are the essential factors for the photosynthesis?
Answer: Carbon dioxide, water, chlorophyll and sunlight are essential factors for photosynthesis to take place.
- 9.** What is chlorophyll?
Answer: Chlorophyll is the green pigment present in green leaves.
- 10.** Why do leaves look green?
Answer: Leaves look green because of the presence of chlorophyll, which is a green pigment.
- 11.** What is the function of chlorophyll?
Answer: Chlorophyll absorbs the sunlight for photosynthesis.
- 12.** What are the final products made after photosynthesis?
Answer: Glucose and oxygen are the final products after photosynthesis.
- 13.** What are stomata?
Answer: The small pores present on the lower surface of leaf, are called stomata.
- 14.** What is function of stomata?
Answer: Stomata absorb carbon dioxide from air for photosynthesis. Stomata facilitates exchange of gases and transpiration.

- 15.** What is the ultimate source of energy?
Answer: Sun is the ultimate source of energy.
- 16.** How water is transported to the leaves?
Answer: Water is transported to the leaves through pipe like structures from the roots of plant. These pipe-like structures are present from root to leaves through branches throughout.
- 17.** What is heterotrophic mode of nutrition?
Answer: The mode of nutrition in which an organism takes food from another organism is called heterotrophic mode of nutrition. The nutrition in animals and non-green plants is the example of heterotrophic mode of nutrition.
- 18.** Give examples of Heterotrophs.
Answer: Animals and non green plants are the examples of heterotrophs.
- 19.** What are saprotrophs?
Answer: Organisms which get their nutrition from dead or decaying plants in liquid form are called saprotrophs.
- 20.** What are the nutrients other than carbohydrates which are required by plants?
Answer: Proteins and fats are the nutrients; other than carbohydrates; which are required by plants.
- 21.** In which form do plants absorb nitrogen?
Answer: Plants absorb soluble form of nitrogen.
- 22.** Why do farmers add nitrogenous fertilizers to the soil?
Answer: Farmers add nitrogenous fertilizers to the soil to fulfill the requirement of nitrogen of the plants. Nitrogen is necessary to synthesize proteins.
- 23.** Which microorganism help to provide nitrogen to the plants?
Answer: A certain type of bacteria called rhizobium helps to provide nitrogen to the plants.
- 24.** How do plants absorb nutrients other than carbohydrates from the soil?
Answer: Other nutrients are available in the soil in the form of minerals. Plants absorb these minerals from the soil; along with water.
- 25.** What do you understand by parasitic plants?
Answer: A plant which lives on another plant and takes nutrients is called a parasitic plant.
- 26.** Give some examples of parasitic plants.
Answer: Cuscuta and mistletoe
- 27.** Why some plants are called parasites?
Answer: Some plants are unable to prepare their own food and need to take food from another plant. Hence, they are called parasites.
- 28.** What is the mode of nutrition in non-green plants?
Answer: Non-green plants show heterotrophic mode of nutrition.
- 29.** What do you understand by non-green plants?
Answer: A plant which lacks chlorophyll is called non-green plant.

30. What do you understand by host?

Answer: An organism which provides shelter and nutrition to another organism is called a host.

31. What is partial parasite?

Answer: A parasite which depends for some of the nutrients; on another organism; is called a partial parasite.

32. Give example of partial parasitic plants?

Answer: Mistletoe

33. What is an insectivorous plant?

Answer: A plant which fulfills its nitrogenous needs by eating insects is called an insectivorous plant.

34. Give an example of insectivores plant?

Answer: Pitcher plant, Venus Fly trap, Bladderwort, Drosera, Rafflesia

35. Why does a plant eat insects?

Answer: Plants living in marshy areas do not get nitrogen from the soil. To fulfill their nitrogenous need, they need to eat insects.

36. Write a brief note on pitcher plants?

Answer: In a pitcher plant, the leaf is modified into a pitcher like structure. The pitcher is complete with a lid. The inside of pitcher is full of hair-like structures. The pitcher is used to trap insects which may fall in it.

37. What do you understand by saprotrophs?

Answer: An organism which feed on dead and decaying material is called a saprotroph. In this mode of nutrition, digestive enzymes are secreted on the food. The digested food is then absorbed by the organism. In saprotrophs digestion takes place outside the body of the organism.

38. Saprophytes grow in which type of places?

Answer: Saprophytes grow in humid and hot conditions.

39. Give some example of saprotrophs.

Answer: Mushroom, yeast, toadstool, etc.

40. What is the meaning of word 'Symbiosis'?

Answer: It is a relationship between two organisms in which both the organisms benefit each other.

41. What is Lichen?

Answer: The lichen is a composite organism formed because of symbiosis of algae and fungi.

42. Give an example of symbiotic relationship.

Answer: A small bird; called plover; cleans the crocodile's teeth. The crocodile keeps its mouth open and the bird takes out meat fibres stuck between the teeth. The bird gets food in lieu of providing dentist's services to the crocodile.

43. How do nutrients get replenished in the soil?

Answer: There are two main means through which nutrients get replenished in the soil. One of them is the nitrogen fixation in soil. Nitrogen fixation replenishes nitrogenous nutrients in the soil. Another mean is decomposition of dead remains of plants and animals (or farm waste). Decomposition of dead remains replenishes various other nutrients in the soil.

44. What is Rhizobium?

Answer: Rhizobium is a bacterium.

45. What is the function of Rhizobium?

Answer: Rhizobium helps leguminous plants in nitrogen fixation in soil.

46. How does Rhizobium help farmers?

Answer: By helping in nitrogen fixation, rhizobium increases soil fertility and thus helps farmers.

47. Why do farmers prefer to sow leguminous plants?

Answer: Leguminous plants carry out nitrogen fixation in soil and thus improve soil fertility.

48. In which form do plants absorb nitrogen?

Answer: Plants absorb nitrogen in the form of nitrates.

49. Write True for the correct statement and False for the incorrect statement.

- (a) Plants derive oxygen from atmosphere and nitrogen from the soil. _____
 - (b) Sandalwood is an example of a total root parasite. _____
 - (c) Colourful leaves of coleus and croton cannot perform photosynthesis. _____
 - (d) All green plants prepare food in the form of glucose. _____
 - (e) Venus fly-trap is an example of parasitic plant. _____ Answer:
- (a) True
 - (b) False
 - (c) False
 - (d) True
 - (e) False

50. Match the columns.

Column A	Column B
(1) Lichen	(i) single-celled green plant
(2) Pitcher plant	(ii) nitrogen fixing bacteria
(3) Chlamydomonas	(iii) mutual association of algae and fungi
(4) Rhizobium	(iv) an insectivorous plant

Answer:

- (1) (iii)
- (2) (iv)
- (3) (i)
- (4) (ii)



Class 7 Science (2022-23)

CHAPTER - 2 NUTRITION IN ANIMALS

NUTRITION

The process by which an organism takes food and utilizes it is called nutrition.

NEED OF NUTRITION

Organisms need energy to perform various activities. The energy is supplied by the nutrients. Organisms need various raw materials for growth and repair. These raw materials are provided by nutrients.

ANIMAL NUTRITION

Plants make their food by the process of photosynthesis, but animals cannot make their food themselves. Animals get their food from plants. Some animals eat plants directly while some animals eat plant eating animals. Thus, animals get their food from plants either directly or indirectly.

All organisms require food for survival and growth. Requirement of nutrients, mode of intake of food and its utilization in body are collectively known as nutrition.

Nutrition in complex animals involves following steps:

- **Ingestion:** The process of taking food into the body is called ingestion. Method of ingestion, i.e. taking of food, varies from one animal to another.
- **Digestion:** The process of breaking down of complex component of food into simpler substances is called digestion. The process of digestion is different in human, grass eating animals, amoeba, etc.
- **Absorption:** The process of passing of digested food into blood vessels in the intestine is called the absorption.
- **Assimilation:** The conversion of absorbed food in complex substances such as proteins and vitamins required by body is called assimilation. In other words, assimilation is the conversion of absorbed food (nutrients) into living tissues. Through the process of assimilation our cells are supplied with oxygen and nutrients.
- **Egestion:** Removal of waste materials from the body is called egestion. The faecal matter is removed through the anus from time-to-time. Since the waste of food left after digestion is also called faeces, hence the process of egestion is also known as defecation.

DIFFERENT WAYS OF TAKING FOOD

The mode of taking food into the body varies in different organisms. Different organism takes food in different ways.

- Bees and humming-birds suck the nectar of plants
- Infants of human and many other animals feed upon their mother's milk by sucking them.
- Snakes like the python swallow the animals they prey upon.

- Human beings use their hands to put food into their mouth and swallow the food after chewing.
- A snake swallows the animals they prey upon without chewing them.
- A frog captures prey with its sticky tongue.
- An earthworm uses its muscular pharynx to swallow its food.
- Spiders weave sticky web in which small insects get stuck.
- Some aquatic animals filter tiny particles floating nearby and feed upon them.
- Amoeba, a unicellular animal, engulfs tiny particles of food by using pseudopodia. Amoeba surrounds the food by pseudopodia and then makes a food vacuole to engulf the food.
- In multicellular organisms; like hydra there are numerous tentacles around their mouth. Hydra uses tentacles to surround its prey and kill them with its stinging cells. Then the food is pushed inside the body cavity.

DIGESTION

The process of breaking down of complex component of food into simpler substances is called **digestion**. The process of digestion is different in human, grass eating animals, amoeba, hydra, etc.

Enzymes help in the breakdown of complex molecules like carbohydrates, protein, fats, etc. into simple molecules.

Digestion in unicellular animals; like Amoeba; is intracellular. The digestive enzymes are secreted in the food vacuoles.

DIGESTION IN HUMAN

We take in food through the mouth, digest and utilise it. The digestive system of humans is well developed. Human digestive system consists of alimentary canal and its associated human digestive system glands.

Various organs of human digestive system in sequence are

- Mouth (Buccal Cavity)
- Oesophagus (food Pipe)
- Stomach
- Small intestine
- Large intestine
- Rectum
- Anus.

The glands which are associated with human digestive system are

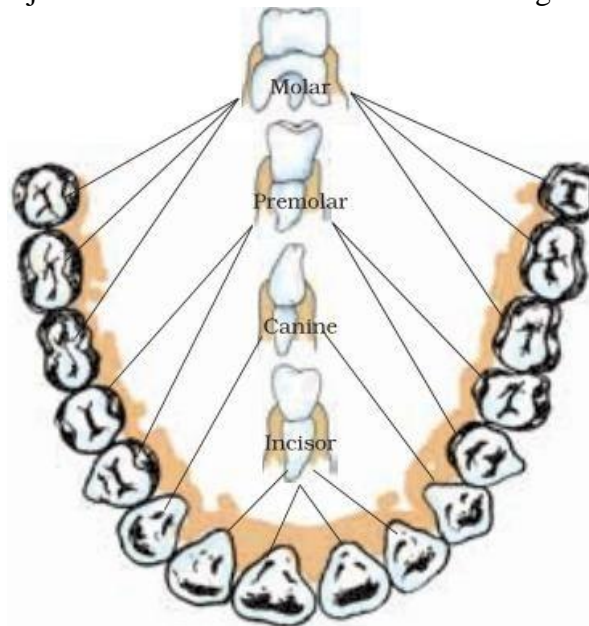
- **Salivary glands**- Located in mouth or Buccal Cavity
- **Liver**- It is the largest gland situated in the upper part of abdomen on the right side.
- **Pancreas**- located just below the stomach

The ducts of various glands open into the alimentary canal and pour secretion of their juices into the alimentary canal.

Mouth: The food is ingested through the mouth. The mouth contains tongue, teeth and salivary glands. Teeth break the food into smaller particles. This process is called mastication. The chewed food is mixed with saliva. Saliva is a watery fluid secreted by the salivary glands. Saliva contains a type of enzyme called the salivary amylase, which converts starch into sugar.

Teeth: Our teeth cut, tear and grind the food before we swallow it. There are four types of teeth in our mouth.

- **Incisors:** These are flat and chisel-shaped teeth. They lie in the front of the mouth. There are eight incisor teeth; four in the upper jaw and four in the lower jaw. The incisor teeth are well adapted for cutting and biting of food items.
- **Canines:** These are round shaped, sharp and pointed teeth. Canines are well adapted to hold and tear the food. There are four canine teeth found in human.
- **Premolars:** There are two premolars on each side of each jaw. Premolars help in crushing and grinding the food. There are 8 premolar teeth in an adult human.
- **Molars:** There are two molars on both sides in both the jaws. They have almost a flat surface with small projections. These teeth are meant for fine grinding of food.



Arrangement of teeth and different type of teeth

There are 12 molar teeth including the wisdom teeth in an adult human. The 4 molar teeth are also called **wisdom teeth**. Wisdom teeth usually grow between the ages of 18 to 21.

The tooth is covered with a white substance called **enamel**. It is the hardest substance in the human body.

Milk teeth and Permanent teeth

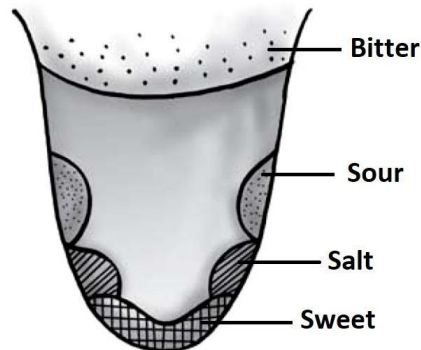
In human beings, the teeth grow twice. First time the teeth grow when one is a small baby (or infant). This set of teeth is called milk teeth. Thus, the first set of teeth which grow during infancy (babyhood) are called milk teeth. Milk teeth are a temporary set of teeth. The milk teeth loosen and begin to fall off at the age between 6 and 8 years. When milk teeth fall off in a child, then another set of teeth grow in their place. So, second time the teeth grow when one is a child. The second set of teeth is called permanent teeth. The permanent teeth grow in place of milk teeth. The permanent set of teeth remains till the old age. But when old people lose their permanent teeth, then new teeth do not grow in their place.

Tooth Decay

. Tooth decay is a process in which the tooth becomes rotten due to the formation of cavities (holes) inside it leading to toothache.

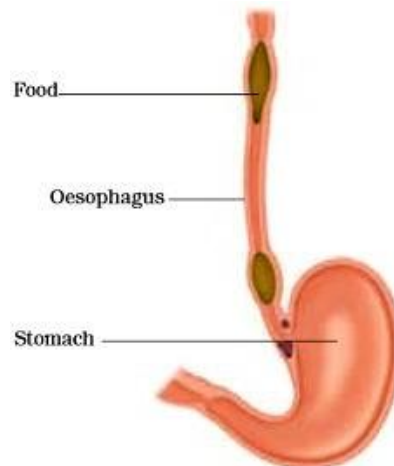
DIGESTIVE SYSTEM

Tongue: The tongue is a muscular organ. Tongue helps to mix saliva in the food. It also helps to push the food down the food-pipe or oesophagus. Taste receptors are present on tongue and give us the sense of taste.



A tongue showing different regions for taste buds

Foodpipe / Oesophagus: It is a tube-like structure connecting the mouth and the stomach. It is about 30 cm. long. Oesophagus has powerful muscles which gently push the food down to the stomach. The oesophagus contracts and relaxes in a rhythmic fashion to facilitate the forward movement of food. This movement happens in other parts of the alimentary canal as well and is called peristalsis. No digestion takes place in oesophagus.



Stomach:

Stomach is the thick walled bag present on the left side of the abdomen. (see human digestive system figure) It is the widest part of the alimentary canal. Oesophagus brings slightly digested food from mouth into the stomach.

The stomach walls contain three tubular glands in its walls which secrete gastric juice. The gastric juice contains three substances: Hydrochloric acid, the enzyme pepsin and mucus. The hydrochloric acid creates an acidic medium which facilitates the action of the enzyme pepsin that is the digestion of protein into simple substances. The acid kills many bacteria that enter along with the food. The mucus helps to protect the stomach wall from its own secretions of hydrochloric acid. The partially digested food then goes from the stomach into the small intestine.

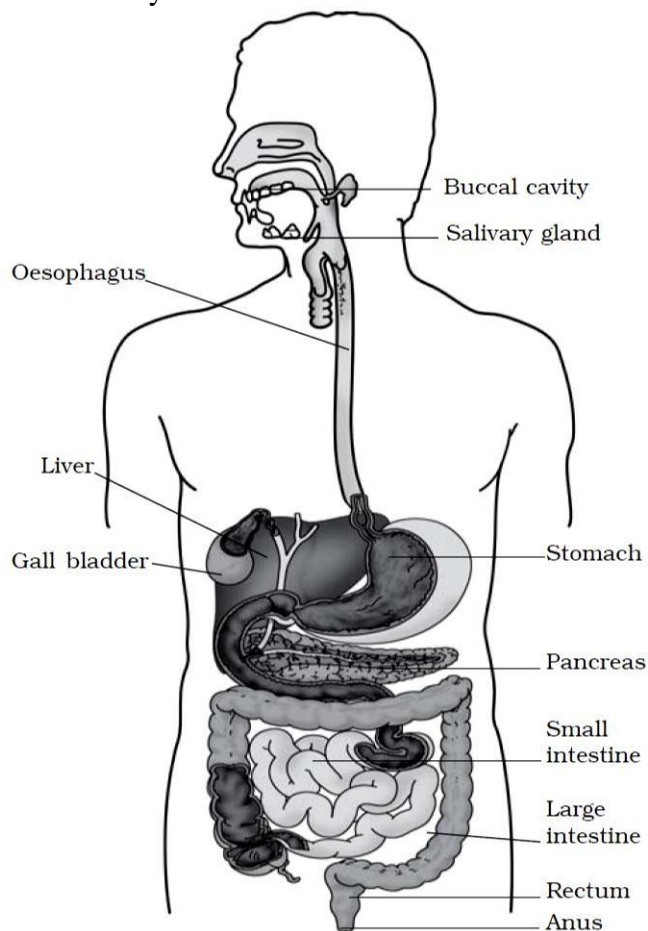
Small intestine: The food leaves the stomach at certain intervals of time and enters into the small intestine.

The small intestine is the longest part of the digestive system. It is about 20 feet or seven meters long in an adult human. Small intestine is a highly coiled tube. It consists of three parts: duodenum, jejunum and Ileum.

In the duodenum, the liver and pancreas pour their secretions. Liver secretes bile juice and pancreas secretes the pancreatic juice. The bile juice contains the bile which carries out emulsification of fat. In this process, the fat is broken into tiny droplets. The pancreatic juice contains several enzymes. The enzymes of the pancreatic juice break down starch into simple sugars and proteins into amino acids.

Minerals and vitamins do not need to be changed because cells are able to absorb them easily.

From duodenum the food goes to the lower part of the intestine. There are numerous finger-like projections on the wall of the small intestine. These projections are called villi. They have fine blood capillaries to absorb the food. After absorption; food mixes in the blood stream and is carried to all the cells of the body. The cells utilize this food to release energy.



Large intestine: The digested food enters into large intestine after small intestine. The large intestine is wider and shorter than small intestine. It is about 1.5 metre in length.

In large intestine; excess of water from the materials is absorbed. The semi solid residue is stored in the last part of the large intestine called rectum and finally throw out of the body through the anus from time to time. The throwing out of waste of digested food from rectum is called egestion. Egestion is also known as defecation.

DIGESTION IN GRASS EATING ANIMALS

Ruminants: None of the animal can digest cellulose which is a major component of the food eaten by herbivores. The plant eating animals digest their food in two steps. Their stomach is divided into four chamber, viz. rumen, reticulum, omasum and abomasum.

First of all, half chewed food is swallowed and it then goes from mouth to the rumen, the first chamber of the stomach. Here, it is acted upon by bacteria. These microorganisms digest the cellulose. This half digested food goes to the second muscular chamber; the reticulum. From the reticulum the food is sent back to the mouth; as cud; to be chewed again. Chewing of the cud is called rumination and such animals are called ruminating animals or ruminants. Cow, goat, buffaloes, sheep, bison, etc. are good example of ruminating animals.

After digestion and absorption, nutrients from food are taken to the cells in all parts of the body. The cells oxidize the food to release energy.

FEEDING AND DIGESTION IN AMOEBIA

Amoeba is a microscopic organism which consists of only a single cell. Amoeba is mostly found in pond water. The figure given below shows the structure of amoeba.

Amoeba eats tiny plants and animals as food which floats in water in which it lives. The mode of nutrition in Amoeba is holozoic. The process of obtaining food by Amoeba is called phagocytosis.

Steps involved in the nutrition of Amoeba:

Ingestion: Amoeba ingests food by forming temporary finger-like projections called pseudopodia around it. The food is engulfed with a little surrounding water to form a food vacuole ('temporary stomach') inside the Amoeba.

Digestion: In Amoeba, food is digested in the food vacuole by digestive enzymes which break down the food into small and soluble molecules by chemical reactions.

Absorption: The digested simple and soluble substances pass out of food vacuole into the surrounding environment.

Assimilation: The absorbed food materials are used to obtain energy through respiration and make the parts of Amoeba cell which leads to the growth of Amoeba.

Egestion: The remaining undigested material is moved to the surface of the cell and thrown out of the body of Amoeba.

NCERT EXERCISE QUESTIONS AND ANSWERS

1. Fill in the blanks:

- (a) The main steps of nutrition in humans are _____, _____, _____, _____ and _____.
- (b) The largest gland in the human body is _____.
- (c) The stomach releases hydrochloric acid and _____ juices which act on food.
- (d) The inner wall of the small intestine has many finger-like outgrowths called _____.
- (e) Amoeba digests its food in the _____.

Answer:

- (a) ingestion, digestion, absorption, assimilation, egestion
(b) liver
(c) digestive
(d) villi
(e) food vacuole.

2. Mark 'T' if the statement is true and 'F' if it is false:

- (a) Digestion of starch starts in the stomach.
(b) The tongue helps in mixing food with saliva.
(c) The gall bladder temporarily stores bile.
(d) The ruminants bring back swallowed grass into their mouth and chew it for some time.

Answer: a) F (b) T (c) T (d) T

3. Tick (✓) mark the correct answer in each of the following:

- (a) Fat is completely digested in the
(i) stomach
(ii) mouth
(iii) small intestine
(iv) large intestine
- (b) Water from the undigested food is absorbed mainly in the:
(i) Stomach
(ii) Food pipe
(iii) Small intestine
(iv) Large intestine

Answer. (a) (iii) Small intestine (b) (iv) Large intestine

4. Match the items of column I with those given in column II:

Column 1	Column 2
<u>Food Components</u>	<u>Product(s) of digestion</u>
Carbohydrates	Fatty acids and glycerol
Proteins	sugar
Fats	Amino acids

Answer:

Column 1	Column 2
<u>Food Components</u>	<u>Product(s) of digestion</u>
Carbohydrates	sugar
Proteins	Amino acids
Fats	Fatty acids and glycerol

5. What are villi? What is their location and function?

Answer: The finger like projections in the inner walls of the small intestine is called villi. These are found in small intestine.

Function: The villi increase the surface area for absorption of the digested food

6. Where is the bile produced? Which component of the food does it help to digest?

Answer: Bile is produced in liver. The bile juice stored in sac called the gall bladder. It helps in the digestion of fats.

7. Name the type of carbohydrate that can be digested by ruminants but not by humans. Give the reason also.

Answer: Cellulose is the carbohydrate that can be digested by ruminants. Ruminants have large sac like structure between the small intestine and large intestine. The cellulose of the food is digested by the action of certain bacteria which are not present in humans.

8. Why do we get instant energy from glucose?

Answer: We get instant energy from glucose because it easily breaks down in the cell with the help of oxygen which provides instant energy to the organism. Glucose does not need to go through the process of digestion; it is directly absorbed into the blood.

9. Which part of the digestive canal is involved in:

- (i) Absorption of food _____.
- (ii) Chewing of food _____.
- (iii) Killing of bacteria _____.
- (iv) Complete digestion of food _____.
- (v) Formation of faeces _____.

Answer: (i) Small intestine (ii) Mouth (iii) Stomach (iv) Small intestine (v) Large intestine

10. Write one similarity and one difference between the nutrition in amoeba and human beings.

Answer: Similarity: In both amoeba and human beings digestive juices break down the complex food particles into simpler substances that can be absorbed.

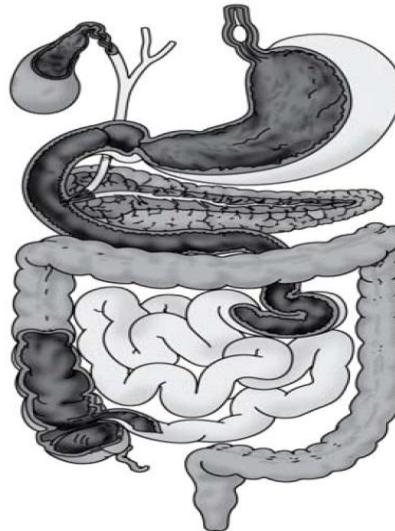
Difference: Amoeba has no mouth and no digestive system whereas human beings has a mouth and a complex digestive system made up of many organs.

11. Match the items of Column I with suitable items in Column II.

Column 1	Column 2
(a) Salivary glands	(i) Bile juice secretion
(b) Stomach	(ii) Storage of undigested food
(c) Liver	(iii) Saliva secretion
(d) Rectum	(iv) Acid release
(e) Small intestine	(v) Digestion is completed
(f) Large intestine	(vi) Absorption of water
	(vii) Release of faeces

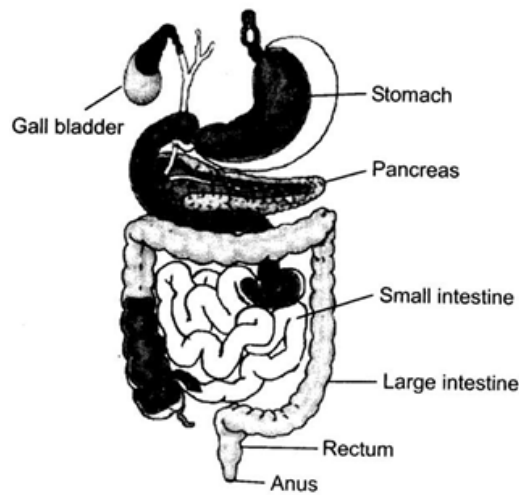
Answer: (a) - (iii), (b) - (iv), (c) - (i), (d) - (v), (e) - (ii), (f) - (vi)

12. Label the below given figure of the Human digestive system.



Human digestive system

Answer:



13. Can we survive only on raw, leafy vegetables/grass? Discuss.

Answer: We know that the animals, fungi, bacteria, non-green plants and human being do not have the ability to make their own food. They depend upon autotrophs or green plants for their food directly or indirectly. The green plant (leafy vegetables/grass) trap solar energy and make their own food in the form of glucose. So, we can say that leafy vegetables and grass can provide sufficient energy to help us survive.



QUESTION BANK -1

1. Fill in the Blanks:

- (a) During the process of digestion carbohydrates are broken down into _____
- (b) During digestion Complex substance are broken down into _____
- (c) The organ that stores bile is _____
- (d) In human beings most of the nutrients are absorbed by the _____
- (e) The inner walls of the stomach secrete _____
- (f) After chewing an apple, the crushed Apple is swallowed and passed from the _____
- (g) The bile helps in the breakdown of _____
- (h) Amoeba takes in food by the use of _____
- (i) The engulfed food in Amoeba is trapped in the _____
- (j) The digested food moves from the stomach to the _____
- (k) During digestion proteins are broken down into _____
- (l) Pancreas is located just below the _____ (m) Excess water in the food is absorbed in the _____
- (n) Grass is rich in carbohydrates known as _____
- (o) The digestive juice that begins the digestion of carbohydrate is _____
- (p) The semi digested food in the stomach called _____
- (q) The digestion of food completed in _____
- (r) During digestion fat is broken down into _____
- (s) Glucose combines with oxygen and produces _____
- (t) The process by which a living cell releases energy from glucose is called _____

2. Match the columns

Column 1	Column 2
1. frog	a. engulfs food by false feet
2. hydra	b. catches insects with its tongue
3. Amoeba	c. uses tentacles for ingestion of food
4. spider	d. uses cilia for ingestion of food
5. paramecium	e. uses proboscis to get food
6. butterfly	f. lives on liquid food
7. tearing of meat	g. milk teeth
8. teeth that fall off in children	h. tongue
9. taste buds	i. mastication
10. chewing and mixing of food	j. canines

3. State whether the following statements are true or false

- (a) The tongue helps in mixing saliva with food.
- (b) Digestion of starch starts in stomach.
- (c) Amino acids provide energy to our body.
- (d) The blood takes digested food to all the cells of the body.

Very Short Answer Type Questions

4. What does gastric juice help to convert?
5. What is the main function of teeth?
6. What are the two components of digestive system?
7. What is oesophagus?

8. Why does bread taste sweet when chewed for some time?
9. Give one instant source of carbohydrate?
10. Where the digestion does starts?
11. What is not digested by human?
12. Name the glands present in the mouth.
13. Where is bile produced?
14. Name the process of taking in food?
15. What helps the food to taste it by our tongue?
16. Name the largest gland in human body.
17. Which part of Amoeba helps in capturing the food particles?
18. Name the organ that helps in nutrition in Hydra?
19. Which organ is known as the food pipe?
20. What is Digestion?
21. Where is the bile produced? Which component of the food does it digest?
22. Name the type of carbohydrate that can be digested by ruminants but not by humans. Give the reason also.
23. Write one similarity and one difference between the nutrition in amoeba and human beings.
24. What is Absorption?
25. Why do we get instant energy from glucose?
26. What is salivary digestion?
27. What are parasites?
28. Name the various digestive organs of man?
29. What is cellulose?
30. What is the function of premolars and molars? Write the number of both teeth in each jaw
31. Which teeth do you use for piercing and tearing? Write the number of these teeth.
32. How many types of teeth do you find in humans? Name them.
33. What are the main steps of digestion in humans?
34. Name the type of food and mode of feeding of the following animals- (a) Ant (b) Mosquito

Short Answer Type Questions-

35. What is digestion?
36. Write the function of the tongue?
37. Where is saliva produced?
38. Name the organs of the human digestive system?
39. Name the different types of teeth found in human beings?

40. Give an example of ruminants?
41. What is peristalsis?
42. What are villi? What is their location and function?
43. Why do we get instant energy from glucose?
44. Can we survive only on raw, leafy vegetables/grass? Discuss.
45. Where are the salivary glands located and what is their functions?
46. Explain the term Assimilation, Pseudopodia?
47. What do you understand by rumen and rumination?
48. Write the functions of the tongue.
49. What is the difference between milk teeth and permanent teeth?
50. Differentiate between incisors and canines?
51. Name the acid produced in the stomach?
52. Name any one digestive juice and describe its role in digestion?
53. How does the liver help in the digestion of food?
54. What is rumination?

Long Answer Type Questions-

55. Draw and label Digestive system, of ruminant?
56. Draw and label Human Digestive system?
57. Explains with diagram Feeding System in Amoeba?
58. Explains the Effect of Saliva on starch?
59. Write the process absorption food in the small intestine?
60. Draw labelled diagrams of (a) Regions of the tongue for different tastes (b) Amoeba
61. Write short notes on: (a) The stomach (b) The liver
62. Write a short note on structure and feeding in amoeba.
63. What do you understand by alimentary canal or digestive tract?
64. Explain the nutrition in Amoeba with the help of a diagram?
65. Explain about the different kinds of teeth and their function in human beings?
66. Write the functions of the following organs in the digestive system: mouth, stomach, liver, small intestine, pancreas
67. Explain the process of digestion in ruminants and the role of a four chambered stomach?
68. How does Amoeba take in (ingest) the food? From which part of the body undigested food is egested in Amoeba?
69. Name the various kind of teeth in our mouth. State their functions.
70. What is meant by tooth decay? Name some of the foods which are the major cause of tooth decay.

What are the various ways of preventing tooth decay?

71. Describe with the help of labelled diagrams, how feeding and digestion in Amoeba takes place.

72. (a) What are ruminants? Which of the following are ruminants?

Fish, Amoeba, Cow, Humans, Dogs, Sheep, Buffalo, Deer, Goat, Giraffe

(b) Name the type of carbohydrate that can be digested by ruminants but not by humans. Give the reason also.

73. Name the three things secreted by the inner lining of our stomach. Also state their functions. What is the function of large intestine?

74. What are incisors, canines, premolars and molars? State their functions.

75. (a) What is meant by the term “rumination”? Name any two ruminants.

(b) Explain why, a cow can digest grass but we cannot.

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CLASS 7 SCIENCE (2022-23)

CHAPTER 4

HEAT

Heat is a form of energy which makes the substance hot. In winter, it is our common experience that we feel cold inside the house and if we come out in front of sun rays, then we feel warm. Now, if we know that how do we feel this sensation of warm or cold? Then, what will be our answer? Think. In this chapter, we will try to find out the answer to such kind of question.

Hot and Cold

In our daily routine, we come across a number of objects, out of which some are hot while other objects are cold, e.g. when a frying pan kept on a burning gas stove becomes hot but the handle of the pan is cold. Even among the hot objects, some objects may be hotter than the other. In the same manner, among the cold objects, some objects may be colder than the other. So, if I ask you how you decide the relative hotness or coldness of objects, then your answer will be by simply touching the objects'. But our sense of touch is not enough in telling us whether an object is really hot or cold so, this can be understood by performing a simple activity.

Temperature and Thermometer

The degree of hotness or coldness of the object is known as the temperature of an object. The temperature of an object is an only property that indicates which object is hot and which one is cold. A high temperature of a body indicates that it is very hot whereas a low temperature of the object indicates that it is quite cold, e.g. the temperature of boiling water is quite high, so boiling water appears to be very hot. On the other side, the temperature of melting ice is quite low. So, ice appears to be very cold on touch.

It is measured by using an instrument called thermometer, which has a scale marked on it which is used to read the temperature, e.g. the scale in laboratory thermometer is marked along the length of thermometer's tube between 0° mark and 100° mark into 100 equal divisions. So, each division is called a degree. The temperature of an object should always be stated with its unit. So, the most common unit for measuring temperature is degree Celsius (°C).

Both the clinical thermometer and laboratory thermometer are mercury thermometers. So, when a particular amount of heat is supplied to the thermometer bulb consisting of mercury (by the hot body whose temperature is to be measured), then the mercury expands and get rises in the glass tube of the thermometer. This fact is used in measuring the temperature.

Clinical Thermometer

It is the thermometer which is used for measuring the temperature of the human body. In case of fever, it is used by a doctor (or at home) to measure the temperature of the patient. This thermometer consists of a long glass tube having a thin and uniform bore. There is a glass bulb at one end of the glass tube which consists of mercury as shown in the figure given below:

Features of a Clinical Thermometer

There is a very short range of temperature of a clinical thermometer, i.e. from 35°C to 42°C. The short range of a clinical thermometer is because of the fact that the temperature of human body normally does not go below 35°C or above 42°C.



Just above the bulb containing mercury, a clinical thermometer has a kink in its glass tube which is to prevent the back flow of mercury into the thermometer bulb when the thermometer bulb is removed from the mouth of

a patient. This kink prevents the mercury level in the thermometer tube from falling on its own. Due to this, we can read the correct body temperature of the patient even after removing the thermometer bulb from his mouth.

Note: After noting the body temperature, the level of mercury can be brought down by giving jerk to the thermometer tube.

As mercury is very toxic and is difficult to dispose off, so thermometer must be handled carefully. Clinical thermometer should not be used to measure the temperature of objects other than the human body. It should not be kept in the sun or near a flame, otherwise, it may break. Nowadays, digital thermometers are used which do not use mercury.

Reading a Clinical Thermometer

There are following steps to read the temperature on a thermometer.

Step I: Firstly, wash the thermometer with an antiseptic solution and if in case, the antiseptic solution is not available, then wash it with clean water.

Step II: Gently, hold the thermometer tube in your hand and give it a jerk in such a way that the mercury thread in the thermometer tube falls below the reading of 35°C .

Step III: Now, put the bulb of the thermometer under the tongue of the patient for about one minute. Then take out the thermometer from the patient's mouth.

Step IV: In order to read the temperature, hold the thermometer horizontally in your hand and rotate it slowly. When we see a magnified image of the mercury thread in its tube, then a position will come. Now, read the temperature on thermometer tube in level with the top of the mercury thread.

Precautions while Reading the Thermometer

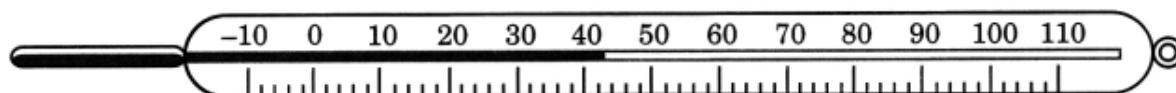
A clinical thermometer should not be used for any object other than the human body. There are some following precautions which are to be observed while reading a clinical thermometer.

- Wash the clinical thermometer before and after using preferably with an antiseptic solution.
- Be ensure that the mercury level before using the clinical thermometer should be below 35°C .
- The clinical thermometer should be read by keeping the level of mercury along the line of sight.
- While reading the clinical thermometer, it should never be held by the bulb.
- The clinical thermometer should be carefully handled.

Laboratory Thermometer

A device which is used for measuring the temperature in a science laboratory is called a laboratory thermometer.

This thermometer is made up of a long glass tube having a thin bore. The graduation marked on the tube of a laboratory thermometer can measure the temperature from -10°C to 110°C , this is known as the range of a laboratory thermometer. Also, determine how much a small division on this thermometer reads (this is also known as least count of the thermometer), it is due to the fact that this information is required to read the thermometer correctly.



Laboratory thermometer

These are the special thermometers which automatically record the maximum and minimum temperature of the day. The maximum and minimum temperature of the last day reported in weather reports in TV and newspapers are measured by the maximum-minimum thermometers.

Reading a Laboratory Thermometer

There are following steps to read the temperature on a thermometer.

Step I: First of all, take some hot water in a beaker.

Step II: Now, try to hold the laboratory thermometer from its glass tube and immerse the bulb of the thermometer in hot water taken in the beaker. Notice that the bulb of the thermometer should not touch the sides or the bottom of the beaker as shown in the figure.

Step III: Here, we will observe the shining thread of mercury moving up in the thermometer tube. After some time, the mercury will stop rising and stand at one place.

Now, read the temperature on the thermometer tube which corresponds to the top of the mercury thread. This will give us the temperature of hot water taken in the beaker.

Precautions in Using a Laboratory Thermometer

- While -measuring temperature, the laboratory thermometer should be held vertically.
- The thermometer bulb should be surrounded from all sides by the substance whose temperature is to be measured.
- The thermometer reading should be taken while its bulb is still in touch with the substance whose temperature is being measured and by keeping the mercury level along the line of sight.
- The thermometer should not be held by the bulb.
- The thermometer should be carefully handled.
- We should note down the temperature reading by keeping the thermometer bulb immersed in hot water because if the thermometer bulb is taken out of hot water, then its mercury thread will start falling and this will give a wrong reading for the temperature of hot water.

Digital Thermometer

There are most of the common thermometers like mercury thermometers which use a liquid metal called mercury for their working. Mercury is a toxic substance (a poisonous substance) and thus it is very difficult to dispose of safely, if a thermometer breaks. So, there is a lot of concern over the use of mercury in thermometers. Also, during these days, digital thermometers are available which do not use mercury.

Transfer of Heat

Heat flows from a hot object to a cold object or heat flows from an object at the higher temperature to another object which is at a lower temperature. This flow of heat is known as the transfer of heat, e.g. if you dip a steel spoon into a cup of hot tea, then we will find that the temperature of spoon rises and it becomes hot. In this case, some of the heat contained in hot tea has been transferred to spoon which is placed inside it.

When the two objects attain the same temperature, then the flow of heat stops. This means that no heat will be transferred from one object to another if the temperature of the two objects is the same.

There are three ways through which heat can be transferred from a hot object to a cold object.

- By conduction (in solid, heat is transferred by conduction)
- By convection (in liquid and gases, heat is transferred by convection)
- By radiation (in free space or vacuum, heat is transferred by radiation)

Let us discuss all the three ways of heat transfer.

1. Conduction

The mode of transfer of heat from hotter part of a material to its colder part or from a hot material to a cold material in contact with it, without the movement of material as a whole, is known as conduction. In all the solids, heat is transferred by the process of conduction.

Conductor and Insulator of Heat

Materials which allow heat to be conducted through them easily are conductors of heat. Those metals such as iron, copper, silver, aluminium, etc., are good conductors of heat.

Bad conductors of heat are those materials which do not allow heat to be conducted through them easily. These

materials are also known as insulators of heat. Wood, plastic and glass are insulators of heat.

Uses of Good and Bad Conductors of Heat

During the winter season, we generally wear woollen clothes. If we compare them with cotton clothes, then we will find that the wool fibres have much more space between them. These get filled with air which is a bad conductor of heat. Hence, being an insulator, both wool and air together prevent the heat from our bodies from escaping out.

Also, jute and sawdust are bad conductors of heat. We cover the ice with a jute cloth or sawdust to prevent it from gaining heat from the surroundings and melting.

The double walls of the refrigerators having space inside which is filled with an insulating material, prevent the heat of the surroundings from reaching the inside of the refrigerator.

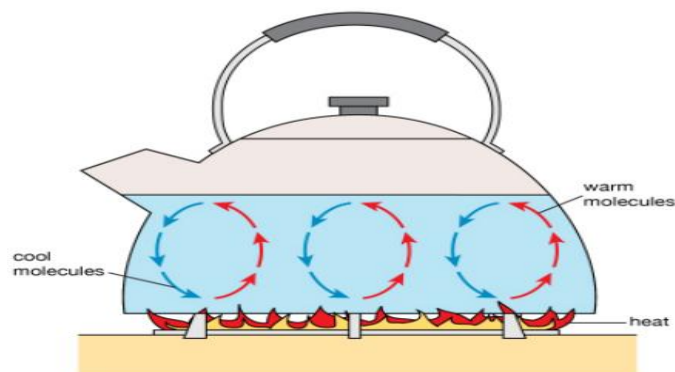
The two thinner blankets (one on top of the other) during the winter season are very much effective because the air layer trapped between the thinner blankets creates insulation and provides the protection from cold.

Sometimes, there are two things which are at the same temperature. It seems like they are at different temperatures, one being cold and the other being warm. This happens because some things are a good conductor of heat while others are poor conductors of heat.

e.g. during winter season, a metal object kept in a room feels very cold to touch but a wooden object in the same room feels warmer to touch. Metal object is a good conductor of heat. So, when we touch the metal object, it conducts away heat from our hand quickly. And by losing heat, our hand feels cold. On the other side, the wooden object (being a poor conductor of heat) does not allow the heat of our hand to escape and hence feels warmer to touch.

The water (or most liquids) and air (or gases) are bad conductors of heat.

2. Convection



The mode of transfer of heat from the hotter part of a fluid (liquid or gas) to its colder parts by the movement of the liquid (or gas) itself is known as convection. The transfer of heat by convection can take place only in liquids and gases. It is due to the reason that the particles in liquids and gases can move about freely.

So, the transfer of heat by convection cannot take place in solids because the particles in the solids are fixed at a place and cannot move about freely. It is also not occurred in empty space or vacuum because there are no particles of any kind in empty space which can move and transfer heat.

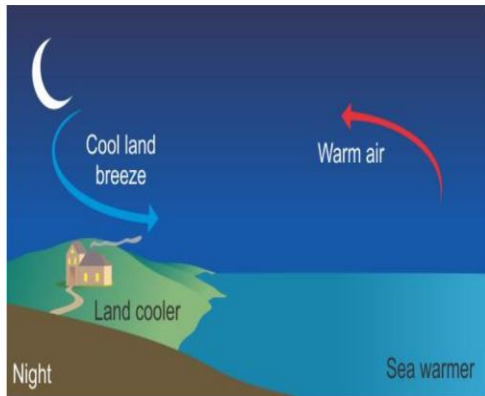
Convection in Water

Water is a poor conductor of heat. So, due to this reason, it cannot transfer heat by conduction but it transfers heat by the process of convection.

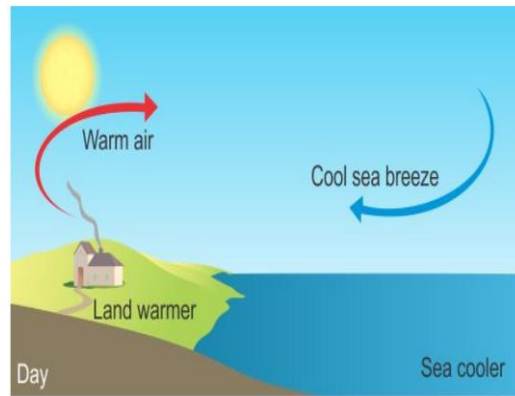
Convection in Air

Air is a very poor conductor of heat, Air transfers heat from its hotter parts to the colder parts by the process of convection.

Sea and Land Breezes



Land Breeze



Sea Breeze

The blowing of sea breeze and land breeze in coastal areas is generally occurred due to the convection of heat in air.

In coastal areas during the day time, the breeze generally flows from the sea towards the land and during the night time, blows from the land towards the sea. Sea and land breezes are actually convection of heat.

During the day, the land heats up more than water. Due to this, the air over the land becomes hotter and lighter and rises up. So, the air from the sea which is cooler and heavier rushes to take the place created by hot rising air. Therefore, a sea breeze blows during the day.

During the night, the land loses heat faster than water and becomes cooler and the air over the sea is now warmer due to which, it rises up and the cooler air over the land rushes to take its place. Therefore, we observe a land breeze at night.

3. Radiation



Radiation

The mode of transfer of heat through which heat energy from a hot body to a cold body by means of heat rays without any material medium between them is known as radiation, e.g. the sun's heat reaches the earth by the process of radiation. The sun is very far away from the earth, and there is mainly an empty space (vacuum) between the sun and the earth even, then the heat from the sun reaches the earth. This is due to the fact that the sun being extremel hot, emits invisible heat radiation (or infrared rays) in all directions.

These radiations travel through the vacuum between the sun and the earth at a very high speed and ultimately, reach us on the earth. Therefore, we can say that the transfer of heat from a hot object to a cold object by the

process of radiation does not require any medium.

In our daily life activities, we have many situations where heat is transferred by radiation through air, e.g.

- Depending on the temperature of surroundings, our body too gives heat to the surroundings or receives heat from the surroundings by radiation.
- If a hot utensil filled with hot milk is kept away from the flame, then it cools down by transferring its heat to the surroundings by radiation.
- If we stand next to a burning fire, then we will feel the heat of the fire falling on our face. The heat is transferred from the fire to our face by the process of radiation.

Clothes

During hot summer days, people prefer to wear white clothes or light coloured clothes because light coloured clothes absorb less heat from the sun and hence, keep us cool and comfortable in hot weather while in the cold winter days people prefer to wear dark clothes because the dark coloured clothes absorb more heat rays from the sun and keep us warm in winter season.

Thus, we can say that dark coloured objects absorb heat better and also emit heat better than light coloured objects. Now, let us try to study this concept on the basis of the given activity.

In the winters, we use woollen clothes. Wool is a poor conductor of heat. Moreover, there is air trapped in between the wool fibres. This air prevents the flow of heat from our body to the cold surroundings. So, we feel warm.

Exercise Questions

1. State similarities and differences between the laboratory thermometer and the clinical thermometer.

Solution:

Similarities

- Both are made of glass and consist of long narrow glass tube.
- At one end both of them have a bulb.
- Bulbs of both the thermometers consist of mercury
- Celsius scale is present in both the thermometer

Differences

Clinical Thermometer	Laboratory thermometer
Temperature range is 35 to 42 °C	Temperature range is -10 to 110 °C
Used to measure human body temperature	Used to measure temperature in the laboratory
It has a kink which prevents immediate backflow of mercury	It does not have a kink

2. Give two examples each of conductors and insulators of heat.

Solution:

Conductors: Iron and Copper

Insulators: Plastic and wood

3. Fill in the blanks :

- (a) The hotness of an object is determined by its _____.
- (b) Temperature of boiling water cannot be measured by a _____ thermometer.
- (c) Temperature is measured in degree _____.
- (d) No medium is required for transfer of heat by the process of _____.
- (e) A cold steel spoon is dipped in a cup of hot milk. Heat is transferred to its other end by the process of _____.
- (f) Clothes of _____ colours absorb more heat better than clothes of light colours.

Solution:

- (a) The hotness of an object is determined by its **temperature.**
- (b) Temperature of boiling water cannot be measured by a **clinical** thermometer.
- (c) Temperature is measured in degree **Celsius.**
- (d) No medium is required for transfer of heat by the process of **radiation.**
- (e) A cold steel spoon is dipped in a cup of hot milk. Heat is transferred to its other end by the process of **conduction.**
- (f) Clothes of **dark** colours absorb more heat better than clothes of light colours.

4. Match the following: (d) night

Column-I	Column-II
(i) Land breeze blows during	(a) summer
(ii) Sea breeze blows during	(b) winter
(iii) Dark coloured clothes are preferred during	(c) day
(iv) Light coloured clothes are preferred during	(d) night

Solution:

Column-I	Column-II
(i) The land breeze blows during	(d) night
(ii) The sea breeze blows during	(c) day
(iii) Dark coloured clothes are preferred during	(b) winter
(iv) Light coloured clothes are preferred during	(a) summer

5. Discuss why wearing more layers of clothing during winter keeps us warmer than wearing just one thick piece of clothing.

Solution:

More layers of clothing during winter keeps us warmer than wearing just one thick piece of clothing because air gets trapped in-between layer. As air is a bad conductor of heat it does not allow the escape of the heat from

the body.

6. Look at Fig mark where the heat is being transferred by conduction, by convection and by radiation.



Solution:



7. In places of hot climate it is advised that the outer walls of houses be painted white. Explain.

Solution:

In places of hot climate, it is advised that the outer walls of houses be painted white because white colour reflects back most of the heat that is incident on it as white is a poor absorber of heat. This helps in keeping the house cool.

8. One litre of water at 30°C is mixed with one litre of water at 50°C . The temperature of the mixture will be
(a) 80°C (b) more than 50°C but less than 80°C (c) 20°C (d) between 30°C and 50°C

Solution:

The temperature of the mixture will be between 30°C and 50°C because hot water loses the heat and simultaneously cold water gains heat this keeps the temperature in between 30°C and 50°C .

9. An iron ball at 40°C is dropped in a mug containing water at 40°C . The heat will

- (a) flow from iron ball to water.
- (b) not flow from iron ball to water or from water to iron ball.
- (c) flow from water to iron ball.
- (d) increase the temperature of both.

Solution:

Answer is (b) not flow from iron ball to water or from water to iron ball because both of them have the same temperature of 40°C .

10. A wooden spoon is dipped in a cup of ice cream. Its other end

- (a) becomes cold by the process of conduction.
- (b) becomes cold by the process of convection.
- (c) becomes cold by the process of radiation.

(d) does not become cold.

Solution:

The answer is (d) does not become cold because wood is a bad conductor of heat.

11. Stainless steel pans are usually provided with copper bottoms. The reason for this could be that

- (a) copper bottom makes the pan more durable.
- (b) such pans appear colourful.
- (c) copper is a better conductor of heat than stainless steel.
- (d) copper is easier to clean than stainless steel.

Solution:

The answer is (c) copper is a better conductor of heat than the stainless steel.

Some Important Questions-

1. **In which direction does the smoke go?**

Answer: Smoke will go upward.

2. **What do you mean by temperature?**

Answer: A reliable measure of the hotness of an object is its temperature.

3. **Which device is used to measure temperature?**

Answer: Thermometer is used to measure temperature.

4. **What is that silver stuff in a thermometer?**

Answer: Silver stuff in a thermometer is mercury.

5. **What is the unit of temperature as adopted by India?**

Answer: India has adopted the celsius scale.

6. **What is the normal temperature of a human being?**

Answer: The normal temperature of human body is 37°C .

7. **What is the range of a laboratory thermometer?**

Answer: The range of a laboratory thermometer is generally from -10°C to 110°C .

8. **What is the use of the kink in clinical thermometer?**

Answer: It prevents mercury level from falling on its own.

9. **How does heat flow from one object to another?**

Answer: Heat flows from a hotter object to a colder object.

10. **Does transfer of heat by radiation require any medium?**

Answer: The transfer of heat by radiation does not require any medium.

11. **Do all hot bodies radiate heat?**

Answer: Yes, all hot bodies radiate heat.

12. **How does heat transfer in liquids and gases?**
Answer: In liquids and gases the heat is transferred by convection.
13. **Will heat transfer if the temperature of two objects is the same?**
Answer: Heat will not be transferred if the temperature of two objects is the same.
14. **What should be the level of mercury in the clinical thermometer before use?**
Answer: Mercury level should be below 35°C.
15. **How does heat transfer in solids?**
Answer: In solids, generally, the heat is transferred by the process of conduction.
16. **What is the best way to clean a thermometer?**
Answer: Thermometer should be washed before and after use, preferably with an antiseptic solution.
17. **What is Conduction?**
Answer: The process by which heat is transferred from the hotter end to the colder end of an object is known as conduction.
18. **What are insulators of heat?**
Answer: The materials which do not allow heat to pass through them easily are insulators of heat.
Example: plastic and wood.
19. **What are conductors of heat?**
Answer: The materials which allow heat to pass through them easily are conductors of heat. Example: aluminum, iron and copper.
20. **What is clinical thermometer?**
Answer: The thermometer that measures our body temperature is called a clinical thermometer.
21. **Give two examples each of conductors and insulators of heat.**
Answer: Conductors – aluminum and copper
Insulators – water and air
22. **How does the heat travel in air?**
Answer: The air near the heat source gets hot and rises. The air from the sides comes in to take its place. In this way the air gets heated.
23. **What do you understand by heat?**
Answer: Heat is a form of energy that can be transferred from one object to another or even created at the expense of the loss of other forms of energy.
24. **What is the use of maximum-minimum thermometer?**
Answer: The maximum and minimum temperatures of the previous day, reported in weather reports, are measured by maximum-minimum thermometer.
25. **Why does the mercury not fall or rise in a clinical thermometer when taken out of the mouth?**

Answer: Clinical thermometer has kink near the bulb prevents mercury level from falling on its own.

26. **Why clinical thermometer cannot be used to measure high temperatures?**

Answer: Clinical thermometer cannot be used to measure high temperatures because the range of this thermometer is from 35°C to 42°C only.

27. **Explain land breeze.**

Answer: At night, the water cools down more slowly than the land. So, the cool air from the land moves towards the sea. This is called the land breeze.

28. **What is the concern associated with the use of mercury thermometer?**

Answer: There is a lot of concern over the use of mercury in thermometers. Mercury is a toxic substance and is very difficult to dispose of if a thermometer breaks.

29. **Explain the construction of clinical thermometer.**

Answer: A clinical thermometer consists of a long, narrow, uniform glass tube. It has a bulb at one end. This bulb contains mercury. Outside the bulb, a small shining thread of mercury can be seen.

30. **In places of hot climate it is advised that the outer walls of houses be painted white. Explain.**

Answer: In places of hot climate it is advised that the outer walls of houses be painted white because light color reflects most of the heat that falls on them and thus keep the house cool.

31. **Is it possible to construct buildings that are not affected much by heat and cold outside?**

Answer: This can be done by constructing outer walls of buildings so that they have trapped layers of air. One way of doing this is to use hollow bricks, which are available these days.

32. Why stainless steel pans are provided with copper bottoms? Explain.

33. What happens when one end of a wooden spoon is dipped in an ice cream cup?

34. Calculate and give the right answer: 1 litre of water at 30°C is added to 1 litre of water at 50°C. What is the temperature of the mixture?

35. Which colour clothes absorb more heat when compared to light colours?

36. What are conductors? Give one example.

37. What are insulators? Give an example.

38. Distinguish between the clinical thermometer and the laboratory thermometer.

39. How to determine the hotness of an object?

Fill ups:

40. a) _____ is the degree of relative hotness or coldness.

41. Cooking vessels should be made up of _____ conductors.

42. Heat is a form of _____.

43. Mercury level falls easily in a _____ thermometer.

44. S.I unit of heat is _____.

45. Range of clinical thermometer is from _____°C to _____°C.

46. A kink is not provided in a _____ thermometer.

Choose the correct option:

47. Conduction takes place in:

Solids only b) Liquids only c) Gases only d) in solids, liquids & Gases

48. In which method of transfer of heat do the molecules travel from hot to cold portion?

a) Conduction b) Convection c) Radiation d) All of the above

49. A thermos flask prevent loss or gain of heat by

a) Conduction b) Convection c) Radiation d) All of the above

50. Convection occurs only in

a) Solids b) Liquids c) Gases d) Liquids & Gases

51. Ventilation in the room is due to:

a) Conduction b) Convection c) Radiation d) All of the above

52. The method of heat transfer in a steel rod is by:

a) Conduction b) Convection c) Radiation d) All of the above

53. Why is underside of cooking vessels painted black?

54. Why do we feel cold when our body sweats?

55. Why only mercury is used in thermometer?

56. Explain three modes of transmission of heat i.e., conduction, convection & radiation, with the help of their applications.

Name the following:

57. Fastest mode of transfer of heat. _____

58. Mode of transfer of heat where the medium does not get heated _____

59. Mode of transfer of heat where no medium is required. _____

60. The metal used in the bulb of thermometer. _____

CLASS 7 SCIENCE (2022-23)

CHAPTER - 5

ACID BASE AND SALT

Acids

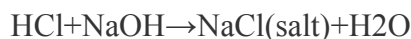
- Acids are substances that taste sour and are corrosive in nature.
- It turns blue litmus paper to red.
- These substances are chemically acidic in nature. E.g.: -orange juice, curd, vinegar, hydrochloric acid etc.

Bases

- Bases are substances that, in aqueous solution, are slippery to the touch and bitter in taste.
- It turns red litmus paper to blue.
- These substances are chemically basic in nature. Eg:- soap, ammonium hydroxide, calcium hydroxide, etc.

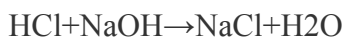
Neutralization Reaction

- When an acid and base react with each other to form a salt, water and heat then such reaction is known as neutralisation reaction.
- In this reaction, the acidic and basic nature of the acid and base respectively are destroyed.
- The reaction between hydrochloric acid and sodium hydroxide is a classic neutralisation reaction where sodium chloride is formed.



Salts

- Salt is the product formed from the neutralisation reaction of acids and bases.
- In the reaction between hydrochloric acid and sodium hydroxide the salt formed is sodium chloride.



- Salt can be acidic, basic or neutral in nature.

Visual Indicators

Indicators

Substances, which are used to test whether a substance is acidic or basic are called indicators.

	Acidic Solution	Basic Solution
Red litmus	No change	Turns blue
Blue litmus	Turns red	No change

Natural Indicators

- Plants or plant parts contain useful chemicals that are used for testing an acidic or basic property of a solution are termed as natural indicators. China Rose and turmeric are examples of natural indicators.

Litmus

- Litmus is a naturally occurring purple indicator, which is extracted from lichens.
- When added to an acidic solution, it turns red and when added to a basic solution, it turns blue.
- It is available in the form of a solution or as strips of paper known as litmus paper.

(A) Red litmus turns blue indicating a basic solution

(B) Blue litmus turns red indicating an acidic solution

Phenolphthalein

- Phenolphthalein is an acid-base indicator which is colourless in acid solution but turns pink to red as the solution becomes alkaline.
- It is a synthetic indicator and is used for the neutralization experiment.

Olfactory Indicators

- Olfactory indicators are substances whose smell changes whether they are mixed with an acidic or a basic solution.
- Onion, clove oil and vanilla extract are examples of such indicators.

Visual Indicators

- Visual Indicators are substances used to show visually (as by a change in colour) the condition of a solution with respect to the presence of a particular material (as a free acid or base).
- Common examples are litmus, red cabbage, phenolphthalein, etc

Neutralization

Neutralisation in Daily Life

- During indigestion, taking milk of magnesia (magnesium hydroxide) gives us relief as it neutralizes the effect of excess acid produced inside the stomach.
- The effect of ant sting which is caused by formic acid can be neutralized by rubbing moist baking soda (basic in nature).
- To ensure that plants can grow well, the soil is treated with either acids or bases depending if it's basic or acidic in nature.
- Factory wastes, generally being acidic in nature can cause environmental damage, are treated with basic substances before discharge.

Safety Measures While Using Acids

- When diluting acids, pour the acid into the water, NOT water into acid as this may cause spattering of the acid.
- Safety gloves are to be worn whenever working with acids or bases.

Uses and Applications

pH of Soil

- Excessive use of chemical fertilisers changes the pH of the soil.
- Plants do not grow well when the soil is either too acidic or too basic.
- Hence substances are added to bring the pH at a neutral level.

Uses of Acids and Bases

- Food preservation – Citric acid.
- Aerated drinks – Carbonic acid.
- Baking powder – Tartaric acid.
- Cooking – Acetic acid(vinegar)
- Manufacture of soaps – Sodium hydroxide.
- Manufacture of bleaching powder – Calcium hydroxide
- As a foaming agent in fire extinguishers – Aluminium hydroxide.

NCERT QUESTIONS

Q.1- State the difference between Acid and Base?

Ans.

<i>Acids</i>	<i>Bases</i>
(i) Acids are sour to taste.	(i) Bases are bitter to taste.
(ii) Acid turns blue litmus to red.	(ii) Base turns red litmus to red.
(iii) Acid is a substance which contains hydrogen ion (H^+).	(iii) Bases are substances which contain hydroxyl ion (OH^-).

Q.2. Ammonia is found in many household products, such as window cleaners. It turns red litmus blue. What is its nature?

Ans. Ammonia has basic nature.

Q.3. Name the source from which litmus solution is obtained. What is the use of this solution?

Ans. Litmus solution is extracted from lichens. It is used to determine whether the given solution is acidic or basic.

Q.4. Is the distilled water acidic/basic/neutral? How would you verify it?

Ans. Distilled water will be neutral. We can verify it by showing that neither blue nor red litmus paper changes its colour when dipped in it.

Q.5. Describe the process of neutralisation with the help of an example.

Ans. The reaction between an acid and a base is known as neutralisation. Salt and water are produced in this process with the evolution of heat.

Antacids like milk of magnesia (magnesium hydroxide), baking soda, etc. which contain a base are used for reducing acidity in stomach when excessive acid released by glands.

Q.6. Mark 'T' if the statement is true and 'F' if it is false:

(i) Nitric acid turns red litmus blue. (T/F)

(ii) Sodium hydroxide turns blue litmus red. (T/F)

(iii) Sodium hydroxide and hydrochloric acid neutralise each other and form salt and water. (T/F)

(iv) Indicator is a substance which shows different colours in acidic and basic solutions. (T/F)

(v) Tooth decay is caused by the presence of a base. (T/F)

Ans. (i) F (ii) F (iii) T (iv) T (v) F

Q.7. Dorji has a few bottles of soft drink in his restaurant. But, unfortunately, these are not labelled. He has to serve the drinks on the demand of customers. One customer wants acidic drink, another wants basic and third one wants neutral drink. How will Dorji decide which drink is to be served to whom?

Ans. Dorji can decide with the help of litmus paper:

(i) The drink which would turn a red litmus blue would be basic.

(ii) If the drink turns a blue litmus to red would be acidic.

(iii) The drink which would not affect both red and blue litmus would be neutral.

Q.8. Explain why:

(a) An antacid tablet is taken when you suffer from acidity.

(b) Calamine solution is applied on the skin when an ant bites.

(c) Factory waste is neutralised before disposing it into the water bodies.

Ans. (a) We take an antacid such as milk of magnesia to neutralise the excessive acid released in stomach.

(b) Ant injects an acidic liquid (Formic acid) into the skin on biting which causes inflammation, to the skin.

The effect of the acid can be neutralised by rubbing. Calamine solution which contains zinc carbonate which is a very weak base and causes no harm to the skin.

(c) The wastes of factories contain acids. If acids are disposed off in the water body, the acids will harm the organisms. So factory wastes are neutralised by adding basic substances.

Q.9. Three liquids are given to you. One is hydrochloric acid, another is sodium hydroxide and third is a sugar solution. How will you identify them? You have only turmeric indicator.

Ans. Name of the substances Effect on turmeric indicator

1. Hydrochloric acid Yellow to blue

2. Sodium hydroxide Yellow to red

3. Sugar solution No change

Q.10. Blue litmus paper is dipped in a solution. It remains blue. What is the nature of the solution?

Explain.

Ans. (i) It can be identified on the basis of the following observations : Bases change the colour of litmus paper to blue. As the colour of blue litmus paper is not affected, the solution must be basic.

(ii) If the solution is neutral, even then colour of litmus will not change.

Q. 11. Consider the following statements:

(a) Both acids and bases change colour of all indicators.

(b) If an indicator gives a colour change with an acid, it does not give a change with a base.

(c) If an indicator changes colour with a base, it does not change colour with an acid.

(d) Change of colour in an acid and a base depends on the type of the indicator. Which of these statements are correct?

(i) All four (ii) (a) and (d) (iii) (b) and (c) (iv) only (d)

Ans. (ii) (a) and (d)

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