**CBSE**

**Class IX Science**

**Sample Paper – 7**

**Time: 3 hrs** **Total Marks: 80**

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**General Instructions:**

- The question paper comprises five sections – A, B, C, D and E. You are to attempt all the sections.
- All questions are compulsory.
- Internal choice is given in sections B, C, D and E.
- Question numbers 1 and 2 in Section A are one mark questions. They are to be answered in one word or in one sentence.
- Question numbers 3 to 5 in Section B are two marks questions. These are to be answered in about 30 words each.
- Question numbers 6 to 15 in Section C are three marks questions. These are to be answered in about 50 words each.
- Question numbers 16 to 21 in Section D are five marks questions. These are to be answered in about 70 words each.
- Question numbers 22 to 27 in Section E are based on practical skills. Each question is a two marks question. These are to be answered in brief.

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## Section A

**1.** Name two breeds of cows selected for long lactation period. (1)

**2.** List the aspects involved in the cycling of nutrients. (1)

## Section B

**3.** What makes the biosphere dynamic but a stable system? (2)

**OR**

Define eutrophication. What is its ill-effect on the ecosystem?

**4.** A ball weighing 15 N falls from a height of 30 metres. Calculate the energy it had when it was at rest. What is the form of energy it experiences once it reaches the ground? (consider g = 10 $m/s^2$) (2)

**5.** Explain the sedimentation and decantation methods.

## Section C

**6.** (3)

(a) Draw a sketch of Bohr's model of an atom with three shells.

(b) If the K, L and M shells of an atom are full, then what would be the total number of electrons in the atom?

(c) What is the maximum number of electrons which can be accommodated in a shell?

**7.** Write the symptoms when the following organs are targeted by microbes. (3)

(a) Lungs

(b) Liver

(c) Brain

**OR**

'It is more difficult to make antiviral medicines than antibiotics'. Justify this statement.

**8.** Give reasons: (3)

(a) Why should we wear cotton clothes in summer?

(b) Why do we see water droplets on the outer surface of a glass containing ice-cold water?

(c) How does it feel when a nurse applies spirit at the injection site?

**9.** A stone is tied to a string and is continuously revolved in circular motion. What is the displacement of the stone? What is the work done if the force applied to revolve the stone is 30 N? (3)

**10.** Write the expression for Newton's law of gravitation and give explanation of all the terms in the expression. What is the SI unit of the gravitational constant? (3)

**11.** A metal plate of mass 30 kg and diameter 100 cm is placed on a stand. Calculate the pressure acting on the stand. (3)

**OR**

Calculate the orbital velocity in unit km/s of the Earth around the Sun if the distance between the Earth and the Sun is $1.49\times10^{8}$ km. (Total time taken by the Earth for revolution $=3.15\times10^{7}$ seconds) (3)

**12.** Calculate the ratio of moles of 3.6 g of water and 4.4 g of carbon dioxide. Atomic mass of C = 12 u, H = 1 u, O = 16 u. (3)

**OR**

Write the names of compounds:

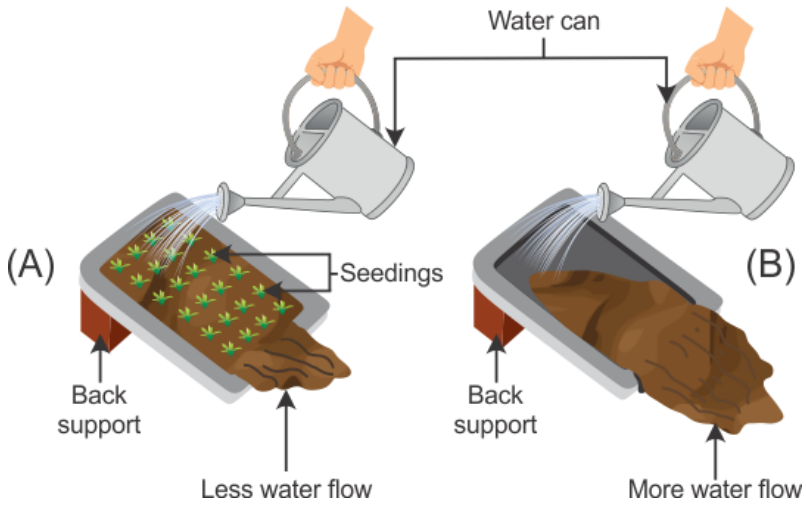
(i) $Al_2(SO_4)_3$

(ii) $CaCl_2$
(iii) $K_2SO_4$

**13.** Samar's father owned an orchard in the Kashmir valley where apples grow in abundance. In the flowering season, Samar observed honeybees on the flowers. He quickly asked his father to start working on the idea of establishing an apiary. (3)
(a) Name the species of honeybee which is commonly used in India for the commercial production of honey.
(b) Write two advantages of bee keeping.
(c) List two qualities of Samar which are worth praising.

**14.** What would happen if all the cells of our body were of the same shape and size? (3)

**15.** Two similar plastic trays A and B filled with soil and manure are taken. In Tray A, mustard seeds are sown and watered for 4–5 days until they germinate into seedlings, and the seedlings grow into small plants. Watering of Tray A is stopped for the next 2–3 days, and the small plants are allowed to grow. Trays A and B are placed on a brick in a tilted position as shown in the figure. Now both trays are watered with equal amount of water using a water can. (3)




Answer the questions given below:
(a) Name the natural phenomenon indicated in Tray B.
(b) Less water flows out from Tray A. Give reason.
(c) Why is the top layer of soil considered the most important layer?

## Section D

**16.** (5)

(a) Give two examples of each:

(i) Organisms with a soft body covered with a calcareous shell.

(ii) Organisms with jointed legs and no wings.

(iii) Organisms with a spiny body and radial symmetry.

(b) Classify the following into cold-blooded and warm-blooded animals:
Rohu, Bat, Pigeon, Salamander

**17.** (5)

(a) A man pulls a trolley through a distance of 20 metres on a smooth horizontal surface. The handle of the trolley makes an angle of 30° with the horizontal surface. If the force applied by the man is 30 N, then calculate the work done in pulling the trolley. (Given: $\sqrt{3} = 1.732$)

(b) Define power. Is power a scalar or vector quantity?

**OR**

(a) What is the amount of work done:

i. By an electron revolving in a circular orbit of radius 'r' around a nucleus?

ii. By an electron moving with half the speed of light in an empty space free of all forces?

(b) An electronic pump is used to pump water from an underground sump to the overhead tank situated 20 m above. It transfers 2000 kg of water to the overhead tank in 15 minutes. Calculate the power of the pump.
What do you mean by instantaneous power of a device?

**18.**

(a) Which metal did Rutherford select for his α particle scattering experiment and why?

(b) Which part of atom was discovered (5)

**OR**

(a) Describe Rutherford's model of an atom.

(b) Write the electronic configuration of the elements whose atomic numbers correspond to 7 and 19.

**19.**

(a) An object weighs 40 N on the Earth. What will be its weight on the Moon? Calculate the mass of this object on the Moon. ($g = 10\ m/s^2$)

(b) A man is standing 30 metres away from a large wall and calls his friend and hears an echo. After what time does he hear an echo? (Speed of sound in air = 330 m/s)

**20.** (5)

(a) Explain how the bark of a tree is formed. How does it act as protective tissue?

(b) What will happen if all the blood platelets are removed from blood?

**OR**

(a) Give the location and function of the following tissues:

(i) Cartilage

(ii) Areolar tissue

(iii) Adipose tissue

(b) Name the tissue which shows the following features:

(i) Cells are dead; cells show thickening; provides mechanical support to plants; made up of one type of cells.

(ii) Cells are living; cells contain green-coloured chloroplast; possess intercellular spaces.

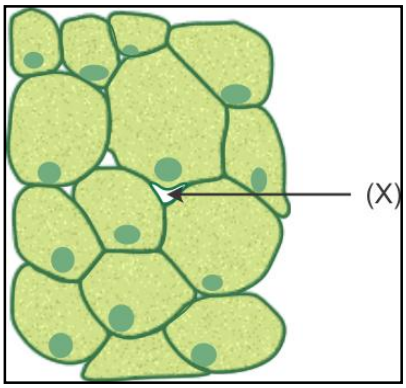
**21.** (5)

(a) What happens when a liquid is left exposed to air?

(b) List the factors which affect the rate of evaporation and explain their effect on it.

## Section E

**22.** Observe the figure carefully. (2)

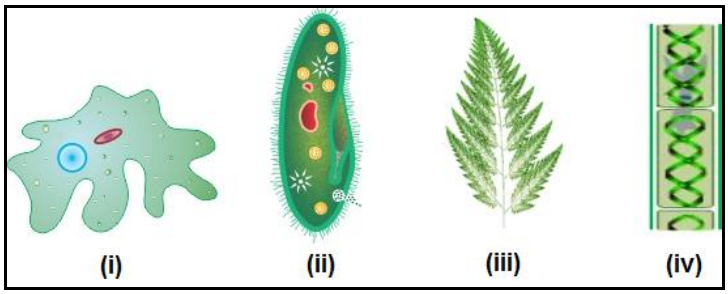



(a) What does X represent? What is its function?
(b) Which plant tissues show the presence of X?

**OR**

Rita observed a temporary mount of an onion peel under the microscope.
(a) Which characteristics would have been noted by Rita?
(b) Which stain is used to observe the cells of an onion peel?

**23.** Study the given organisms and answer the questions based on them. (2)




(a) Which of these organisms belong to Kingdom Protista?
(b) Write any one salient feature of the division to which plants (iii) and (iv) belong.

**24.** Which of the following will show Tyndall effect? (2)
(a) Salt solution
(b) Milk
(c) Copper sulphate solution
(d) Starch solution

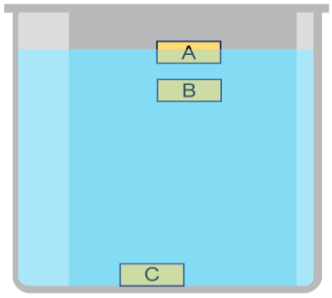
**25.** Explain how both physical and chemical changes take place during the burning of a candle. (2)

**OR**

Classify the following into physical or chemical change:
Freezing of water, rusting of almirah, Digestion of food, Explosion of crackers

**26.** Check the following combination of solid and liquid and note down what will be the position of a solid in a liquid in the beaker. Give reason for the same.
Positions A, B and C mean that the object floats on liquid, the object just floats on liquid and the object sinks in liquid, respectively.

(2)




i) Wooden block and water
ii) Ice and water
iii) Iron nail and mercury

**27.** Distinguish between longitudinal waves and transverse waves. (Give two points each)

**OR**

Rohan is strumming a guitar. When a string of the guitar is plucked, it produces vibrations. What kind of waves are produced here? Give reasons for your answer. (2)

# Class IX Science
# Sample Paper – 7 Solution

## Section A

**1.** Jersey and Brown Swiss

**2.** Aspects involved in the cycling of nutrients:
- Input of nutrients
- Output of nutrients
- Internal nutrient cycling

## Section B

**3.** When the biotic components of the biosphere such as plants and animals interact with the abiotic components such as soil and water, constant transfer of food and energy takes place. The flow of energy is unidirectional, but the flow of nutrients is cyclic. This makes the biosphere a dynamic but stable system.

**OR**

Eutrophication is nutrient enrichment involving the addition of nitrates and phosphates to water bodies which results in the growth of aquatic plants, especially algae causing colouration of water known as algal bloom. Eutrophication leads to the depletion of dissolved oxygen in water resulting in killing of aquatic organisms such as fish.

**4.** A ball weighs 15 N. Thus, it is has a mass of

$W = mg \rightarrow m = \frac{W}{g} = \frac{15}{10} = 1.5$ kg

When at rest, the ball experiences potential energy.

Thus, PE = m × g × h = 1.5 × 10 × 30 = 450 joules

Energy experienced by the ball once it reaches the ground is called kinetic energy.

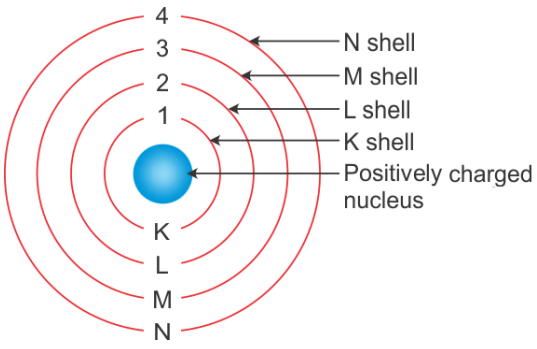
**5.** Sedimentation and decantation methods are used to separate a mixture containing an insoluble solid in a liquid. In this method, the mixture is allowed to stand undisturbed for some time. The insoluble solid substance settles and a clear liquid is left standing. This clear liquid is called supernatant liquid. The solid substance that settles is called sediment. This entire process is known as sedimentation.

The clear water (supernatant liquid) is then poured out carefully into another beaker leaving the sediments undisturbed. This process is known as decantation.

## Section C

**6.**

a)




(b) Number of electrons in fully filled K shell = 2
Number of electrons in fully filled L shell = 8
Number of electrons in fully filled M shell = 8
So, the total number of electrons = 2 + 8 + 8 = 18

(c) Maximum number of electrons which can be accommodated in a shell = $2n^2$
where n = shell number

**7.**

(a) **Lungs**: Cough and breathlessness
(b) **Liver**: Nausea, vomiting and abdominal pain
(c) **Brain**: Headache, vomiting, fits and unconsciousness

**OR**

It is more difficult to make antiviral medicines than antibiotics because viruses have biochemical mechanisms of their own. They enter the host cells and use the host's machinery for their life processes. Therefore, antiviral medicines work against the host body rather than against the virus. Antibiotics block bacterial synthesis pathways without affecting the body because bacteria have and use their own metabolic pathways. Therefore, they do not affect the host body.

**8.**

(a) We perspire more in summer. Cotton being a good absorber of water helps in absorbing sweat and exposes it to the atmosphere for evaporation. When sweat evaporates from our body, it takes away the heat from our body. Thus, our body loses heat and gets cooled.

(b) On coming in contact with the cold glass of water, water vapour present in the air loses energy and gets converted to liquid, which can be seen as water droplets.

(c) It feels cold as the spirit evaporates from the skin. When the spirit changes from the liquid state to the vapour state, it absorbs heat energy from the skin. The skin thus loses heat and feels cool.

**9.** The stone is revolved in a circular motion, and thus, the displacement performed by the stone is zero because it repeatedly comes to its initial position. Thus, the work done on revolving the stone is

$W = F \times s = 30 \times (0) = 0$ joule

**10.** $F = G \times \frac{M.m}{r^2}$,

where $F \rightarrow$ gravitational force

$G \rightarrow$ gravitational constant

$M, m \rightarrow$ masses of the two bodies

$r \rightarrow$ distance between the two bodies

The SI unit of gravitational constant G is $Nm^2/kg^2$.

**11.** The pressure is the ratio of force (F) exerted by a body to the area (A) upon which the body is exerting the force. Also, weight (W) is the force exerted by a body due to the Earth's gravitational pull, i.e. F = W.

$W = mg$

Acceleration due to gravity $(g) = 10\ m/s^2$

$\therefore W = 30 \times 10 = 300\ N$

$\therefore F = 300\ N$

$A = \pi r^2$

$\therefore\ A = 3.14 \times (0.5)^2 = 3.14 \times 0.25 = 0.785$

$\therefore\ P = \frac{300}{0.785} = 382.1\ N/m^2$

Pressure exerted by the block on the floor is $382.1\ N/m^2$.

**OR**

time taken by the earth to revolve around sun$(T) = 3.15 \times 10^7$ seconds

mean distance between erath and sun is $(r) = 1.49 \times 10^8$ km

if the planet takes time T to complete one revolution $(2\pi r)$around sun then ,

the orbital velocity of earth is given by$(v) = \frac{2\pi r}{T} = \frac{2 \times 3.14 \times 1.49 \times 10^8}{3.15 \times 10^7}$

$\therefore v = \frac{9.35 \times 10^8 \times 10^{-7}}{3.15} = 2.96 \times 10^1 = 29.6\ km/s$

**12.** Given weight of water = 3.6 g

Molecular weight of water = 16 + 2 = 18 g

$$\text{Moles of water} = \frac{3.6}{18}$$
$$= 0.2$$

Given weight of carbon dioxide = 4.4 g

Molecular weight of carbon dioxide = 12 + 44 = 56 g

$$\text{Moles of carbon dioxide} = \frac{4.4}{44}$$
$$= 0.1$$

Mole ratio of 3.6 g water and 4.4 g of carbon dioxide is $\frac{0.2}{0.1} = 2:1$

**OR**

(a) $Al_2(SO_4)_3$ - Aluminium sulphate

(b) $CaCl_2$ - Calcium chloride

(c) $K_2SO_4$ - Potassium sulphate

**13.**

(a) *Apis mellifera* is the exotic breed of honeybee which is used for the commercial production of honey.

(b) <u>Advantages of bee keeping:</u>

- It can be used as an additional income-generating activity.
- Beehives are a source of wax which can be used for medicinal applications.

(c) Two qualities of Samar:

- He is a good observer.
- He thinks scientifically and commercially.

**14.** Different cells of our body assume different sizes and shapes to perform specific functions in the body. The human body is complex and requires a huge range of functions to be carried out. If all the cells in our body were of the same size, shape and volume, then they would all perform the same function and a multitude of other important functions cannot be carried out, making life impossible.

**15.**

(a) Soil erosion. It is the process of removal of the top layer of soil under the effect of strong winds and fast running water.

(b) Tray A has mustard plants growing in it. The roots of the plants play an important role in holding the soil particles. As a result, less water flows out from Tray A.

(c) The top layer of soil is considered the most important layer because it is rich in humus and living microorganisms which help in recycling of nutrients in the soil.

## Section D

**16.** (a)

(i) Molluscs: Garden snail, sea mussel

(ii) Arachnids: Scorpion, spider

(iii) Echinoderms: Sea urchin, star fish

(b)

- Cold-blooded animals: Rohu, salamander
- Warm-blooded animals: Bat, pigeon

**17.** (a)

Work (W) done by a force (F) is given by

$W = F \times s \cos\theta$

The force applied on the trolley= 30 N

displacement of the trolley= 20 metres

the angle made by pulley with the horizontal surface $=30^{\circ}$

$\therefore$ the total work done by man(W)= $30 \times 20 \cos 30^{\circ}$

$$\rightarrow W = 30 \times 20 \frac{\sqrt{3}}{2} = 30 \times 10\sqrt{3} = 30 \times 10 \times 1.732 = 519.6 \text{ Joule}$$

(b) Power is the rate at which the work is done or energy is consumed.

It is a scalar quantity as it only depends on the magnitude but not on the direction.

**OR**

(a)

i. In case of an electron revolving in a circular orbit of radius 'r' around a nucleus, centripetal force provided by the electrostatic force of attraction acts on the electron towards the centre, but the motion is along the tangent to the circular orbit at each point. As force and displacement are mutually perpendicular to each other, the work done is zero.

ii. In case of an electron moving with half the speed of light is free of all forces, work done will be zero as there is no force acting on the electron.

(b) Height of the overhead tank 'h' = 20 m

Mass of water to be raised 'm' = 2000 kg

Time 't' = 15 min = $15 \times 60 = 900$ s

$$\text{Power of the pump} = \frac{\text{Total work}}{\text{Total time}} = \frac{mgh}{t} = \frac{2000 \times 9.8 \times 20}{900} = 435.5 \text{ W}$$

Instantaneous power of a device at a particular instance of time is the rate of doing work by the device at that very instant.

**18.**

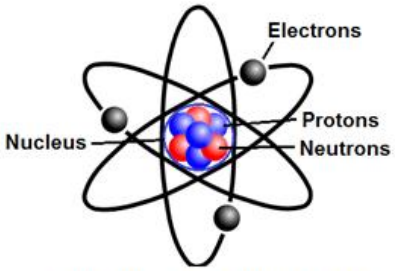
(a) Rutherford selected gold metal because he wanted as thin a layer as possible, and gold is the most malleable metal.
Heavy metals such as platinum will show the same observation with alpha particles as shown by gold foil.
If a light nucleus like lithium is used, then fast-moving alpha particles may even push the light nucleus aside and may not be deflected back.

(b) The nucleus was discovered by Rutherford.
Rutherford performed an experiment by allowing a stream of alpha particles to pass through a very thin gold foil. He observed that alpha particles pass through the metal foil without deviating from their path. This shows that an atom contains a large empty space called nuclear space.

**OR**

(a) Rutherford's atomic model:

- Based on the results of the α-particle scattering experiments, Rutherford put forth his atomic model.
- An atom contains a positively charged centre called the nucleus of the atom. Almost all the mass of the atom is concentrated in the nucleus.
- The electrons of the atom revolve around the nucleus in fixed, circular orbits.
- The size of the nucleus is many times smaller than the size of the atom. The nucleus of an atom is 10,000 times smaller than the atom.



Rutherford's Atomic Model

(b) Atomic numbers and electronic configuration:

| Atomic numbers | Electronic configuration |
|---|---|
| | K L M N |
| 7 | 2 5 |
| 19 | 2 8 8 1 |

**19.** (a)

Weight of object on the Earth ($W_E$) = 40 N

acceleration due to gravity ($g_E$)= 10 $m/s^2$

$W_E = m_E \times g_E$

$\therefore m_E = \frac{40}{10} = 4 \text{ kg}$

Weight of man on the moon ($W_M$) is given by

$\therefore W_M = \frac{1}{6} W_E$

$\therefore W_M = \frac{1}{6} \times 40 = 6.66 \text{ N}$

As the mass of an object is 4 kg on the earth it will remain the same on moon.

$\therefore m_M = 4 \text{ kg}.$

(b) We know that

Speed of sound in air (v)= $\frac{\text{Distance}}{\text{time}}$

$330 = \frac{30}{t}$

$\therefore \text{time} = \frac{30}{330} = 0.090 \text{ seconds}$

To travel the distance of 30 m, the time taken is 0.090 seconds. So, to hear an echo, the total time required is 0.090 × 2 = 0.18 seconds.

**20.**

(a) Strips of secondary meristem replace the epidermis of the stem. Cells on the outside are cut off from this layer. This forms the several layer thick cork or the bark of a tree. Cells of cork are dead and compactly arranged without intercellular spaces. They have suberin in their walls which makes them impervious to gases and water. Thus, the cork cells prevent desiccation, infection and mechanical injury in plants.

(b) Blood platelets are responsible for the release of thromboplastin necessary for blood clotting at the site of injury. In the absence of blood platelets, blood clotting will not occur after injury and bleeding will continue from the wound. This will finally cause the death of the injured person.

**OR**

(a)

| Tissue | Location | Function |
|---|---|---|
| (i) Cartilage | Bone surface in joints in the nose, ear, trachea and larynx. | Smoothens the bone surface in joints, gives support to the nose, ear, trachea and larynx. |
| (ii) Areolar tissue | Between skin and muscles, around blood vessels and nerves and bone marrow. | Fills the space inside the organs, supports internal organs and helps in the repair of tissues. |
| (iii) Adipose tissue | Below the skin and between the internal organs. | Storage of fats and insulation. |

(b)

(i) Sclerenchyma
(ii) Parenchyma

**21.**

(a) When a liquid is left exposed to air, its volume decreases gradually because of evaporation of some of the water from its surface.

(b) Four factors affecting the rate of evaporation:

i) Surface area: Evaporation is a surface phenomenon. If the surface area is increased, the rate of evaporation increases.

ii) Temperature: With the increase of temperature, more number of particles gets enough kinetic energy to go into the vapour state, and hence, the rate of evaporation increases.

iii) Humidity: If the humidity of air is high, then the rate of evaporation decreases.

iv) Wind speed: With the increase in wind speed, the particles of water vapour move away with the wind, decreasing the amount of water vapour in the surroundings. Hence, the rate of evaporation increases.

## Section E

**22.**

(a) X represents intercellular space between cells. These spaces are important for gaseous exchange and water transport. They even minimise cellular damage on freezing.

(b) Parenchyma shows the presence of abundant intercellular spaces.

**OR**

(a) The following characteristics would have been noted by Rita:

- Presence of single nucleus
- Cells attached edge to edge without intercellular spaces
- Presence of a cell wall around each rectangular cell

(b) Safranin is generally used to stain plant cells such as an onion peel. It reacts with lignin present in the tissues of the plant cell wall and stains it red.

**23.** (i) *Amoeba*, (ii) *Paramoecium*, (iii) Fern, (iv) *Spirogyra*

(a) *Amoeba* and *Paramoecium* belong to Kingdom Protista.

(b) Fern belongs to Division Pteridophyta. They have a well-developed vascular system for the conduction of water and other substances.

*Spirogyra* belongs to Division Algae. The plant body is not differentiated into root, stem and leaves but is in the form of an undivided thallus.

**24.** Milk and starch solution are colloids and hence will show Tyndall effect.

Copper sulphate solution and salt solution will not show Tyndall effect.

**25.** Wax of the candle is made of carbon and hydrogen, which react with oxygen on burning and change to carbon dioxide and water, which escapes into the air. This is a chemical change. As a result, a candle melts and reduces in size. This is a physical change. So, during the burning of a candle, both physical and chemical changes take place.

**OR**

Physical Change - Freezing of water

Chemical Change - Rusting of almirah, digestion of food, explosion of crackers

**26.**

i) The wooden block position in water will be at A. It will float on water, as the density of wood is less than the density of water.

ii) The position of ice will be B. The ice will just float on water, as the density of ice and water is approximately equal.

iii) The position of the iron nail will be A. The iron nail will float on mercury, as the density of iron is less than the density of mercury.

**27.** Longitudinal waves:

i) Longitudinal waves are waves in which the particles of the medium vibrate back and forth (parallel) in the same direction as the waves.

ii) Longitudinal waves are made of compressions and rarefactions.

Transverse waves:

i) Transverse waves are waves in which the particles of the medium vibrate at right angles (perpendicular) to the direction of the wave.

ii) Transverse waves consist of crests and troughs.

**OR**

Vibrations produced by the string travel in the form of longitudinal waves. When sound waves produced by the string pass through air, the air particles vibrate back and forth parallel to the direction of sound waves; hence, these waves are longitudinal waves.