SAMPLE PAPER - 2

Class 09 - Science

Time Allowed: 3 hours   **Maximum Marks: 80**

General Instructions:

1. This question paper consists of 39 questions in 5 sections.

2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

3. Section A consists of 20 objective type questions carrying 1 mark each.

4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.

5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words.

6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.

7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

1. In an endothermic process, heat is absorbed, in an exothermic process heat is evolved and in an athermic   **[1]**
   process, no thermal change is observed. What is the nature of evaporation of ether?

   a) First exothermic then endothermic   b) Athermic

   c) Exothermic   d) Endothermic

2. Following are a few definitions of osmosis read carefully and select the correct definition.   **[1]**

   a) Movement of solvent molecules from its   b) Movement of solvent molecules from higher
      higher concentration to lower concentration   concentration to lower concentration of
                                                            solution through a permeable membrane

   c) Movement of solute molecules from lower   d) Movement of water molecules from a
      concentration to higher concentration of   region of higher concentration to a region of
      solution through a semipermeable   lower concentration through a
      membrane   semipermeable membrane

3. A particle accelerates from rest at a constant rate for some time and attains a constant velocity of 8 ms^{-1}.   **[1]**
   Afterward, it decelerates at a constant rate and comes to rest. If the total time taken is 4 second, the distance
   travelled is:

   a) 32 meter   b) 16 metre

c) 4 metre

d) insufficient data

4. Using fertilizers in farming is an example of **[1]**

a) High cost production

b) Low cost production

c) None of these

d) No cost production

5. Chloroplasts may occur in **[1]**

a) chlorenchyma and sieve tubes

b) xylem parenchyma and sclerenchyma

c) collenchyma and sclerenchyma

d) parenchyma and collenchyma

6. Chromosomes are made up of **[1]**

a) RNA

b) DNA

c) DNA and protein

d) Protein

7. Match the following with correct response: **[1]**

(1) A dozen of pencil	(A) Mole
(2) Avogadro constant	(B) 12
(3) Unit used for calculation of amount of chemical substances	(C) Carbon-12
(4) Reference atom	(D) 6.022×10^{23}

a) 1-D, 2-A, 3-C, 4-B

b) 1-C, 2-B, 3-D, 4-A

c) 1-A, 2-C, 3-B, 4-D

d) 1-B, 2-D, 3-A, 4-C

8. Which of the following statements is the best description of the composition of blood? **[1]**

a) plasma and three types of cells

b) plasma and haemoglobin

c) serum and three types of cells

d) fibrin and three types of cells

9. A given solid is weighted in air using a spring balance. It is then weighed separately by immersing it fully first in vessel containing tap water and then in a vessel containing salt solution. The reading of the spring balance would be: **[1]**

a) least in water

b) equal in all the three cases

c) least in air

d) least in salt solution

10. When a body moves uniformly along the circle, then:- **[1]**

a) its speed changes but velocity remain the same

b) both speed and velocity changes

c) both speed and velocity remain the same.

d) its velocity changes but speed remain the same

11. What mass of CO_2 will 3.011×10^{23} molecules contain? **[1]**

a) 4.4 g

b) 11.0 g

c) 44.0 g

d) 22.0 g

12. Rhythmic contraction and relaxation throughout life, are shown by **[1]**

a) epithelium of lungs

b) striated muscles of tongue

c) striated muscles of limbs   d) cardiac muscles of heart

13. Which among the following is concerned with the synthesis and transport of lipids within the cell?   **[1]**

    a) Smooth endoplasmic reticulum   b) Lysosomes

    c) Rough endoplasmic reticulum   d) Golgi apparatus

14. The formula for quicklime is   **[1]**

    a) $Ca(OH)_2$ b) $CaCl_2$

    c) CaO d) $CaCO_3$

15. Which type of solution is formed when sand and water are mixed thoroughly and then kept undisturbed for some   **[1]**
time?

    a) True solution   b) Mixture

    c) Colloidal   d) Suspension

16. Match the following with the correct response.   **[1]**

(a) Green revolution	(i) Increased wheat production
(b) White revolution	(ii) Increased egg production
(c) Silver revolution	(iii) Increased milk production
(d) Blue revolution	(iv) Increased fish production

    a) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)   b) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

    c) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)   d) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii)

17. **Assertion (A):** The position-time graph of a body moving uniformly in a straight line is parallel to position-axis.   **[1]**
Reason (R): The slope of the position-time graph in a uniform motion gives the velocity of an object.

    a) Both A and R are true and R is the correct   b) Both A and R are true but R is not the
       explanation of A.   correct explanation of A.

    c) A is true but R is false.   d) A is false but R is true.

18. **Assertion (A):** An iron almirah is a solid at room temperature.   **[1]**
Reason (R): Water can flow and it assumes the shape of the containing vessel.

    a) Both A and R are true and R is the correct   b) Both A and R are true but R is not the
       explanation of A.   correct explanation of A.

    c) A is true but R is false.   d) A is false but R is true.

19. **Assertion (A):** Vessel and sieve tubes both are meant for transport purposes.   **[1]**
Reason (R): Vessels are lignified.

    a) Both A and R are true and R is the correct   b) Both A and R are true but R is not the
       explanation of A.   correct explanation of A.

    c) A is true but R is false.   d) A is false but R is true.

20. **Assertion (A):** Thomson's model of an atom is popularly known as the plum pudding or Christmas pudding   **[1]**
model of an atom.

Reason (R): According to the Thomson's plum pudding model, an atom is a positively charged sphere in which the electrons are embedded.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

Section B

21. i. State and define SI unit of power. **[2]**

ii. A person carrying 10 bricks each of mass 2.5 kg on his head moves to a height 20 m in 50 s. Calculate power spent in carrying bricks of the person. (Given, g = 10 ms^{-2}).

OR

Two boys A and B weighing 60 kg and 40 kg respectively, climb on a staircase each carrying a load of 20 kg on their head. The staircase has 10 steps, each of height 50 cm. If A takes 20 s to climb and B takes 10 s to climb, then

i. who possesses greater power?

ii. find the ratio of their powers.

22. What is Bose-Einstein Condensate? **[2]**

23. Two children are at opposite ends of an aluminium rod. One strikes the end of the rod with a stone. Find the ratio of times taken by the sound wave in air and in aluminium to reach the second child. Given velocity of sound in air and aluminium are 346 ms^{-1} and 6420 ms^{-1} respectively. **[2]**

24. Is there any similarity in materials? **[2]**

25. Two friends on roller-skates are standing 5 m apart facing each other. One of them throws a ball of 2 kg towards the other, who catches it. How will this activity affect the position of the two? Explain your answer. **[2]**

OR

Two balls of the same size of different materials, rubber and iron are kept on the smooth floor of a moving train. The brakes are applied suddenly to stop the train. Will the balls start rolling? If so, in which direction? Will they move with the same speed? Give reasons for your answer.

26. The element boron occurs in nature as two isotopes having atomic masses 10u and 11u. What are the percentage abundances of these isotopes in a sample of boron having average atomic mass of 10.8u? **[2]**

Section C

27. Observe the given figure and answer the following questions: **[3]**
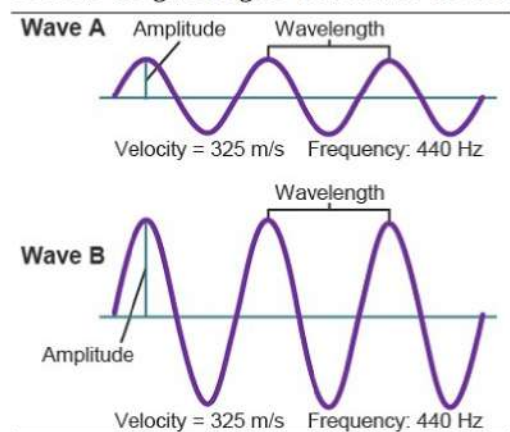
i. Identify the characteristics of the two graphs as shown above in the given figure.

ii. What is the relationship between the velocity of sound, its wavelength, and frequency?

iii. What is the term for the magnitude of the maximum disturbance in the medium on either side of the mean value?

iv. Give the unit of frequency?

28. The following data represents the distribution of electrons, protons and neutrons in atoms of four elements A, B, C, D. **[3]**

Element	Protons	Neutrons	Electrons
A	10	10	10
B	11	12	11
C	12	12	12
D	13	14	13

Solve the following questions.

i. Write the electronic distribution of atoms of elements A and D.

ii. Element A is an inert gas. Why?

iii. What is the valency of element C?

29. A driver of a car travelling at 52 km h^{-1} applies the brakes and accelerates uniformly in the opposite direction. **[3]** The car stops in 5 s. Another driver going at 3 km h^{-1} in another car applies his brakes slowly and stops in 10 s. On the same graph paper, plot the speed versus time graphs for the two cars. Which of the two cars travelled farther after the brakes were applied?

OR

Four cars A, B, C and D are moving on a leveled road. Their distance versus time graphs are shown in figure. Which car is the slowest.
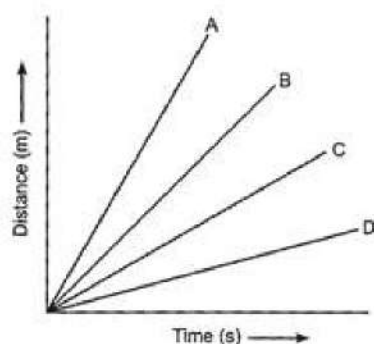
30. Calculate the force of gravitation between the earth and the sun, given that the mass of the earth = 6 × 10^{24} kg **[3]** and of the sun = 2 × 10^{30} kg. The average distance between the two is 1.5 × 10^{11} m.

31. Two bodies as shown in the figure collide with each other and join thereafter, with what velocity will they move **[3]** after combining together?
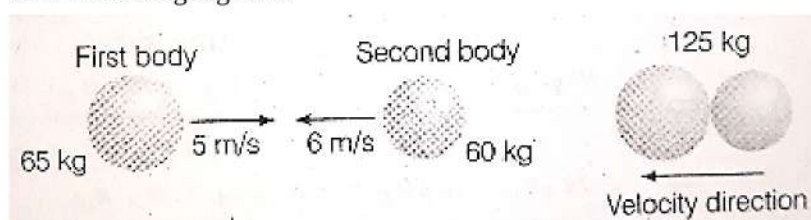
32. Write main differences between plant cell and animal cell. **[3]**

OR

There would be no plant life if chloroplasts did not exist. Justify.

33. Observe the given below image of the tissue and answer the following questions: **[3]**
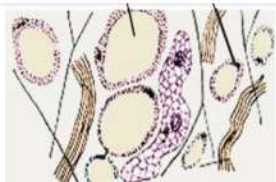
   i. Identify the type of tissue shown in the given image.

  ii. Where is it found?

 iii. Why this tissue acts as an insulator?

Section D

34.   i. At some moment, two giant planets Jupiter and Saturn of the solar system are in the same line as seen from **[5]** the earth. Find the total gravitational force due to them on a person of mass 50 kg on the earth. Could the force due to the planets be important?

     Mass of the Jupiter = 2×10^{27} kg

     Mass of the Saturn = 6×10^{26} kg

     The distance of Jupiter from the earth = 6.3×10^{11} m

     The distance of Saturn from the earth = 1.28×10^{12} m

  ii. A bag of sugar weighs 'w' at a certain place on the equator. If this bag is taken to Antarctica, then will it weigh the same or more or less. Give a reason for your answer.

OR

  i. A steel needle sinks in water but a steel ship floats. Explain, how?

  ii. Why do you prefer a broad and thick handle of your suitcase?

35. Make a comparison and write down ways in which plant cells are different from animal cells. **[5]**

OR

Write the main function of each of the following.

(a) Plasma membrane

(b) cell wall

(c) Ribosome

(d) Lysosome

(e) Nucleolus

(f) Endoplasmic reticulum

36.   i. Draw a neat and labelled diagram of the apparatus used to separate components of blue-black ink. Name the **[5]** process and state the principle involved.

  ii. Identify, the physical and chemical changes from the following.

    a. Burning of magnesium in air.

    b. Tarnishing of silver spoon.

    c. Sublimation of iodine.

    d. Electrolysis of water.

Section E

37. **Read the text carefully and answer the questions:** **[4]**

Plants are stationary or fixed they don't move. Since they have to be upright, they have a large quantity of supportive tissue. The supportive tissue generally has dead cells. Animals, on the other hand, move around in

search of food, mates and shelter. Another difference between animals and plants is in the pattern of growth. The growth of plants occurs only in certain specific regions. New cells produced by meristem are initially like those of meristem itself, but as they grow and mature, their characteristics slowly change and they become differentiated as components of other tissues. The girth of the stem or root increases due to lateral meristem (cambium). Cells of meristematic tissue are very active, lack vacuoles.

Plant Body Structure

(i) Is meristematic tissue composed of a single type of cell?

(ii) Identify A in the given figure

OR

Which meristematic is present at the growing tips of stems and roots?

38. **Read the text carefully and answer the questions:** [4]

Cattle Breeding

Cross-breeding helps in the development of certain desired characteristics in animals like, Increased milk production, Resistance against diseases, Breeds that require less amount of quality feed.

Exotic breed cattle (long lactation) are interbred with the locally bred cattle (high resistance to the diseases) to produce high quality bred that contain both the characteristics. In order to obtain a good quality of milk from the cattle, it is important to manage shelter, food, breeding and disease control of cattle. Cattle are prone to various internal and external parasites, bacteria and virus which are likely to affect their milk production.

(i) What are milch animals ?

(ii) What are the draught animals?

(iii) How does cross-breeding help in cattle breeding?

Mention the preconditions for a good yield of milk.

39. **Read the text carefully and answer the questions:** [4]

A mole is defined as the mass of the substance which consists of an equal quantity of basic units. Example atoms in 12 grams are the same as 12C. The basic units can be molecules, atoms or formula units based on the substance. A mole fraction indicates the number of chemical elements. One mole of any substance is equal to the value of 6.023×10^{23}. It can be used to measure the products obtained from the chemical reaction.
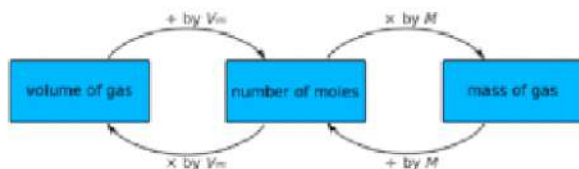
(i) Calculate the number of moles of sodium in a sample containing 10^{20} atoms of sodium.

(ii) How do we express number of particles in terms of moles?

(iii) How do we express mass of a substance in terms of moles?

OR

Calculate the number of moles in 56 g of He.

Section A

1. **(d)** Endothermic

   Explanation: Evaporation of ether occurs due to the absorption of heat by surrounding. So, it is an endothermic process. The chemical reaction in which heat is absorbed is called an endothermic reaction. The reaction in which heat is evolved is called exothermic reaction and the reaction in which no thermal changes occur is called the athermic process.

2. **(d)** Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane

   Explanation: Osmosis is the passive movement of water or any other solvent molecules from a region of higher water concentration to a region of lower water concentration through a semipermeable membrane.

3. **(b)** 16 metre

   Explanation: Here total time taken by the particle = T = $t_1 + t_2$ = 4 sec.

   Where t_1 = time during when the particle accelerates

   t_2 = time during which the particle deaccelerates.

   The maximum velocity attained = 8 m/sec

   $S = \frac{1}{2}vt = \frac{1}{2} \times 8 \times 4 = 16$ m

4. **(a)** High cost production

   Explanation: High cost production

5. **(d)** parenchyma and collenchyma

   Explanation: The main function of parenchyma is to provide support and to store food. In some plant parts, parenchyma has chlorophyll as well. In that case, parenchyma carries out photosynthesis and is then termed as chlorenchyma. Collenchyma tissue contains chloroplast and carry out photosynthesis.

6. **(c)** DNA and protein

   Explanation: Each chromosome is made up of DNA tightly coiled many times around proteins called histones that support its structure.

7. **(d)** 1-B, 2-D, 3-A, 4-C

   Explanation:

(1) A dozen of pencil	(B) 12
(2) Avogadro constant	(D) 6.022×10^{23}
(3) Unit used for calculation of amount of chemical substances	(A) Mole
(4) Reference atom	(C) Carbon-12

8. **(a)** plasma and three types of cells

   Explanation: Blood is classified as connective tissue and consists of two main components:

   i. Plasma, which is a clear extracellular fluid.

   ii. Formed elements, which are made up of the blood cells and platelets.

   Formed elements are:

   - Erythrocytes, also known as red blood cells (RBCs)
   - Leukocytes, also known as white blood cells (WBCs)
   - Platelets

9. **(d)** least in salt solution

   Explanation: The buoyant force acting on the solid depends on the factors such as the density of fluid and volume of solid. As the density of saltwater is highest among the given options, the buoyant force is maximum in the case of saltwater and the reading of spring balance would be least in this case.

10. **(d)** its velocity changes but speed remain the same

Explanation: Speed remains the same as it is 'uniform' circular motion and velocity changes at every point because of direction changes. The tendency of the object at every point is to go tangential to its position.

11. **(d)** 22.0 g

Explanation: The molecular mass of CO_2 is 44 $(12 + 26 \times 2)$.

6.022×10^{23} molecules of carbon will contain 44 g.

Hence, 3.011×10^{23} molecules of CO_2 will contain a mass of 22 g.

12. **(d)** cardiac muscles of heart

Explanation: Cardiac muscles are present in the heart. They contract and relax rapidly, rhythmically, and tirelessly. They help to pump the blood to various parts of the body.

13. **(a)** Smooth endoplasmic reticulum

Explanation: Smooth endoplasmic reticulum synthesises lipids while rough endoplasmic reticulum synthesise proteins.

14. **(c)** CaO

Explanation: The formula for quick lime is CaO.

The Thermal decomposition of calcium carbonate gives calcium oxide which is also called as quick lime along with carbon dioxide.

$CaCO_3 \rightarrow CaO + CO_2$

15. **(d)** Suspension

Explanation: Sand will form a suspension in water. If you shake a container of sand and water, the sand spreads through the water, forming a cloudy liquid. The sand will then settle to the bottom of the container as sediment. Suspensions often need to be shaken or stirred before use to spread the sediment through the liquid.

16. **(c)** (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv)

Explanation: (a) Green revolution - (i) Increased wheat production - The initiatives, led by Norman Borlaug, the "Father of the **Green Revolution**", who received the Nobel Peace Prize in 1970, credited with saving over a billion people from starvation, involved the development of high-yielding varieties of cereal grains, expansion of irrigation infrastructure, modernization of management techniques, distribution of hybridized seeds.

(b) White revolution - (ii) Increased milk production- It transformed India from a milk deficient nation into the world's largest milk producer, surpassing the USA in 1998, with about 17 percent of global output. It doubled milk available per person, and made dairy farming India's largest self-sustainable rural employment generator. It was launched to help farmers direct their own development, placing control of the resources they create in their own hands.

(c) Silver revolution - (iii) Increased egg production- The practice of raising poultry, such as chickens, turkeys, ducks, geese, as a subcategory of animal husbandry, for the purpose of farming meat or eggs for food. It requires small capital and provides additional income and job opportunities to a large number of the rural population in the shortest possible time. The vast majority of poultry are farmed using factory farming techniques.

(d) Blue revolution - (iv) Increased fish production- The term "blue revolution" refers to the remarkable emergence of aquaculture as an important and highly productive agricultural activity. Aquaculture refers to all forms of active culturing of aquatic animals and plants, occurring in marine, brackish, or freshwaters.

17. **(d)** A is false but R is true.

Explanation: If the position-time graph of a body moving uniformly in a straight line is parallel to the position axis, it means that the position of body is changing at constant time. The statement is abrupt and shows that the velocity of body is infinite.

18. **(b)** Both A and R are true but R is not the correct explanation of A.

Explanation: Almirah is rigid and has fixed shape. So, it is a solid at room temperature.

19. **(b)** Both A and R are true but R is not the correct explanation of A.

Explanation: The vessel is a long-distance channel for water transport. A Sieve tube is a long-distance channel for the transport of organic nutrients. The wall of the vessel is lignified. Lignification is absent in sieve tubes.

20. **(a)** Both A and R are true and R is the correct explanation of A.

Explanation: Thomson's model of an atom is popularly known as the plum pudding or Christmas pudding model of an atom. According to Thomson's plum pudding model, an atom is a positively charged sphere in which the electrons are embedded. The negative charge of the electrons and the positive charge of the sphere are equal in magnitude. Thus, an atom as a whole is electrically neutral.

21. i. The SI unit of power is watt.

    1 watt is the power of a body which does work at the rate of 1 joule per second.

    i.e. 1 watt = $\frac{1\,joule}{1\,second}$

    ii. Given, mass of one brick = 2.5 kg

    Mass of 10 bricks = 2.5 × 10 = 25 kg

    Height, h = 20 m, time, t = 50 s, power, P = ?

    ∴ Power, P = $\frac{mgh}{t}$ = $\frac{25 \times 10 \times 20}{50}$ = 100 Js^{-1}

    OR

    Given, mass of A (m_A) = 60 kg

    mass of B (m_B) = 40 kg

    mass of luggage (m_L) = 20 kg

    Height of staircase (h) = 0.5 × 10 = 5 m

    So, work done by boy A to climb staircase = mgh = (60 + 20) × 9.8 × 5 = 3920 J

    So, power of A = $\frac{work}{time}$ = $\frac{3920}{20}$ = 196 W

    Similarly, power of Bf = $\frac{work}{time}$ = $\frac{mgh}{t}$

    $\frac{[(40+20) \times 9.8 \times 5]}{10}$ = $\frac{2940}{10}$ = 294 W

    i. B possesses greater power than A.

    ii. So, the ratio is given by $\frac{power\ of\ A}{power\ of\ B}$ = $\frac{196}{294}$ = 2:3

    So, power, P = $\frac{W}{t}$ = $\frac{3000}{3}$ = 1000 W

22. It is a phenomenon which occurs at very low temperature. In 1995, Carle Wieman (a physicist from USA) chilled atoms of a gas of extremely low density, to the lowest temperature ever achieved, and created a new state of matter called the Bose-Einstein condensate. This effect is based on the works of the Indian physicist, Prof. Satyendra Nath Bose and Albert Einstein. They predicted the existence of the Bose Einstein condensate in 1925 and therefore, this effect is named after them. Scientists consider this as the fifth state of matter. At very low temperatures

    (around 2×10^{-7} K) a Bose-Einstein condensate can be formed in which several thousand atoms become a single entity (a superatom). This effect has been observed with atoms of rubidium (Rb) and lithium (Li).

23. $\frac{Time\ taken\ by\ sound\ travel\ aluminium}{Time\ taken\ by\ sound\ in\ air} = \frac{Speed\ of\ sound\ in\ air}{Speed\ of\ sound\ in\ aluminium}$

    Speed of sound in air Speed of sound in aluminium

    $\Rightarrow \frac{T_{alu}}{T_{air}} = \frac{346}{6420}$

    $\Rightarrow T_{Alu} : T_{Air}$ = 346:6420 = 1: 18.55

24. Yes, all materials are made up of one or other kind of matter and the matter possess mass and occupies space.

25. Separation between them will increase. Initially the momentum of both of them are zero as they are at rest. In order to conserve the momentum the one who throws the ball would move backward. The second will experience a net force after catching the ball and therefore will move backwards that is in the direction of the force.

    OR

    Yes, the balls will start rolling in the direction in which the train was moving. Due to the application of the brakes, the train comes to rest but due to inertia the balls try to remain in motion. Therefore, they begin to roll. Since the masses of the balls are not the same, therefore, the inertial forces are not same on both the balls. Thus, the balls will move with different speeds.

26. Let the percentage of B – 10 isotope = x

    ∴ the percentage of B – 11 isotope = 100 – x

    From the information, the average atomic mass of boron = $\frac{10 \times x}{100} + \frac{11 \times (100 - x)}{100}$

    But the given average atomic mass of boron = 10.8 u

    ∴ $\frac{10 \times x}{100} + \frac{11 \times (100 - x)}{100} = 10.8u$

    10x + 1100 – 11x = 10.8 × 100

    – x + 1100 = 1080

    – x = 1080 – 1100

    – x = –20

    x = 20

∴ Percentage abundance of B – 10 isotope = 20%

Percentage abundance of B – 11 isotope = 100 – 20 = 80%

Section C

27. i. In the graphical figure, both the waves are of the same frequency but with different amplitude. In wave, A amplitude is less and in wave, B amplitude is higher.

    ii. The relationship between the velocity of sound, its wavelength and frequency is given as-

   Velocity of sound = frequency × wavelength

    iii. Amplitude

    iv. Frequency its unit is hertz.

28. i. Electronic distribution of atoms of elements A and D.

	k	L	M
A =	2,	8	
D =	2,	8,	3

    ii. The number of electrons in the outermost shell of element A is 8.

    The outermost shell of this element is complete and the element does not need to gain or lose electrons to complete its outermost shell. Hence, A is an inert gas.

    iii. Valency of element C (2, 8, 2) is 2.

29.
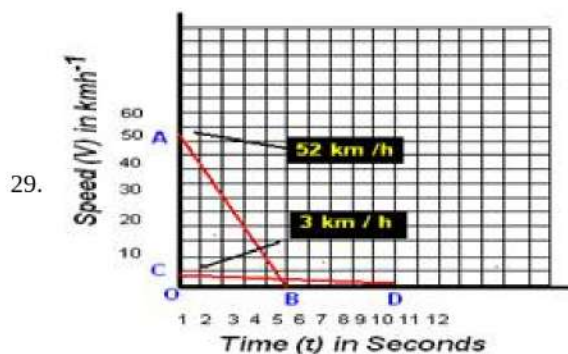
As given in the figure below AB (in red line) and CD(in red line) are the Speed-time graph for given two cars with initial speeds

52kmh^{-1} and 3 km h^{-1} respectively.

Distance Travelled by first car before coming to rest =Area of △OAB

$= (\frac{1}{2}) \times OB \times OA$

$= (\frac{1}{2}) \times 5s \times 52$ kmh^{-1}

$= (\frac{1}{2}) \times 5 \times (52 \times 1000)/3600$m

$= (\frac{1}{2}) \times 5 \times (\frac{130}{9})$m

$= \frac{325}{9}$

= 36.11 m

Distance Travelled by second car before coming to rest =Area of △OCD

$= (\frac{1}{2}) \times OD \times OA$

$= (\frac{1}{2}) \times 10$ s $\times 3$ kmh^{-1}

$=(\frac{1}{2}) \times 10 \times (\frac{3 \times 1000}{3600})$ m

$= (\frac{1}{2}) \times 10 \times (\frac{5}{6})$ m

$= 5 \times (\frac{5}{6})$ m

$= \frac{25}{6}$ m

= 4.16 m

∴ Clearly the first car will travel farther(36.11 m)than the first car(4.16 m).

OR

Speed = Slope of distance - time graph. The smaller the slope, the smaller is the speed.

30. $F_{gravitation} = \frac{G \times M_e \times M_s}{(Dist.\ of\ the\ earth\ from\ the\ sun)^2}$

$= \frac{6,67 \times 10^{-11} \times 6 \times 10^{24} \times 2 \times 10^{30}}{1.5 \times 10^{11} \times 1.5 \times 10^{11}}$

$$= \frac{6.67 \times 6 \times 2 \times 10^{30-11+24-11-11}}{2.25}$$

$$= 35.57 \times 10^{21} \text{N}$$

31. Given, $m_1 = 65$ kg, $m_2 = 60$ kg

$u_1 = +5$ m/s positive direction

$u_2 = -6$ m/s negative direction, $v = ?$

Total momentum of two bodies before collision $= m_1 u_1 + m_2 u_2$

$= 65 \times 5 + 60 \times (-6) = -35$ kg-m/s

If v is the velocity of two combined bodies.

Agter collision, the total momentum will be $= m_1 v_1 + m_2 v_2 \ [\because v_1 = v_2 = v]$

$=(65 + 60) \text{ kg} \times v \text{ m/s} = 125 \text{ v kg-m/s}$

$\therefore$ According to the law of conservation of momentum,

$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2 \Rightarrow -35 = 125v$

$\therefore v = \frac{-35}{125} = -0.28 \ m/s$

So, two bodies will move with a velocity of 0.26 m/s in the direction of the second body.

32.

Plant cells	Animal cell
1.They are larger in size.	1.They are smaller in size.
2.Cell wall is present.	2. Cell wall is absent.
3. Lysosomes are absent or very few in number	3. Lysosomes are larger in number.
4. Plastids are present.	4. Plastids are absent.
5. Subunits of Golgi bodies known as dictyosomes are present.	5. Prominent Golgi bodies are present.
6. Vacuoles are larger in size.	6. Vacuoles are smaller in size.

OR

Chloroplasts contain the pigment chlorophyll which is responsible for food preparation in plants by the process of photosynthesis. Hence, if there were no chloroplasts then there would not have been any plant life.

33. i. The given image shows adipose connective tissue.

ii. Adipose connective tissue is found below the skin and between internal organs.

iii. The cells of adipose connective tissue are filled with fat globules. So the storage of fats let it act as an insulator.

Section D

34. i. a. Gravitational force acting on the 50 kg,

F = mg = 50 × 9.8 = 490 N

b. Gravitational force acting on the 50 kg mass due to jupiter,

$$F_{\text{Jupiter}} = \frac{G \times M_{\text{jupiter}} \times M_{\text{person}}}{(\text{distance of jupiter from the earth})^2}$$

$$F_{\text{Jupiter}} = \frac{6.67 \times 10^{-11} \times 2 \times 10^{27} \times 50}{6.3 \times 10^{11} \times 6.3 \times 10^{11}}$$

$$F_{\text{Jupiter}} = 1.68 \times 10^{-5} \text{ N}$$

c. Gravitational force acting on the 50 kg mass due to saturn

$$F_{\text{saturn}} = \frac{G \times M_{\text{saturn}} \times M_{\text{person}}}{(\text{distance of saturn from the earth})^2}$$

$$F_{\text{saturn}} = \frac{6.67 \times 10^{-11} \times 6 \times 10^{26} \times 50}{1.28 \times 10^{12} \times 1.28 \times 10^{12}}$$

$$F_{\text{saturn}} = 1.12 \times 10^{-6} \text{ N}$$

$\therefore$ Total gravitational force due to the Jupiter and the Saturn $= (1.68 \times 10^{-5} + 1.12 \times 10^{-6}) = 1.8 \times 10^{-5}$ N

Thus, the combined force due to the planets Jupiter and Saturn (1.8×10^{-5}) N is negligible as compared to the gravitational force i.e. 490 N due to the earth.

ii. We know that g at the equator is less than g at poles (Antarctica). Thus, weight at the equator is less than weight at the pole (Antarctica). A bag of sugar weighs 'w' at a certain place on the equator. If this bag is taken to Antarctica, then it will weigh more due to the greater value of g.

OR

i. Ship displaces more water than needle as the volume of the ship is more than that of the needle. Since upthrust depends on the volume of the object (U= Vdg), so more the volume of the object, more upthrust act on it and object floats.

ii. Since, pressure act on the body is inversely proportional to the surface area of contact, i.e.

$P \propto \frac{1}{A}$

It means that more the area of contact, less pressure will act on the body. As the broad and the thick handle of our suitcase has a large area, due to which less pressure acts on our hand and it is very easy to take from one place to another.

35.

Plant cell	Animal cell
1. cell wall is present.	1. cell wall is absent.
2. Plastids are present.	2. Plastids are absent.
3. They have dictyosomes instead of Golgi body.	3. They have Golgi apparatus.
4. centrosomes and centrioles are absent.	4. centrosomes and centrioles are present.
5. Vacuoles are larger in size.	5. vacuoles are smaller in size.
6. Daughter cells separate from each other due to formation of cell plate.	6. Daughter cells separate from each other due to contrition or furrow formation.

OR

(a) Plasma membrane – The cell membrane separates the cell from its external environment, and is selectively permeable (controls what gets in and out). It protects the cell and provides stability. Proteins are found embedded within the plasma membrane, with some extending all the way through in order to transport materials.

(b) Cell wall – The cell wall is a rigid organelle composed of cellulose and lying just outside the cell membrane. The cell wall gives the plant cell it's box-like shape. it also protects the cell. The cell wall contains pores which allow materials to pass to and from the cell membrane

(c) Ribosome – Ribosomes are small particles which are found individually in the cytoplasm and also line the membranes of the rough endoplasmic reticulum. Ribosomes produce protein. They could be thought of as "protein factories" of the cell.

(d) Lysosome –Lysosomes are small sac-like structures surrounded by a single membrane and containing strong digestive enzymes which when released can break down worn out organelles or food. The lysosome is also known as a suicide sac.

(e) Nucleolus – It synthesizes ribosome

(f) Endoplasmic Reticulum – Produces lipids and proteins and also in intracellular transport of substances.

36. i.
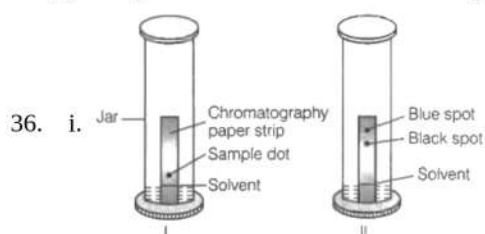
The labelled diagram of the apparatus used to separate components of blue-black ink is shown above.

Name of the process: Paper chromatography.

Principle of paper chromatography: Different components of a mixture move with different speeds in a solvent, so they separate at different heights. Here blue ink and black ink rise with the help of solvent at different speeds to form two spots at different heights.

ii. The physical and chemical changes are as follows:
   - Burning of magnesium in the air: Chemical change
   - Tarnishing of silver spoon: Chemical change
   - Sublimation of iodine: Physical change
   - Electrolysis of water: Chemical change

Section E

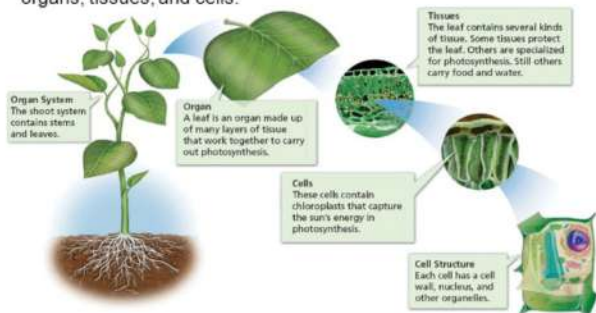37. **Read the text carefully and answer the questions:**

Plants are stationary or fixed they don't move. Since they have to be upright, they have a large quantity of supportive tissue. The supportive tissue generally has dead cells. Animals, on the other hand, move around in search of food, mates and shelter. Another difference between animals and plants is in the pattern of growth. The growth of plants occurs only in certain specific regions. New cells produced by meristem are initially like those of meristem itself, but as they grow and mature, their characteristics slowly change and they become differentiated as components of other tissues. The girth of the stem or root increases due to lateral

meristem (cambium). Cells of meristematic tissue are very active, lack vacuoles.

Plant Body Structure

The body of a plant is organized into organ systems, organs, tissues, and cells.

(i) Yes, meristematic tissue is composed of a single type of cell.

(ii) Intercalary.

OR

Apical meristematic.

38. **Read the text carefully and answer the questions:**

Cattle Breeding

Cross-breeding helps in the development of certain desired characteristics in animals like, Increased milk production, Resistance against diseases, Breeds that require less amount of quality feed.

Exotic breed cattle (long lactation) are interbred with the locally bred cattle (high resistance to the diseases) to produce high quality bred that contain both the characteristics. In order to obtain a good quality of milk from the cattle, it is important to manage shelter, food, breeding and disease control of cattle. Cattle are prone to various internal and external parasites, bacteria and virus which are likely to affect their milk production.


(i) Animals that produce milk are called **milch animals**. In India, buffaloes are the primary source of milk. Example - Cows, goats, buffaloes.

(ii) Animals that are used for carrying out agricultural work like tilling, carting etc. are called draught animals (males and females that are poor in milk-yielding varieties).

(iii) Cross-breeding helps in the development of certain desired characteristics in animals like,

   i. Increased milk production.

   ii. Resistance against diseases.

   iii. Breeds that require less amount of quality feed.

OR

In order to obtain good quality milk from the cattle, it is important to manage shelter, food, breeding, and disease control of cattle.

39. **Read the text carefully and answer the questions:**

A mole is defined as the mass of the substance which consists of an equal quantity of basic units. Example atoms in 12 grams are the same as 12C. The basic units can be molecules, atoms or formula units based on the substance. A mole fraction indicates the number of chemical elements. One mole of any substance is equal to the value of 6.023×10^{23}. It can be used to measure the products obtained from the chemical reaction.
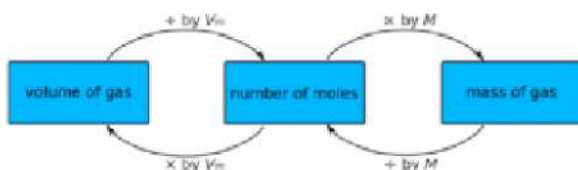
(i) Number of moles = $\dfrac{Number\ of\ atoms\ of\ sodium}{Avogadro's\ number\ of\ particles}$

$= \dfrac{1.0 \times 10^{20}\ \text{atoms}}{6.022 \times 10^{23}\ \text{atoms}} = 1.66 \times 10^{-4}\ \text{mol}$

(ii) Number of particle is expressed by Number of moles = $\dfrac{Given\ number\ of\ particles}{Avogadro's\ number}$

(iii) Mass of a substance in terms of moles expressed by Number of moles = $\dfrac{Given\ mass}{Gram\ atomic\ mass}$

OR

Number of moles in 56g of He = $\dfrac{Mass\ of\ He}{Gram\ atomic\ mass\ of\ He}$ = $\dfrac{56}{4}$ = 14 mol.