10th STD

PUBLIC EXAMINATION APRIL - 2025

Reg. No. ☐☐☐☐☐☐

Part - III

Science (With Answers)

Time Allowed : 3.00 Hours]   **[Maximum Marks**: 75

Instructions : 1. Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately.

2. Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams.

Note : This question paper contains **four** parts.

PART - I

Note: (i) Answer **all** the questions.   **(12 × 1 = 12)**

(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. One kilogram force equals to :
   (a) 9.8 dyne
   (b) 9.8×10^4 N
   (c) 98×10^4 dyne
   (d) 980 dyne

2. The eye defect 'Presbyopia' can be corrected by:
   (a) convex lens
   (b) concave lens
   (c) convex mirror
   (d) bifocal lens

3. The work done in moving a charge of 10 C across two points in a circuit is 100 J. What is the potential difference between the points?
   (a) 0.1 V
   (b) 10 V
   (c) 100 V
   (d) 1000 V

4. Artificial radioactivity was discovered by :
   (a) Becquerel
   (b) Irene Curie
   (c) Roentgen
   (d) Neils Bohr

5. _____ is an important metal to form amalgam.
   (a) Ag
   (b) Hg
   (c) Mg
   (d) Al

6. When the pressure is increased at constant temperature, the solubility of gases in liquid _____.
   (a) no change
   (b) increases
   (c) decreases
   (d) no reaction

7. The pH of a solution is 3. Its [OH⁻] concentration is :
   (a) 1×10^{-3} M
   (b) 3 M
   (c) 1×10^{-11} M
   (d) 11 M

8. $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ is :
   (a) Reduction of ethanol
   (b) Combustion of ethanol
   (c) Oxidation of ethanoic acid
   (d) Oxidation of ethanal

9. Casparian strips are present in the _____ of the root.
   (a) cortex
   (b) pith
   (c) pericycle
   (d) endodermis

10. The centromere is found at the centre of the _____ chromosome.
    (a) Telocentric
    (b) Metacentric
    (c) Sub-metacentric
    (d) Acrocentric

11. World AIDS Day :
    (a) December 1
    (b) May 31
    (c) April 22
    (d) October 2

12. Which software is used to create animation?
    (a) Paint
    (b) PDF
    (c) MS Word
    (d) Scratch

PART - II

Note: Answer **any seven** questions. Question No. **22** is **compulsory.**   **(7 × 2 = 14)**

13. Define one Calorie.

[1]

14. What is a longitudinal wave?

15. State two conditions necessary for rusting of iron.

16. Match the following :

    1. Functional group –OH - (i) Benzene
    2. Heterocyclic compounds - (ii) Potassium Stearate
    3. Unsaturated compounds - (iii) Alcohol
    4. Soap - (iv) Furan
    5. Carbocyclic compounds - (v) Ethene

17. What is the importance of valves in the heart?

18. What is Bolting? How can it be induced artificially?

19. Identify the parts A, B, C, and D in the given figure.
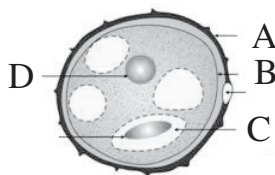
20. The degenerated wing of a Kiwi is an acquired character. Why is it called an acquired character?

21. What will happen if trees are cut down?

22. Find the mass percentage composition of methane (CH_4)

PART - III

Note: Answer **any seven** questions. Question No. **32** is **compulsory.**   **(7 × 4 = 28)**

23. Derive the ideal gas equation.

24. Differentiate the eye defects : Myopia and Hypermetropia.

25. Compare the properties of alpha, beta and gamma radiations.

26. Write the applications of Avogadro's Law.

27. (i) What is an alloy?

    (b) State the reasons for alloying.

28. Explain the mechanism of cleansing action of soap.

29. How does locomotion take place in leech?

30. With a neat labelled diagram, explain the structure of a neuron.

31. (i) What are the consequences of soil erosion?

    (ii) How will you prevent soil erosion?

32. A source producing a sound of frequency 90 Hz is approaching a stationary listener with a speed equal to (1/10) of the speed of sound. What will be the frequency heard by the listener?

PART - IV

Note : Answer **all** the questions. Draw diagrams wherever **necessary.**   **(3 × 7 = 21)**

33. (a) (i) State and prove the law of conservation of linear momentum.

    (ii) State the principle of moments.

    (OR)

    (b) (i) What is meant by electric current?

    (ii) Name and define its unit.

    (iii) Which instrument is used to measure the electric current? How should it be connected in a circuit?

34. (a) (i) In what way hygroscopic substances differ from deliquescent substances?

    (ii) The acquatic animals live more in cold region. Why?

    (iii) Define volume percentage.

    (OR)

    (b) (i) Differentiate reversible and irreversible reactions.

    (ii) A solid compound 'A' on heating decomposes into gas 'B' and 'C'. On passing the gas 'C' through water, it becomes acidic. Identify A, B and C.

35. (a) Differentiate the following :

    (i) Monocot root and Dicot root

    (ii) Aerobic and Anaerobic respiration

    (OR)

    (b) (i) Explain the structure of a chromosome.

    (ii) Distinguish between somatic gene therapy trnd germ line gene therapy.

Answers

PART - I

1. (c) 98×10^4 dyne
2. (d) bifocal lens
3. (b) 10 V
4. (b) Irene Curie
5. (b) Hg
6. (b) increases
7. (c) 1×10^{-11} M
8. (b) Combustion of ethanol
9. (d) endodermis
10. (b) Metacentric
11. (a) December 1
12. (d) Scratch

PART - II

13. One calorie is defined as the amount of heat energy required to rise the temperature of 1 gram of water through 1ºC.

14. A longitudinal wave is a wave in which the particles of a medium vibrate along the direction of propagation of the wave.

15. The conditions necessary for rusting of iron are
    (i) Presence of moist air
    (ii) Presence of oxygen
    (iii) Presence of water.

16. 1. Functional group –OH - Alcohol
    2. Heterocyclic compounds - Furan
    3. Unsaturated compounds - Ethene
    4. Soap - Potassium Stearate
    5. Carbocyclic compounds - Benzene

17. (i) They regulate the flow of blood in a single direction.
    (ii) They prevent back flow of blood.

18. (i) The sudden shoot elongation of a plant followed by flowering is called bolting.

(ii) It can be induced artificially by the treatment of gibberellins on rosette plant.
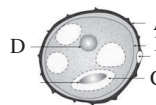
19.
    A - Exine
    B - Intine
    C - Generative cell
    D - Vegetative nucleus

20. (i) According to Lamarck's use and disuse theory the degenerated wing of a kiwi is an example for organ of disuse.
    (ii) Because when an organ is not used for a long time, it gradually degenerates.

21. Cutting down of trees gives rise to ecological problems like floods, drought, soil erosion, loss of wildlife, extinction of species, imbalance of biogeochemical cycles, alteration of climatic conditions and desertification.

22. **Solution:**

Molecular mass of $CH_4 = 12 + 4 = 16g$

Mass % of carbon $= \dfrac{12}{16} \times 100 = 75\%$

Mass % of hydrogen $= \dfrac{4}{16} \times 100 = 25\%$

PART - III

23. (i) The ideal gas equation relates all the properties of an ideal gas.

(ii) An ideal gas obeys Boyle's law, Charles's law and Avogadro's law.

(iii) According to Boyle's law, PV = constant ... (1)

(iv) According to Charles's law, V/T = constant ... (2)

(v) According to Avogadro's law, V/n = constant ... (3)

(vi) Combining equations (1), (2) and (3), we can write, PV/nT = constant ... (4) This relation is called the combined law of gases. Consider, $n = \mu N_A$.

(vii) Using this value, equation (4) can be written as PV/ $\mu N_A T$ = constant

(viii) The value of constant in the above equation is taken to be k_B, which is called as Boltzmann constant. $(1.38 \times 10^{-23}$ $JK^{-1})$. Hence, we have the following equation: PV/ $\mu N_A T = k_B$; PV $= \mu N_A k_B T$

(ix) Here, $\mu N_A k_B = R$, which is universal gas constant and its value is 8.31 J mol^{-1}K^{-1}. PV = RT   ... (5)
This is called **ideal gas** equation.

24.

	Myopia	**Hypermetropia**
(i)	It is also known as short sightedness.	It is also known as long sightedness.
(ii)	It occurs due to the lengthening of eye ball.	It occurs due to the shortening of eye ball.
(iii)	Image of distant objects are formed before the retina.	Image of nearby objects are formed behind the retina
(iv)	It can be corrected using a concave lens.	It can be corrected using a convex lens.

25.

Properties	**α rays**	**β rays**	**γ rays**
Particles	Helium nucleus ($_2$He^4) consisting of two protons and two neutrons.	Electrons ($_{-1}$e^0), basic elementary particle in all atoms.	Electromagnetic waves consisting of photons.
Charge	Positively charged particles. Charge = +2e	Negatively charged particles. Charge = –e	Neutral particles. Charge = zero
Ionising power	100 times greater than β rays and 10,000 times greater than γ rays	Comparatively low	Very less ionization power
Penetrating power	Low penetrating power (even stopped by a thick paper)	Penetrating power is greater than that of α rays.	They have a very high penetrating power greater than that of β rays.

26. **Applications of Avogadro's hypothesis**
  (i)   It explains Gay-Lussac's law.
  (ii) It helps in the determination of atomicity of gases.
  (iii) Molecular formula of gases can be derived using Avogadro's law.
  (iv) It determines the relation between molecular mass and vapour density.

27. **(i)** An alloy is a homogeneous mixture of two or more metals or of one or more metals with certain non-metallic elements.

  (ii) Reasons for alloying:
    To modify appearance and colour.
    To modify chemical activity.
    To lower the melting point.
    To increase hardness and tensile strength.
    To increase resistance to electricity.

28. A soap molecule contains two chemically distinct parts. They are:

  Hydrophilic :

  (i) This polar end is a short head with a carboxylate group (–COONa)

  (ii) It is water loving in nature.

  (iii) This end is attracted towards water and water soluble.

Hydrophobic :

(i) It is a long tail made of the hydrocarbon chain.

(ii) It is water hating in nature.

(iii) Attracted towards dirt or oil on the cloth.

Cleansing action :

(i) When a soap or detergent is dissolved in water, the molecules join together as clusters called 'micelles'.

(ii) Their long hydrocarbon chains attach themselves to the oil and dirt.

(iii) The dirt is surrounded by the non-polar end of the soap molecules.

(iv) The charged carboxylate end of the soap molecules makes the micelles soluble in water.

(v) Thus, the dirt is washed away with the soap.

29. Locomotion in leech takes place by
   (i) Looping or crawling movement
   (ii) Swimming movement.

   (i) **Looping or Crawling movement :** This movement is brought about by the contraction and relaxation of muscles. The two suckers serve for attachment during movement on a substratum.

   (ii) **Swimming movement :** Leeches swim very actively and perform undulating movements in water.

30. A neuron typically consists of three basic parts: **Cyton, Dendrites** and **Axon.**

   (i) **Cyton :**
      • It has a **central nucleus** with abundant cytoplasm called **neuroplasm**.
      • The cytoplasm has large granular body called **Nissl's granules.**
      • Other cell organelles like mitochondria, ribosomes, lysosomes and endoplasmic reticulum.
      • Neurons do not have the ability to divide.
      • Several neurofibrils help in transmission of nerve impulses to and from the cell body.

Structure of Neuron
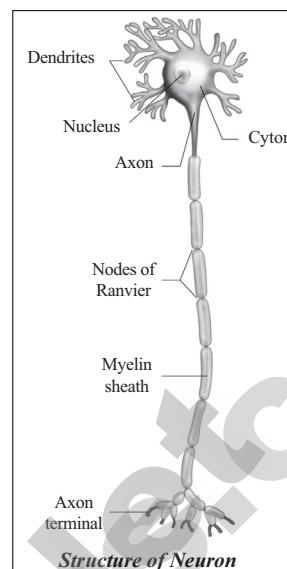
   (ii) **Dendrites :**
      • These are the **numerous** branched **cytoplasmic** processes that project from the **surface** of the cell body.
      • They conduct nerve impulses **towards** the **cyton.**
      • The branched **projections increase** the surface **area** for receiving the **signals** from other **nerve cells.**

   (iii) **Axon :**
      • The axon is a single, **elongated,slender** projection.
      • The end of axon terminates as nob like swellings called **synaptic knob**.
      • The plasma membrane of axon is **axolemma**, and the cytoplasm is **axoplasm**. It carries impulses away from the cyton.

31. **(i) Soil erosion consequences :**
   (i) The top layers of soil contain humus and mineral salts, which are vital for the growth of plants.
   (ii) The direct and primary effect of soil erosion is soil loss and nutrient leaching resulting in reduction of land productivity.
   (iii) Annual floods cause damage to crops, property and lives.

(ii) Prevent soil erosion :

(i) Retain vegetation cover, so that soil is not exposed.

(ii) Cattle grazing should be controlled.

(iii) Crop rotation and soil management improve soil organic matter.

32. **Solution:** When the source is moving towards the stationary listener, the expression for apparent frequency is

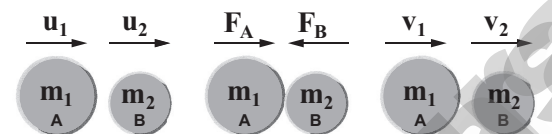$$n' = \left(\frac{v}{v - v_s}\right) n = \left(\frac{v}{v - \left(\frac{1}{10}\right)v}\right) n$$

$$= \left(\frac{10}{9}\right) n$$

$$= \left(\frac{10}{9}\right) \times 90 = 100 \text{ Hz}$$

PART - IV

33. **(a)**

(i) "There is no change in the linear momentum of a system of bodies as long as no net external force acts on them"

Conservation of linear momentum

Proof:

♦ Let two bodies A and B having masses m_1 and m_2 move with initial velocity u_1 and u_2 in a straight line.

♦ Let the velocity of the first body be higher than that of the second body. i.e., $u_1 > u_2$.

♦ During an interval of time t second, they tend to have a collision. So final velocity will be v_1 and v_2 respectively.

Force on body B due to A,

$$F_A = m_2 (v_2 - u_2)/t$$

Force on body A due to B,

$$F_B = m_1 (v_1 - u_1)/t$$

By Newton's III law of motion,

Action force = Reaction force

$$F_B = -F_A$$

$$\frac{m_1(v_1 - u_1)}{t} = \frac{-m_2(v_2 - u_2)}{t}$$

$$m_1 v_1 + m_2 v_2 = m_1 u_1 + m_2 u_2 \text{ ------ (1)}$$

The above equation (1) confirms in the absence of an external force, the algebraic sum of the momentum after collision is numerically equal to sum of the momentum before collision. Hence, the law of conservation of linear momentum is proved.

(ii) When a number of like or unlike parallel forces act on a rigid body and the body is in equilibrium, then the algebraic sum of the moments in the clockwise direction is equal to the algebraic sum of the moments in the anticlockwise direction. Moment in clockwise direction = Moment in anticlockwise direction,

$$F_1 \times d_1 = F_2 \times d_2$$

(OR)

(b) (i) Electric current is defined as the rate of flow of charges in a conductor. $I = \dfrac{Q}{t}$.

(ii) The SI unit of electric current is ampere (A). When a charge of one coulomb flows across any cross - section of a conduction, in one second.

$$1 \text{ ampere} = \frac{1 \text{ coulomb}}{1 \text{ second}}$$

(iii) Ammeter is used to measure the electric current. It is connected in a circuit by series connection.

34.

(a) (i)

Hygroscopic substances	Deliquescence substances
When exposed to the atmosphere at ordinary temperature, they absorb moisture and do not dissolve.	When exposed to the atmospheric air at ordinary temperature, they absorb moisture and dissolve.
Hygroscopic substances do not change its physical state on exposure to air.	Deliquescent substances change its physical state on exposure to air.
They may be amorphous solids or liquids.	They are crystalline solids.
E.g. : Quick Lime (CaO)	**E.g. :** Potassium Hydroxide (KOH)

(ii) Aquatic animals live more in cold regions because,

   (i)   More amount of dissolved oxygen is present in the water of cold regions.

   (ii)   The solubility of oxygen in water is more at low temperatures.

(iii) Volume percentage is defined as the percentage by volume of solute (in ml) present in the given volume of the solution.
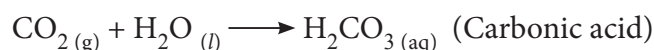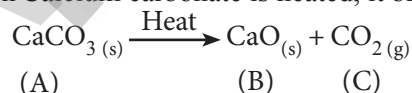
$$\text{Volume Percentage} = \frac{\text{Volume of the solute}}{\text{Volume of the solute} + \text{Volume of the solvent}} \times 100$$

(OR)

(b) (i)

Reversible Reaction	Irreversible reaction
It can be reversed under suitable conditions	It cannot be reversed
Both forward and backward reactions take place simultaneously	It is unidirectional. It proceeds only in forward direction
It is relatively slow	It is fast
Equilibrium is attained.	Equilibrium is not attained.

(ii) When Calcium carbonate is heated, it breaks down into calcium oxide and carbon dioxide.

$$CaCO_{3\,(s)} \xrightarrow{\text{Heat}} CaO_{(s)} + CO_{2\,(g)}$$
$$\quad\text{(A)} \qquad\qquad \text{(B)} \qquad \text{(C)}$$

$$CO_{2\,(g)} + H_2O_{(l)} \longrightarrow H_2CO_{3\,(aq)} \text{ (Carbonic acid)}$$

A	CaCO$_3$	Calcium carbonate
B	CaO	Calcium oxide
C	CO$_2$	Carbon dioxide

35. **(a) (i)**

	Tissues	Monocot Root	Dicot Root
1.	Number of Xylem	Polyarch	Tetrarch
2.	Cambium	Absent	Present (During secondary growth only)
3.	Secondary Growth	Absent	Present
4.	Conjunctive Tissue	Sclerenchyma **Eg:** Maize	Parenchyma **Eg:** Bean

(ii)

	Aerobic Respiration	Anaerobic Respiration
(i)	Organic food is completely oxidised with the help of oxygen.	Organic food is broken down in the absence of oxygen.
(ii)	Glucose is broken down into carbon dioxide, water and energy.	Glucose is converted into ethanol or lactate.
(iii)	Lot of energy is produced	Very small quantity of energy is produced
(iv)	It is a complex process	It is a simpler process.
(v)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP$	$C_6H_{12}O_6 \rightarrow 2CO_2 + 2C_2H_5OH + Energy\ (ATP)$

(OR)

(b)   (i)

(i)   The chromosomes are thin, long and thread like structures consists of two identical strands called sister chromatids.

(ii)   They are held together by the centromere.

(iii) Each chromatid is made up of spirally coiled thin structure called chromonema. The chromosomes are made up of DNA, RNA, chromosomal proteins (histones and non-histones) and certain metallic ions.

(iv) **Primary constriction:** The two arms of a chromosome meet at a point called primary constriction or centromere. In this region the spindle fibres attach to the chromosomes during cell division.

(v) **Secondary constriction :** Some chromosomes possess secondary constriction at any point of the chromosome. They are known as the nuclear zone or nucleolar organizer.

Structure of chromosome
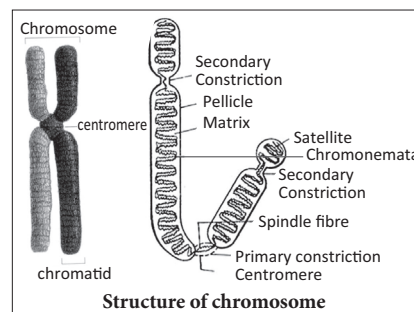
Telomere : The end of the chromosome is called telomere. It maintains and provides stability to the chromosomes.

Satellite : Some of the chromosomes have an elongated knob-like appendage at one end of the chromosome known as satellite. The chromosomes with satellites are called as the sat-chromosomes.

(ii)

	Somatic gene therapy	Germ line gene therapy
(i)	It is the replacement of defective gene in somatic cells.	It is the replacement of defective gene in germ cells (egg and sperm).
(ii)	It takes place in body cell.	It takes place in the egg and sperm cells.
(iii)	It is only beneficial to the patient.	It will be inherited to the next generation.

☆ ☆ ☆