

TAMIL NADU – STANDARD X SCIENCE

Common Quarterly Examination – 2025

Detailed Answer Key

Evaluation note: Equivalent scientifically correct wording, suitable examples, correctly labelled diagrams, and logically correct intermediate steps may be awarded marks wherever applicable.

Part I – Choose the Correct Answer

1. Answer: (b) Tennis

In tennis, the direction and speed of the ball are changed by the force applied through the racket. This demonstrates the turning effect of force.

2. Answer: (d) Bifocal lenses

Presbyopia is an age-related defect of vision caused mainly by reduced accommodation of the eye. It is commonly corrected using bifocal or suitable progressive lenses.

3. Answer: (c) Zero

Heating or cooling a substance generally changes its volume or state, but the total mass of the substance remains unchanged in a closed system.

4. Answer: (c) Carbon dioxide

Carbon dioxide, CO_2 , contains three atoms in each molecule: one carbon atom and two oxygen atoms. Hence it is triatomic.

5. Answer: (c) Galvanization

Galvanization is the process of coating iron or steel with a thin layer of zinc to protect it from corrosion.

6. Answer: (c) Water

Water dissolves a very large number of ionic and polar substances and is therefore commonly called the universal solvent.

7. Answer: (a) Cortex

Casparian strips are present in the endodermal cells of roots, which form the innermost layer of the cortex.

8. Answer: (b) Warm blooded

Mammals are warm-blooded (homeothermic) animals. They maintain a comparatively constant internal body temperature.

9. Answer: (a) SA node

The sinoatrial (SA) node acts as the natural pacemaker of the heart and initiates the rhythmic electrical impulses that start each heartbeat.

10. Answer: (c) Duramater

The three cranial meninges from outside to inside are dura mater, arachnoid mater and pia mater. Dura mater is the outermost and toughest layer.

11. Answer: (d) F. W. Went

F. W. Went demonstrated the role of the coleoptile tip in growth and showed that a growth-promoting substance is produced in the tip.

12. Answer: (d) Androecium and gynoecium

The essential reproductive parts of a flower are the androecium (male reproductive whorl) and gynoecium (female reproductive whorl).

Part II – Short Answers

13. State Newton's second law.

Newton's second law states that the rate of change of momentum of a body is directly proportional to the external force applied to it and takes place in the direction of the force.

$$F \propto dp/dt$$

For a body of constant mass, $F = ma$.

14. Differentiate convex lens and concave lens.

Convex lens	Concave lens
Thicker at the centre and thinner at the edges.	Thinner at the centre and thicker at the edges.
Converges parallel rays of light.	Usually diverges parallel rays of light.
Has a positive focal length.	Has a negative focal length.

15(a). The number of atoms present in a molecule is called its ____.

Answer: Atomicity.

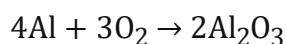
15(b). Atomicity of phosphorus is ____.

Answer: 4. The molecular form of elemental phosphorus is P_4 ; therefore its atomicity is four.

16. Identify A and B.

A = Aluminium (Al)

Aluminium is a silvery-white metal. On heating with oxygen it forms aluminium oxide:



B = Aluminium oxide (Al_2O_3)

An alloy of aluminium used in aircraft manufacture is **duralumin**.

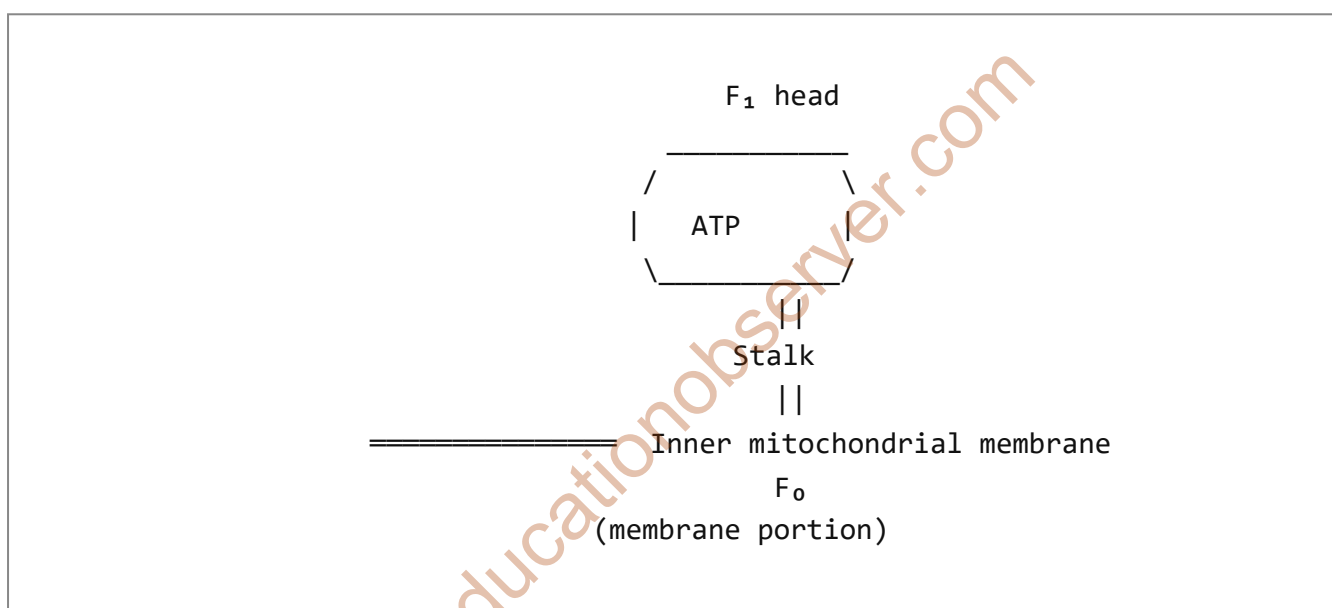
17. Define solubility.

Solubility is the maximum amount of a solute that can be dissolved in a given amount of solvent at a specified temperature to form a saturated solution.

18. Structure of oxysomes.

Oxysomes (F_1 particles or elementary particles) are ATP-producing structures present on the inner mitochondrial membrane. Each oxysome has:

- **F_0 component:** embedded in the inner mitochondrial membrane and forms the membrane channel.
- **F_1 component:** projects towards the mitochondrial matrix and contains the catalytic part responsible for ATP synthesis.
- A stalk connects the F_0 and F_1 portions.



19. Give reason: Guard cells are responsible for opening and closing of stomata.

Guard cells surround each stoma. When they become turgid, the stomatal pore opens; when they lose water and become flaccid, the pore closes. Thus changes in the turgidity of guard cells regulate opening and closing of stomata.

20(i). State whether true or false. If false, write the correct statement: All the nerves in the body are covered and protected by meninges.

Answer: False. The meninges are protective membranes covering the **brain and spinal cord**. Peripheral nerves are protected by connective-tissue coverings such as endoneurium, perineurium and epineurium.

20(ii). State whether true or false: Gibberellins cause parthenocarp in tomato.

Answer: True. Gibberellins can induce parthenocarpic fruit development in certain plants, including tomato, resulting in fruit formation without fertilisation.

21. What is colostrum?

Colostrum is the first milk secreted by the mammary glands after childbirth. It is yellowish and rich in proteins, antibodies and other protective substances, especially immunoglobulins, which help provide passive immunity to the newborn.

22. Calculate the potential difference.

Given:

- Work done, $W = 100 \text{ J}$
- Charge, $Q = 10 \text{ C}$

Potential difference:

$$V = W/Q = 100/10 = 10 \text{ V}$$

Answer: 10 volt.

Part III – Answer in Brief

23. Applications of the universal law of gravitation.

1. It explains the force that binds us to the Earth.
2. It explains the motion of the Moon around the Earth.
3. It explains the motion of planets around the Sun.
4. It explains the occurrence of tides due to the gravitational attraction of the Moon and the Sun.
5. It helps explain the motion of artificial satellites around the Earth.

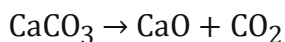
24. Differentiate myopia and hypermetropia.

Myopia	Hypermetropia
Also called short-sightedness.	Also called long-sightedness.
Nearby objects are seen clearly, but distant objects appear blurred.	Distant objects are seen more clearly, but nearby objects appear blurred.
Image of a distant object is formed in front of the retina.	Image of a nearby object tends to be formed behind the retina.
Corrected using a concave lens.	Corrected using a convex lens.

25. Merits of LED bulb.

- Consumes less electrical energy.
- Has high luminous efficiency.
- Produces comparatively less heat.
- Has a long service life.
- Requires low operating voltage and is suitable for efficient lighting.
- Contains no mercury, unlike fluorescent lamps.

26. Calcium carbonate decomposition.



(i) **Number of moles of calcium carbonate involved:** The balanced equation shows **1 mole** of CaCO_3 is involved.

(ii) **Gram molecular mass of CaCO_3 :**

$$\text{Ca} = 40; \text{C} = 12; \text{O}_3 = 3 \times 16 = 48$$

$$\text{Molar mass} = 40 + 12 + 48 = 100 \text{ g mol}^{-1}$$

(iii) **Moles of CO_2 :** From the balanced equation, 1 mole of CaCO_3 produces **1 mole** of CO_2 .

27(i). Match the following.

Term	Correct match
Calcination	Heating in the absence of air
Redox reaction	Aluminothermic process
Dental filling	Silver-tin amalgam
Group 18 elements	Noble gas elements

27(ii). Give an example each.

Type of solution	Example
Gas in liquid	Carbon dioxide dissolved in water (soda water).
Solid in liquid	Common salt dissolved in water (salt solution).

28. Write notes on saturated and unsaturated solutions.

Saturated solution: A solution containing the maximum amount of solute that can dissolve in a given amount of solvent at a particular temperature is called a saturated solution. Any additional solute remains undissolved.

Unsaturated solution: A solution containing less solute than the maximum amount that can dissolve at a particular temperature is called an unsaturated solution. More solute can still dissolve in it.

29. Parasitic adaptations in leech.

- The anterior and posterior suckers help the leech attach firmly to the host.
- The mouth contains three jaws with numerous minute teeth for making a wound.
- Salivary glands secrete **hirudin**, an anticoagulant that prevents blood clotting.
- Its muscular pharynx helps suck blood from the host.
- The body is flattened and well suited for attachment and movement.
- The crop has diverticula that allow storage of a large quantity of blood.

30. Differences between endocrine and exocrine glands.

Endocrine glands	Exocrine glands
Usually ductless.	Usually have ducts.
Release hormones directly into blood or tissue fluid.	Release their secretions through ducts to a body surface or cavity.
Secretion is mainly hormonal and acts on target tissues.	Secretion may include enzymes, mucus, sweat, saliva, etc.
Examples: pituitary, thyroid and adrenal glands.	Examples: salivary glands, sweat glands and digestive glands.

31. Characteristics of insect-pollinated flowers.

- Flowers are usually large, brightly coloured or conspicuous.
- They often have a pleasant fragrance.
- Nectar is commonly present as a reward for insects.
- Pollen grains are relatively large, sticky or spiny, so that they adhere to the insect body.
- Pollen grains are generally produced in smaller quantities than in wind-pollinated flowers.
- Anthers and stigma are positioned so that visiting insects can transfer pollen effectively.

32. Calculate the volume percentage of ethanol.

Volume of ethanol = 3.5 L

Volume of aqueous ethanol solution = 15 L

Volume percentage:

$$\begin{aligned}\text{Volume \%} &= (\text{Volume of solute} / \text{Volume of solution}) \times 100 \\ &= (3.5 / 15) \times 100 = 23.33\%\end{aligned}$$

Answer: 23.33% (approximately).

Part IV – Long Answers

33(a). Derive the ideal gas equation.

For an ideal gas, the gas laws can be combined as follows:

1. At constant temperature, Boyle's law gives **$PV = \text{constant}$** .
2. At constant pressure, Charles' law gives **$V/T = \text{constant}$** .
3. Combining Boyle's and Charles' laws with the amount of gas, the general relation is:

$$PV \propto nT$$

Introducing the proportionality constant R , called the universal gas constant:

$$PV = nRT$$

where P = pressure of the gas, V = volume, n = number of moles, R = universal gas constant and T = absolute temperature in kelvin.

OR

33(b). Electric current, its unit and measurement.

(i) Meaning of electric current: Electric current is the rate of flow of electric charge through a conductor.

$$I = Q/t$$

(ii) Unit: The SI unit of electric current is the **ampere (A)**. One ampere is the current when one coulomb of charge flows through a conductor in one second.

$$1 \text{ A} = 1 \text{ C s}^{-1}$$

(iii) Instrument and connection: Electric current is measured using an **ammeter**. An ammeter is connected **in series** with the circuit or the component through which the current is to be measured. Its positive terminal is connected towards the positive terminal of the source.

34(a). Salient features of modern atomic theory.

1. Matter is composed of atoms.
2. Atoms of the same element have the same atomic number, though atoms of the same element may differ in mass due to isotopes.
3. Atoms of different elements have different atomic numbers.
4. Atoms are divisible into subatomic particles such as electrons, protons and neutrons.
5. Atoms combine in simple whole-number ratios to form compounds.
6. Atoms are neither created nor destroyed in ordinary chemical reactions; they are rearranged during reactions.
7. Atoms of different elements can combine to form more than one compound in different whole-number ratios.
8. The identity of an element is determined by its atomic number, i.e. the number of protons in its nucleus.

OR

34(b). Explain the melting process.

Melting is the change of a substance from the **solid state to the liquid state** on heating.

- When a solid is heated, its particles gain kinetic energy and vibrate more vigorously.
- At the melting point, the particles gain sufficient energy to overcome the forces holding them in their fixed positions.
- The solid changes into a liquid.
- During melting, the temperature remains constant until the entire solid has melted because the supplied heat is used to overcome intermolecular forces. This heat is called the **latent heat of fusion**.

35(a). Enumerate the functions of blood.

1. **Transport of oxygen:** Haemoglobin in red blood cells carries oxygen from the lungs to tissues.
2. **Transport of carbon dioxide:** Blood carries carbon dioxide from tissues to the lungs.
3. **Transport of nutrients:** Digested nutrients are transported from the intestine to body cells.
4. **Transport of hormones:** Hormones are carried from endocrine glands to their target organs.
5. **Removal of wastes:** Metabolic wastes are transported to organs such as the kidneys, lungs and skin for elimination.
6. **Protection:** White blood cells defend the body against pathogens and foreign substances.
7. **Clotting:** Platelets help prevent excessive blood loss by forming blood clots.
8. **Regulation:** Blood helps regulate body temperature, pH and water balance.

OR

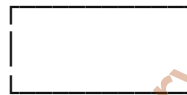
35(b). Experiment demonstrating that a growth-stimulating hormone is produced at the tip of the coleoptile.

F. W. Went's coleoptile experiment:

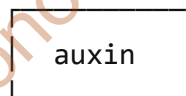
1. A coleoptile is a protective sheath surrounding the young shoot of a grass seedling.
2. The tip of a coleoptile was removed and placed on an agar block for a suitable period.
3. The agar block was then placed on the decapitated coleoptile.
4. The coleoptile showed growth, demonstrating that a growth-promoting substance had moved from the tip into the agar.
5. When the agar block was placed asymmetrically on the decapitated coleoptile, the coleoptile bent towards the opposite side.

Conclusion: The tip of the coleoptile produces a growth-promoting hormone, called **auxin**, which promotes cell elongation and causes the characteristic growth response.

Coleoptile tip



agar block



decapitated
coleoptile



growth/bending



End of answer key. Diagrams should be neat, proportional and properly labelled. In numerical problems, formula, substitution, calculation and final unit should be shown.