

**CBSE**  
**Class IX Science**  
**Sample Paper – 13**

**Time: 3 hrs**

**Total Marks: 80**

**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.

**Section A**

1. List two human impacts on the carbon cycle. (1)
2. What is hybridisation? (1)

**Section B**

3. What are isotopes? Give any two uses of isotopes. (2)
4. Why is osmoregulation necessary in aquatic organisms? (2)

**OR**

What is the main function of the following organelles?

- (a) Golgi bodies
- (b) Vacuoles

5. What force is needed to produce an acceleration of  $4 \text{ m/s}^2$  in a body of mass 10 kg? (2)



## Section C

6. Answer the following: (3)
- (a) Define velocity. State its SI unit. State whether it is a scalar or vector quantity.
- (b) Write the formula for average velocity. A car travels a distance of 50 km in 5 hours and returns travelling the same distance in 6 hours. Calculate the average velocity of the car.
7. (3)
- (a) Give four general characters of Phylum Echinodermata.
- (b) Write two examples.
8. (3)
- (a) What are the two ways of changing the velocity of the body?
- (b) What is uniform velocity?
9. A 0.34-g sample of a compound of oxygen and boron was found by analysis to contain 0.136 g of boron and 0.204 g of oxygen. Calculate the percentage composition of the compound by weight. (3)
10. The signs and symptoms of a disease depend on the tissue or organ which the microbe targets. Justify the statement giving an example. (3)
11. A 15-g bullet is travelling at a speed of 350 m/s. It strikes a target of 2.5 kg which is initially at rest and remains embedded in it. What is the speed with which the target will move off? (3)

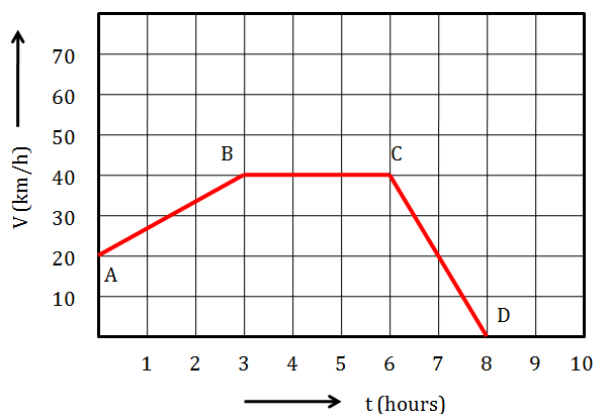
OR

The velocity–time graph for a moving body is given alongside. (3)

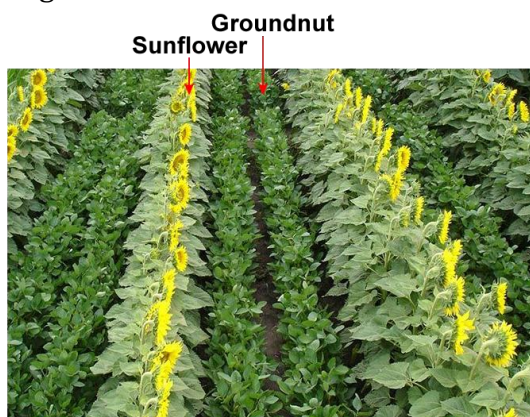
(a) In which part of the graph can you say that the body is decelerating?

(b) How much distance is covered by a body in 8 hours?

(c) Find acceleration between points A and B.



12. A field with sunflower and groundnut is shown below. (3)



- (a) What pattern of cropping does the field show?  
(b) Mention any two advantages of this type of cropping pattern.

**OR**

What are the components of cattle feed?

13. (3)

- (a) What are the two ways in which the physical states of matter can be changed?  
(b) Draw the 'states of matter triangle' to show the interconversion of states of matter.  
(c) How can the evaporation of a liquid be made faster?

**OR**

Elements X, Y and Z have atomic numbers 6, 9 and 12, respectively. Which one

- (a) forms an anion  
(b) forms a cation  
(c) Has four electrons in the valence shell

14. Give reasons: (3)

- (a) What will happen if the apical meristem is damaged or cut?  
(b) Branches of a tree move and bend freely in high wind velocity.  
(c) Why is blood considered a type of connective tissue?

15. Give reason for the following observations: (3)

- (a) Naphthalene balls disappear with time without leaving any solid.  
(b) We get the smell of perfume even when sitting several metres away.  
(c) Ice at 273 K is more effective in cooling than water at the same temperature.

## Section D

16. (5)
- Define kinetic energy. What is the SI unit of kinetic energy? Write the formula for kinetic energy.
  - Two bodies of equal masses move with uniform velocities  $v$  and  $4v$ , respectively. What is the ratio of their kinetic energies?
17. Differentiate between homogeneous and heterogeneous mixtures with examples. (5)
18. (5)
- What are decomposers?
  - State their role in the ecosystem.
  - In which type of plants do nitrogen-fixing bacteria reside?
  - Explain the various forms in which carbon is found on the Earth.

OR

- Write the importance of the carbon cycle in nature. List any two points.
  - What are the factors on which the cycling of an element or substance depends?
  - The nitrogen cycle is called a perfect cycle in nature. Explain.
19. Briefly describe how to separate a mixture of (5)
- Sulphur and sand
  - $\text{CuO}$  and  $\text{ZnO}$
  - Cream from milk
  - Iron filings and sugar
  - Kerosene oil and water

OR

Iron powder and sulphur powder were mixed and divided into two parts A and B. When part A was heated strongly over a burner, substance C was formed. Part B was however not heated at all. When dilute hydrochloric acid was added to substance C, gas D was evolved, and when dilute hydrochloric acid was added to part B, gas E was evolved.

- What type of substance is B?
- What type of substance is C?
- Name the gas (i) D and (ii) E.
- State one characteristic property of gas D.
- Write one test to identify gas E.



20. (5)
- (a) What is the significance of the following?
- (i) Haemocoel
  - (ii) Notochord
  - (iii) Coelom
- (b) Why do bryophytes and pteridophytes grow in moist and shady places?
- (c) What is meant by 'characteristics' in classification?

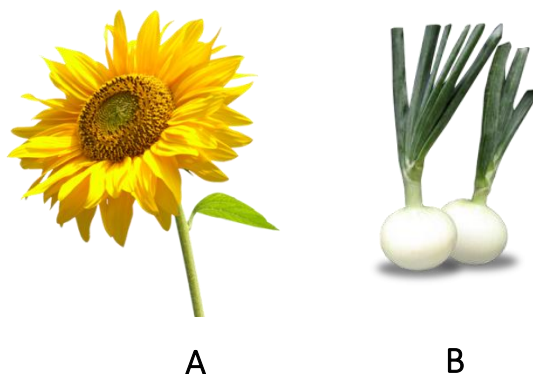
21. (5)
- (a) Distinguish between mass and weight. ( any 3 points)
- (b) A cricket ball is thrown up at the speed of 20 m/s. How high will it go before it begins to fall?

**OR**

- a) Where is the value of  $g$  maximum when it is related to the Earth's surface? How does it change above and below the Earth's surface? What happens to the value of  $g$  at the centre of the Earth?
- b) A ball is dropped from a height of 18 m. It reaches the ground at 2 s. What is the initial velocity of the ball?

## Section E

22. Observe figures A and B carefully. (2)

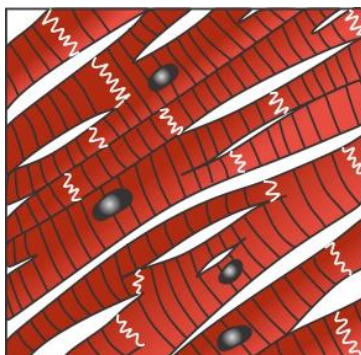


- (a) Identify the monocot and dicot plant.  
(b) Which of the given plants has a fibrous root system and parallel venation?

OR

- (a) Give two examples of plants with reticulate venation.  
(b) List any two characteristic features of dicot plants.

23. The given figure represents a tissue found in the human body. (2)



- (a) Identify the tissue and state its location in the body.  
(b) Is it voluntary or involuntary in nature?

24. If the angle made by the incident sound ray with the plane surface is  $20^\circ$ . What is the angle of reflection? (2)

25. On heating 40 g of  $\text{CaCO}_3$ , 17.6 g of carbon dioxide is obtained. What is the mass of CaO formed? (2)

26. The relative densities of four liquids A, B, C and D are 1.5, 1.2, 0.87 and 2.98, respectively. An object is floated in all these liquids one by one. In which liquid will the object float with its maximum volume submerged under the liquid? (2)



**OR**

An object of mass 900 g exerts a force of 8.18 N somewhere on the Earth. Calculate the value of acceleration due to gravity at that point.

27. A student sets up an apparatus for determining the boiling point of water. He records the temperature after regular intervals. What will be the temperature of water when it starts to boil? (2)

**OR**

Classify each of the following as a homogeneous or heterogeneous mixture.

Soda water, wood, air, soil, vinegar, filtered tea

**CBSE**  
**Class IX Science**  
**Sample Paper – 13 Solution**

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**Section A**

1. Human impacts on the carbon cycle:
  - (a) Burning of fossil fuels
  - (b) Extensive use of land
2. Hybridisation refers to the crossing between genetically dissimilar plants. In this method, the two crop varieties are selected, each with at least one of the desired characteristics such as high yield or resistance to disease.

**Section B**

3. Isotopes are atoms of the same element having the same atomic number but different mass number.  
Uses:  
An isotope of cobalt is used in the treatment of cancer.  
An isotope of uranium is used as nuclear fuel.
4. Osmoregulation, i.e. maintenance of water concentration inside the body, regulates the concentration of water inside cells. Aquatic organisms have higher concentration of water outside their bodies, which causes endosmosis.

**OR**

Functions:

- (a) Golgi bodies: Help in the formation of the cell plate during cell division and synthesis of lysosomes and secretory vesicles
  - (b) Vacuoles: Involved in the maintenance of water balance
5. Mass of the body = 10 kg  
Acceleration,  $a = 4 \text{ m/s}^2$   
 $F = m \times a = 10 \times 4 = 40 \text{ N}$





## Section C

6.

(a) Velocity is defined as the rate of change of displacement to time.

The SI unit of velocity is m/s. Velocity depends on magnitude as well as direction and therefore is a vector quantity.

(b) Formula for average velocity is

$$v_{\text{avg}} = \frac{\text{Total displacement}}{\text{Total time taken}}$$

Total displacement = final position – initial position = 50 km – 50 km = 0 km

Total time taken = 5 hr + 6 hr = 11 hr

Thus, the average velocity of the car is 0 km/h.

7. (a) General characters of Phylum Mollusca:

- They are triploblastic, coelomates, unsegmented and show pentamerous symmetry in adults.
- Their body is without head but has oral and aboral surfaces.
- They are characterised by the presence of a water vascular system that extends from the body surface as a series of tentacle-like projections.
- The digestive system is usually complete, but excretory organs are absent.

(b) Examples: Starfish, Sea cucumber

8.

(a) Velocity of a body can be changed in the following ways:

(i) By changing the speed of the body

(ii) By keeping the speed constant but by changing the direction of the body

(b) A body has a uniform velocity if it travels in a specific direction in a straight line and moves over equal distances in equal intervals of time.

9. Given:

Mass of boron = 0.136 g

Mass of oxygen = 0.204 g

Mass of the sample compound (boron + oxygen) = 0.34 g

According to the law of definite proportions, boron and oxygen are in a fixed ratio in the given compound = 0.136: 0.204 = 2:3

$$\% \text{ of boron} = \frac{\text{mass of boron} \times 100}{\text{mass of compound}} = \frac{0.136 \times 100}{0.34} = 40\%$$

$$\% \text{ of oxygen} = \frac{\text{mass oxygen} \times 100}{\text{mass of compound}} = \frac{0.204 \times 100}{0.34} = 60\%$$



10. The signs and symptoms of a disease depend on the organ or tissues from the targets of the pathogens that cause the infectious diseases. The pathogens damage the targeted organs or tissues which in turn give rise to signs and symptoms. For example, if the lungs are the targets, then symptoms will be cough and breathlessness. If the liver is targeted, there will be jaundice.

11. Mass of the bullet,  $m = 15 \text{ g}$

$$m = \frac{15}{1000} = 0.015 \text{ kg}$$

Initial speed of the bullet,  $u_1 = 350 \text{ m/s}$

Mass of the target,  $M = 2.5 \text{ kg}$

Initial speed of the target,  $u_2 = 0 \text{ m/s}$

The bullet gets embedded in the target. So, the total mass of the bullet and the target becomes

$$M' = m + M = 2.515 \text{ kg}$$

Both objects move together with speed  $v_2$ .

According to the law of conservation of linear momentum,

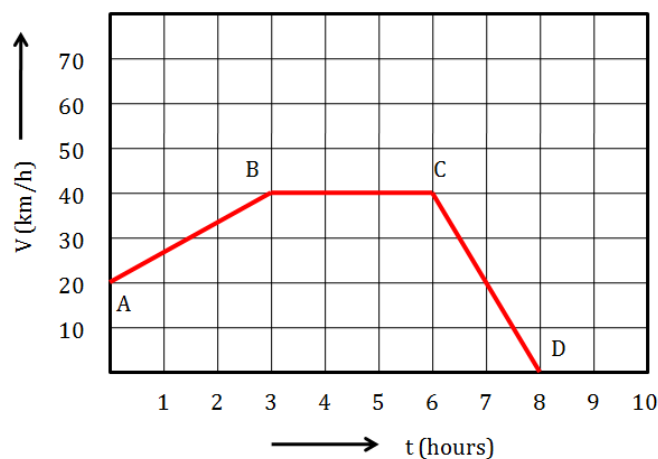
$$m_1 u_1 + m_2 u_2 = M' v_2$$

$$\therefore m_1 u_1 = M' v_2$$

$$\therefore v_2 = \frac{m_1 u_1}{M'} = \frac{0.015 \times 350}{2.515}$$

$$\therefore v_2 = 2.087 \text{ m/s}$$

OR



(a) Velocity of the body decreases with time from C to D. Thus, deceleration occurs from C to D.

(b) The distance covered by the body is the area under the curve.

Total number of squares under the curve ABCD = 25.

On Y-axis – 1 unit = 10 km/h

Thus, the total distance covered in 8 hours =  $25 \times 10 = 250 \text{ km}$ .

(c) A body moves with a constant velocity from B to C.

12.

- (a) The field shows intercropping of sunflower and groundnut crops.
- (b) Advantages of intercropping:
- (i) It increases the productivity of crops per unit area.
  - (ii) It helps maintain soil fertility and allows better use of natural resources.

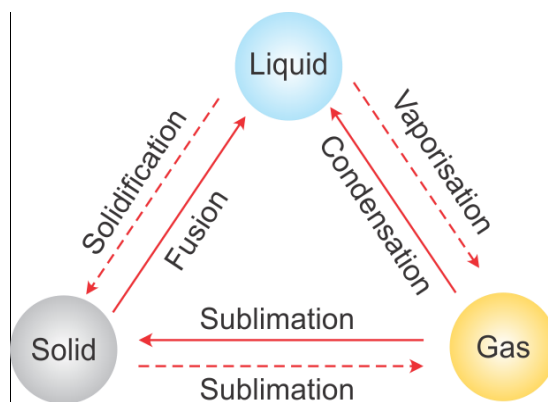
OR

Cattle feed contains two types of substances—roughage and concentrates—in the form of fodder and grain along with a lot of water.

- a) Roughage: It consists of coarse and fibrous substances having low nutrient content. Animals get roughage from hay (straw of cereals) and grain along with a lot of water.
- b) Concentrate: Foods rich in one or more nutrients (like carbohydrate, fats, proteins, minerals and vitamins) and low in fibres are provided by cotton seeds, oilseeds, oilcakes and cereal grains like gram and bajra. In winters, cattle are mostly fed on green fodder, mainly Berseem and Lucerne. In other seasons, they are given maize, bajra, jowar and dry fodder.

13.

- (a) The physical states of matter can be changed by changing pressure and temperature.
- (b) Inter-conversion of states of matter:



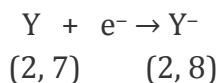
- (c) The rate of evaporation of a liquid can be made faster by
- (i) Increasing the temperature
  - (ii) Increasing the surface area of the liquid
  - (iii) Lowering humidity
  - (iv) Increasing wind speed

OR

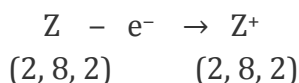


Element	X	Y	Z
Atomic no.	6	9	12
Electronic arrangement	(2, 4)	(2, 7)	(2, 8, 2)

(a) Y (2, 7) forms anions.



(b) Z (2, 8, 2) forms cations.



(c) X (2, 4) has four electrons in the valence shell.

**14.**

- (a) If the apical meristem is cut off, one or more lateral meristems will grow faster in a lateral manner. This will lead to bushy growth.
- (b) Branches of a tree move and bend freely in high wind velocity because of the presence of collenchyma that adds the property of flexibility.
- (c) Blood is considered a type of connective tissue because the blood has a fluid matrix, i.e. plasma, in which blood cells are suspended and which flows between different organs of the body.

**15.**

- (a) Naphthalene undergoes sublimation easily, i.e. the change of state of naphthalene from solid to gas without intervention of the liquid state. Thus, naphthalene balls keep on forming naphthalene vapours which disappear into the air with time without leaving any solid.
- (b) Gaseous particles possess high speed and move very rapidly in all directions. When perfume is sprayed, its particles diffuse into the particles of air at a very fast rate and reach our nostrils. This enables us to smell the perfume from a distance.
- (c) Cooling takes place when heat is removed from a system. In case of ice at 0°C, it will first take heat (latent heat) from the medium to convert to water at 0°C. In short, in case of ice at 0°C, there will be change in phase so more energy will be required, whereas in case of water at 0°C, there will be no change in phase. Hence, lesser energy will be taken from the surroundings. So, at the same temperature of 273 K, a large amount of heat will be removed by ice from the surroundings than in case of water. Hence, ice at 273 K is more effective in cooling than water at the same temperature.



## Section D

16.

(a) Energy of a body due to its motion is called kinetic energy.

Joule is the SI unit of kinetic energy.

$$\text{Kinetic energy} = \frac{1}{2}mv^2$$

(b) Masses of two bodies are the same.

Velocities of the two bodies are  $v$  and  $4v$ , respectively.

$$\text{Kinetic energy} = \frac{1}{2}mv^2$$

$$\text{K.E.}_1 = \frac{1}{2}mv^2$$

$$\text{K.E.}_2 = \frac{1}{2}m(4v)^2$$

$$\frac{\text{K.E. of body A}}{\text{K.E. of body B}} = \frac{\frac{1}{2}mv^2}{\frac{1}{2}m(4v)^2} = \frac{1}{16}$$

17.

Homogeneous mixtures	Heterogeneous mixtures
<ul style="list-style-type: none"><li>Substances are completely mixed together in these mixtures.</li></ul>	<ul style="list-style-type: none"><li>Substances remain separate in these mixtures.</li></ul>
<ul style="list-style-type: none"><li>They have uniform compositions throughout their mass.</li></ul>	<ul style="list-style-type: none"><li>They have non-uniform compositions throughout their mass.</li></ul>
<ul style="list-style-type: none"><li>They have no visible boundaries of separation between the constituents.</li></ul>	<ul style="list-style-type: none"><li>They have visible boundaries of separation between the constituents.</li></ul>
<ul style="list-style-type: none"><li>Salt in water and sugar in water are examples of homogeneous mixtures.</li></ul>	<ul style="list-style-type: none"><li>Mixtures of sodium chloride and iron filings and oil and water are examples of heterogeneous mixtures.</li></ul>

18.

(a) Organisms which decompose the dead remains of plants and animals are called decomposers.

(b) Role of decomposers in the ecosystem:

(i) They help in the cycling of nutrients in the biosphere.



- (ii) They convert the available nutrients to a usable form.
- (iii) They help in complete disposal of dead animals or living things.
- (c) Nitrogen-fixing bacteria such as *Rhizobium* reside in the root nodules of leguminous plants.
- (d) Carbon in the elemental form occurs as diamond and graphite. Carbon in the combined state occurs as carbon dioxide, carbonates and hydrogen carbonate salts in various minerals. Biomolecules such as carbohydrates, fats, proteins, nucleic acids and vitamins also contain carbon.

**OR**

(a) Importance of the carbon cycle in nature:

- It provides carbon in the form of carbon dioxide which is used by plants during photosynthesis to prepare food. In this way, carbon is made available to the animal kingdom.
- It maintains the level of carbon dioxide in nature which helps to maintain a suitable temperature on the Earth's surface.

(b) Cycling of an element or a substance depends on the following factors:

- Source
- Form of availability
- Form in which an element is released back into the nutrient pool

(c) The nitrogen cycle is considered a perfect cycle in nature because the overall amount of nitrogen in the atmosphere and water bodies is maintained through this cycle. Use of chemical fertilisers also maintains its concentration in the biosphere. Since nitrogen is not lost to the atmosphere, the nitrogen cycle is considered a perfect cycle.

**19.**

(a) Mixture of sulphur and sand:

Add a solvent to the mixture of sulphur and sand. Sulphur dissolves in carbon disulphide, while sand does not. When filtered, the residue is sand. When the filtrate is kept open, carbon disulphide evaporates and sulphur crystals form.

(b) Mixture of CuO and ZnO:

Add a solvent to the mixture of CuO and ZnO which dissolves only one component, e.g. sodium hydroxide. When sodium hydroxide is added to the mixture, ZnO dissolves. Filter to obtain the residue of CuO.



(c) Mixture of cream from milk:

Centrifugation is used to separate cream from milk. The milk is put in a closed container in a big centrifuge machine. When the centrifuge machine is switched on, the milk is rotated (or spun) at a high speed in its container. The centrifugal force acts on the milk, and due to this, the milk separates into cream and skimmed milk. The cream, being lighter, floats over the skimmed milk and can then be removed.

(d) Mixture of iron filings and sugar:

By using a magnet, we can separate iron filings and sugar from their mixture. Iron filings will stick to the surface of the magnet and sugar will be left behind.

(e) Mixture of kerosene oil and water:

A separating funnel is used to separate the mixture of two immiscible liquids. Kerosene oil and water do not mix with each other and form two separate layers. The mixture separates into two layers according to their densities. The heavier liquid (water) forms the lower layer, whereas the lighter liquid forms the upper layer (kerosene). Thus, the water is first collected in the beaker and kerosene is collected in another beaker.

**OR**

- (a) B is a mixture (Fe + S).
- (b) C is a compound (iron sulphide).
- (c) (i) D is hydrogen sulphide gas.  
(ii) E is hydrogen gas.
- (d) Gas D has a rotten egg like smell.
- (e) Gas E burns with a 'pop' sound.

**20.**

(a)

- (i) Haemocoel: In Arthropods, there is an open circulatory system, and so the blood does not flow in well-defined blood vessels. The coelomic cavity is blood filled and is called haemocoel. It helps in meeting the high oxygen demand of Arthropods.
  - (ii) Notochord: The notochord is a long, rod-like support structure that runs along the back of the animals separating the nervous tissue from the gut. It provides a place for muscles to attach for the ease of movement.
  - (iii) Coelom: Coelom is the body cavity. The well-developed organs of the body can be accommodated into it.
- (b) Bryophytes and pteridophytes grow in moist and shady places because they require water for fertilisation.
- (c) Characteristics mean a particular form or a particular function.



21.

(a) Differences in mass and weight:

Sr. No.	Mass	Weight
1.	The mass of an object is the quantity of matter contained in it.	The weight of an object is the force with which it is attracted towards the centre of the Earth.
2.	SI unit of mass is kilogram (kg).	SI unit of weight is Newton (N).
3.	The mass of the object remains unchanged.	The weight of the object is not constant. It changes with change in acceleration due to gravity.
4.	The mass of an object can never be zero.	The weight of an object can be zero.

(b) Initial speed of the ball,  $u = 20 \text{ m/s}$

Final speed,  $v = 0$

Acceleration due to gravity,  $g = -9.8 \text{ m/s}^2$

According to the third equation of motion,

$$v^2 = u^2 + 2gh$$

Substituting the values in this equation, we get

$$(0)^2 = (20)^2 + 2 \times (-9.8) \times h$$

$$0 = 400 - 19.6 \times h$$

$$h = 20.4 \text{ metres}$$

Maximum height is 20.4 metres before it begins to fall.

**OR**

a) (i) The value of  $g$  is maximum on the Earth's surface.

(ii) Its value decreases on going above or inside the Earth's surface.

(iii) Value of  $g$  is zero at the centre of the Earth.

b) A ball is dropped from a height of 18 m.

Thus, the initial velocity of the ball ( $u$ ) = 0 m/s.





## Section E

22.A –Sunflower plant; B – Onion plant

- (a) Sunflower is a dicot plant, while onion is a monocot plant.  
(b) Onion plant will have a fibrous root system and parallel venation because it is a monocot. Dicot plants have a tap root system and reticulate venation.

**OR**

- (a) Plants with reticulate venation: Rose, mango  
(b) Characteristic features of dicot plants: (Any two)
- Embryo bears two cotyledons
  - Stem with vascular bundles in a ring
  - Leaves with reticulate venation

23.

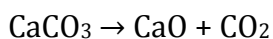
- (a) The given figure shows cardiac muscle tissue found in the walls of the human heart.  
(b) Cardiac muscles contract and relax continuously. We do not have control over their working. Hence, they are involuntary in nature.

24. Angle made by the incident sound ray with the plane surface =  $20^\circ$

$$\text{Angle of incidence} = 90^\circ - 20^\circ = 70^\circ$$

$$\text{Angle of reflection} = \text{angle of incidence} = 70^\circ$$

25. The chemical reaction is given by



$$40 \text{ g} \quad \times \quad 17.6 \text{ g}$$

Let  $x$  be the mass of CaO; using the law of conservation of mass, we can write

$$40 \text{ g} = x + 17.6 \text{ g}$$

$$\therefore x = (40 - 17.6) \text{ g}$$

$$x = 22.4 \text{ g}$$

26. The object will float maximum in liquid C as the density of liquid C is less.

**OR**

$$W = m \times g$$

$$m = 900 \text{ g} = 0.9 \text{ kg}$$

$$W = 8.18 \text{ N}$$

$$\text{So, } g = 8.18 \text{ N} / 0.9 \text{ kg} = 9.08 \text{ m/s}^2$$

Thus, the acceleration due to gravity is  $9.08 \text{ m/s}^2$ .



27. A student sets up an apparatus for determining the boiling point of water. He records the temperature after regular intervals and finds that the temperature of water when it begins to boil first rises and then becomes constant at  $100^{\circ}\text{C}$ .

**OR**

If the mixture has one phase, it is homogeneous; otherwise, it is heterogeneous.

**Homogeneous** - soda water, air, vinegar, filtered tea

**Heterogeneous** - wood, soil