

CLASS 10 – SCIENCE

Common Quarterly Examination 2025–26

Kallakurichi District • English Medium • Maximum Marks: 75 • Time: 3 Hours

Detailed Answer Key

PART – I: Choose the Correct Answer

12 × 1 = 12

No.	Correct option	Answer / Explanation
1	(c)	Cycling. The turning effect (torque) of force is used to rotate the pedals/wheel mechanism.
2	(b)	2f. For a convex lens, an object at 2f forms a real, inverted image of the same size at 2f.
3	(c)	Zero. Heating or cooling changes the temperature/dimensions, but not the mass when there is no loss or gain of matter.
4	(c)	Carbon dioxide (CO₂). One molecule contains three atoms.
5	(b)	7 periods and 17 groups.
6	(d)	Sulphur in carbon disulphide. Carbon disulphide is the solvent, so this is a non-aqueous solution.
7	(c)	When H₂O is split. Oxygen is released during the photolysis (splitting) of water in the light-dependent reaction.
8	(a)	Pancreas. It acts as an exocrine gland by secreting digestive enzymes and as an endocrine gland by secreting hormones such as insulin and glucagon.
9	(c)	Zygote. Syngamy is the fusion of male and female gametes, producing a zygote.
10	(d)	DNA ligase. DNA ligase joins Okazaki fragments on the lagging strand.
11	(d)	16 Ω. If length is doubled and volume remains constant, area becomes half. Therefore $R' = \rho(2L)/(A/2) = 4R = 4 \times 4 = 16 \Omega$.
12	(c)	a–3, b–4, c–2, d–1. a. Decrease in WBC → Leukopenia (3)

- | | |
|--|--|
| | b. Decrease in platelets → Thrombocytopenia (4)
c. Increase in WBC → Leukocytes (2)
d. Decrease in RBC → Anaemia (1) |
|--|--|

Printing/setting error in Q12: The question paper prints two alternatives with the same option letter “c”. The intended matching is clearly **a–3, b–4, c–2, d–1**, which is the third listed combination.

PART – II: Short Answers

Answer any 7; Q.22 compulsory • 7 × 2 = 14

13. Define inertia. Give its classifications.

Answer: Inertia is the tendency of a body to resist any change in its state of rest or uniform motion in a straight line. The three types are:

1. Inertia of rest
2. Inertia of motion
3. Inertia of direction

14. Why does the sky appear blue in colour?

Answer: Sunlight is scattered by molecules of the atmosphere. Shorter wavelengths, especially blue light, are scattered more strongly than longer wavelengths. Hence the sky appears blue.

15. Define atomicity.

Answer: Atomicity is the number of atoms present in one molecule of an element. Examples: He – monoatomic; O₂ – diatomic; O₃ – triatomic.

16. What is molar volume of a gas?

Answer: The volume occupied by one mole of a gas at STP is called its molar volume. It is **22.4 L (22.4 dm³)** at STP.

17. Define the term solution.

Answer: A solution is a homogeneous mixture of two or more substances. The substance present in larger amount is the **solvent** and the substance dissolved in it is the **solute**.

18. What is respiratory quotient?

Answer: RQ = Volume of CO₂ liberated / Volume of O₂ consumed. It is the ratio of the volume of carbon dioxide evolved to the volume of oxygen consumed during respiration.

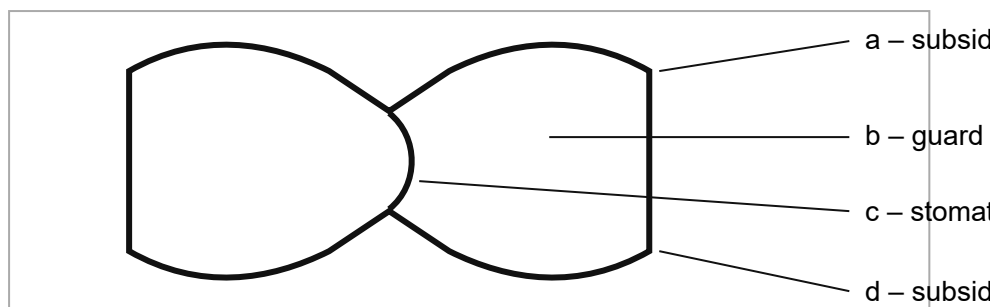
19. Write the dental formula of rabbit.

I 2/1, C 0/0, PM 3/2, M 3/3

Therefore, the dental formula is **2033 / 1023**.

20. Draw the given diagram and label the parts.

Identification: The printed figure is a stomatal apparatus showing the characteristic dumbbell-shaped guard-cell arrangement of a grass/monocot type stoma.



Note: The low-resolution printed diagram makes the individual label endpoints difficult to distinguish. The identification above follows the visible dumbbell-shaped stomatal structure.

21. Write the importance of fertilization.

Answer:

- Fusion of male and female gametes forms the zygote.
- It restores the diploid chromosome number.
- It initiates embryo development and subsequently seed formation.
- It brings about genetic variation through fusion of gametes.

22. A gas is compressed four times of its initial pressure at constant temperature. $V_1 = 20$ cc. Find V_2 .

Answer: By Boyle's law, $P_1 V_1 = P_2 V_2$.

Given $P_2 = 4P_1$ and $V_1 = 20$ cc.

Therefore, $P_1(20) = 4P_1 V_2$.

So, $V_2 = 5$ cc.

23. Describe rocket's propulsion.

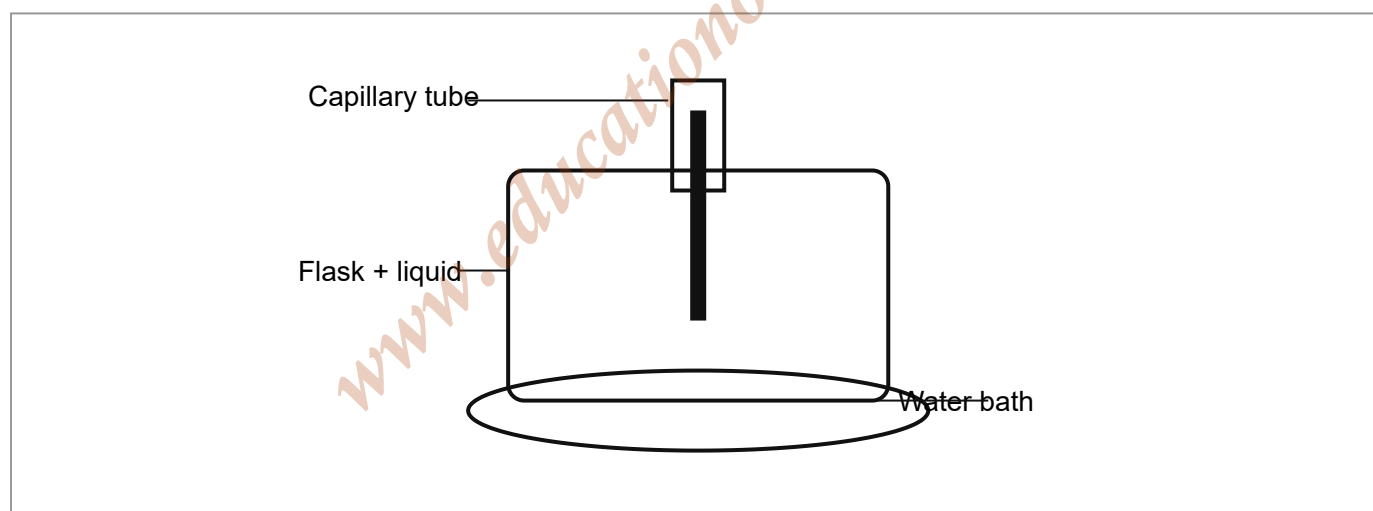
Rocket propulsion is based on **Newton's third law of motion** and conservation of linear momentum.

1. Fuel burns in the combustion chamber and produces high-pressure gases.
2. The gases are expelled at very high velocity through the nozzle in the backward direction.
3. The gases exert an equal and opposite reaction on the rocket.
4. This reaction produces thrust and propels the rocket forward, even in the absence of air.

24. Explain the experiment for measuring the real and apparent expansion of a liquid.

A liquid is taken in a glass flask fitted with a narrow graduated capillary tube.

- Initially the liquid level is marked at room temperature.
- The flask containing the liquid is heated in a water bath.
- On heating, both the liquid and the vessel expand. The rise of liquid level observed in the capillary gives the **apparent expansion**.
- The vessel itself also expands. Hence the actual or **real expansion** of the liquid is greater than its apparent expansion.
- **Real expansion = Apparent expansion + Expansion of the vessel.**

**25(a). State any two applications of Avogadro's law.**

- It helps in determining the molecular formula/molecular mass of gases from their vapour densities and volumes.
- It establishes that equal volumes of gases at the same temperature and pressure contain equal numbers of molecules and is used in gas-volume calculations and determining molecular/atomicity relationships.

25(b). State two conditions for rusting of iron.

Answer:

1. Presence of **oxygen (air)**.

2. Presence of **water/moisture**.

26. Write notes on saturated and unsaturated solutions.

Saturated solution	Unsaturated solution
A solution which contains the maximum amount of solute that can dissolve in a given amount of solvent at a particular temperature.	A solution which contains less than the maximum amount of solute that can dissolve in a given amount of solvent at a particular temperature.
On adding more solute at the same temperature, the excess remains undissolved.	More solute can still dissolve at the same temperature.

27. Differentiate aerobic respiration and anaerobic respiration.

Feature	Aerobic respiration	Anaerobic respiration
Oxygen	Requires oxygen.	Occurs in the absence of oxygen.
Breakdown	Glucose is completely oxidized.	Glucose is incompletely broken down.
Products	$\text{CO}_2 + \text{H}_2\text{O}$	In yeast: ethanol + CO_2 .
Energy	Large amount of energy is released.	Small amount of energy is released.

28. What is transpiration? Give the importance of transpiration.

Transpiration: Loss of water in the form of water vapour from the aerial parts of plants, mainly through stomata.

Importance:

- Produces transpiration pull for upward movement of water and minerals.
- Helps in the ascent of sap.
- Cools the plant.
- Helps in the transport/distribution of mineral salts.

29(a). Name the gaseous plant hormone. Describe its three different actions in plants.

Answer: Ethylene.

- Promotes fruit ripening.
- Promotes senescence and abscission of leaves/fruits.
- Helps in flowering/ripening responses in certain plants and promotes related growth responses.

29(b). Which hormone is known as the stress hormone? Why?

Answer: Abscissic acid (ABA). It is called the stress hormone because it helps plants respond to adverse conditions such as drought by promoting stomatal closure and reducing water loss.

30. Explain the types of chromosomes based on the position of centromere.

Type	Centromere position / shape
Metacentric	Centromere at the middle; produces two equal arms; V-shaped during anaphase.
Sub-metacentric	Centromere slightly away from the middle; arms are unequal; L-shaped during anaphase.
Acrocentric	Centromere close to one end; one very short and one long arm; J-shaped during anaphase.
Telocentric	Centromere at the terminal end; effectively one arm; I-shaped during anaphase.

31. List out the parasitic adaptations in leech.

- Anterior and posterior suckers help in attachment to the host.
- Three jaws with teeth make a Y-shaped wound.
- Muscular pharynx acts as a suction pump.
- Salivary secretion contains **hirudin**, an anticoagulant that prevents clotting of blood.
- Crop has diverticula and can store a large quantity of blood for a long period.

32(a). At the same temperature and pressure: 3 L O₂, 5 L Cl₂ and 6 L H₂.

By Avogadro's law, at the same temperature and pressure, number of molecules is directly proportional to volume.

- **Highest number of molecules:** 6 L H₂.
- **Lowest number of molecules:** 3 L O₂.

32(b). 25 g sugar is dissolved in 100 g water. Calculate mass percentage of solute.

Mass percentage = (Mass of solute / Mass of solution) × 100

Mass of solution = 25 + 100 = 125 g.

Mass percentage = (25 / 125) × 100 = **20%**.

33(a)(i). What is power of accommodation of eye?

The power of accommodation is the ability of the eye lens to change its focal length (and hence its power) so that clear images of objects at different distances are formed on the retina. This is achieved by the action of the **ciliary muscles**.

33(a)(ii). List any five properties of light.

Any five:

1. Light travels in a straight line in a homogeneous medium.
2. Light undergoes reflection.
3. Light undergoes refraction when it passes from one medium to another.
4. White light can be dispersed into its constituent colours.
5. Light can undergo interference/diffraction, showing its wave nature.

33(b). Derive the resultant resistance of three resistors in series and parallel.

(i) Series: Let R_1 , R_2 and R_3 be connected in series. The same current I flows through all resistors.

$$V = V_1 + V_2 + V_3 = IR_1 + IR_2 + IR_3 = I(R_1 + R_2 + R_3). \text{ Hence, } R_s = R_1 + R_2 + R_3.$$

(ii) Parallel: The potential difference V is the same across each resistor and the total current is $I = I_1 + I_2 + I_3$.

$$I = V/R_1 + V/R_2 + V/R_3. \text{ Since } I = V/R_p,$$

$$1/R_p = 1/R_1 + 1/R_2 + 1/R_3.$$

For three resistors, equivalently: $R_p = R_1 R_2 R_3 / (R_1 R_2 + R_2 R_3 + R_3 R_1)$.

34(a)(i). Calculate the number of moles in 27 g of Al.

Molar mass of Al = 27 g mol⁻¹.

$$\text{Number of moles} = 27/27 = 1 \text{ mol.}$$

34(a)(i)(2). Calculate the number of moles in 1.51×10^{23} molecules of NH_4Cl .

Using Avogadro constant $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$:

$$n = N/N_A = (1.51 \times 10^{23})/(6.022 \times 10^{23}) \approx 0.25 \text{ mol.}$$

34(a)(ii). Give the salient features of Modern Atomic Theory.

- Atoms of an element contain the same number of protons (same atomic number), but isotopes may have different numbers of neutrons.
- Atoms are composed of subatomic particles such as electrons, protons and neutrons.
- Atoms of different elements differ in atomic number and other properties.
- Atoms combine in simple whole-number ratios to form compounds.
- Atoms can be rearranged in chemical reactions; they are not created or destroyed in ordinary chemical reactions.

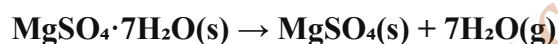
- Atoms of different elements can combine to form compounds, and compounds have definite composition.

34(b)(i). Give an example for each type of solution.

Type	Example
Gas in liquid	Carbon dioxide in water (soda water).
Solid in liquid	Common salt in water.
Solid in solid	Alloy such as brass (zinc in copper).
Gas in gas	Air.

34(b)(ii). What happens when $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ is heated? Write the equation.

On heating, hydrated magnesium sulphate loses its water of crystallisation and forms anhydrous magnesium sulphate.



34(b)(iii). Define solubility.

Solubility is the maximum mass of solute that can be dissolved in **100 g of solvent** at a specified temperature to form a saturated solution.

35(a)(i). What are the structures involved in the protection of the brain?

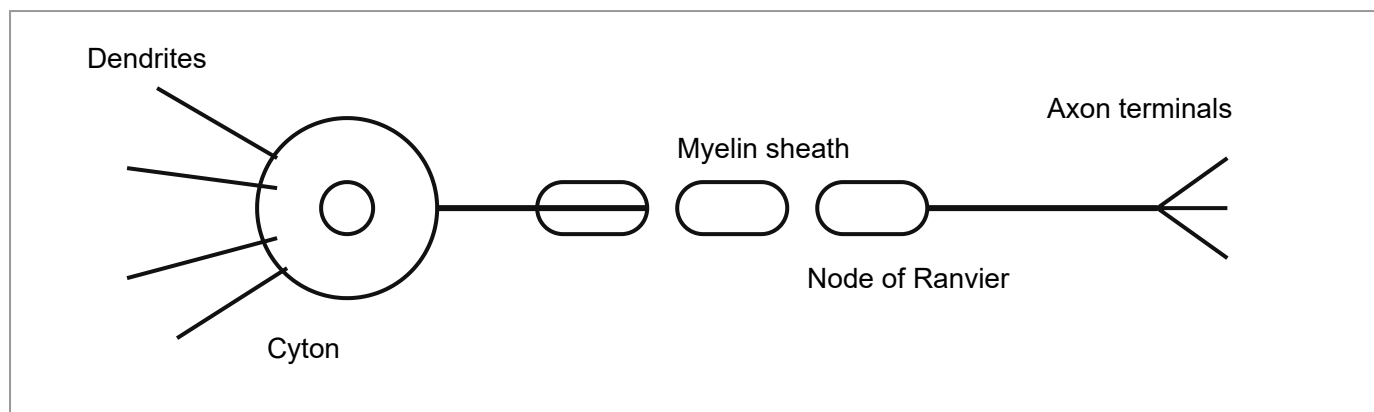
The brain is protected by:

- **Skull (cranium):** the bony structure surrounding the brain.
- **Meninges:** three protective membranes – dura mater, arachnoid membrane and pia mater.
- **Cerebrospinal fluid (CSF):** cushions the brain and helps protect it from mechanical shock.

35(a)(ii). With a neat labelled diagram explain the structure of a neuron.

A neuron is the structural and functional unit of the nervous system. Its main parts are:

- **Cyton/cell body:** contains the nucleus and cytoplasm.
- **Dendrites:** receive nerve impulses and conduct them towards the cell body.
- **Axon:** conducts impulses away from the cell body.
- **Myelin sheath:** insulating covering around the axon in myelinated neurons.
- **Nodes of Ranvier:** gaps between successive myelin sheath segments.
- **Axon terminals/synaptic knobs:** transmit signals to the next cell across a synapse.



35(b). How is the structure of DNA organized? What is the biological significance of DNA?

Structure/organisation:

- DNA is made of two long polynucleotide strands arranged as a double helix.
- Each nucleotide contains deoxyribose sugar, a phosphate group and a nitrogenous base.
- The bases are adenine (A), thymine (T), guanine (G) and cytosine (C).
- A pairs with T by two hydrogen bonds; G pairs with C by three hydrogen bonds.
- Nucleotides in each strand are linked by phosphodiester bonds; the two strands are held together by hydrogen bonds.
- DNA is organized with proteins to form chromatin, which condenses into chromosomes; functional segments of DNA are genes.

Biological significance:

- Stores hereditary/genetic information.
- Transmits genetic information from one generation to the next.
- Controls protein synthesis and thereby influences cell structure and functions.
- DNA replication permits genetic information to be copied during cell division.
- Changes in DNA can produce variations and mutations.

RECHECKED ISSUES IN THE QUESTION PAPER

Item	Observation	Key treatment
Q12	The option letter “c” is printed twice.	Use the third listed combination: a–3, b–4, c–2, d–1 .
Q20	The low-resolution diagram is difficult to read precisely at the label endpoints.	It is interpreted as a dumbbell-shaped grass/monocot stomatal apparatus; the answer is given with an explicit identification note.
Q34(b) (ii)	The printed formula uses “ $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ”.	Correct dehydration equation: $\text{MgSO}_4 \cdot 7\text{H}_2\text{O} \rightarrow \text{MgSO}_4 + 7\text{H}_2\text{O}$.
General	Several OCR/print characters are faint or distorted in the source scan.	Mathematical expressions and chemical formulae have been normalized in this answer key.

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