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Education as a Service (EaaS)

SAMPLE PAPER - SET 10

SESSION: 2025-26

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Class	IX	Subject	Science (086)
Time Allowed	3 Hours	Maximum Marks	80
Date	_____	Student Name	_____

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 Answer questions carrying **2 marks each**. Answers to these questions should be in the range of 30 to 50 words.
5. **Section C** consists of 7 Short Answer type questions carrying **3 marks each**. Answers to these questions should be in the range of 50 to 80 words.
6. **Section D** consists of 3 Long Answer type questions carrying **5 marks each**. Answers 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 **4 marks each** with sub-parts.

SECTION A (20 × 1 = 20 Marks)

Q1. Which of the following is a Kharif crop? **[1]**

(a) Wheat

(b) Mustard

(c) Paddy

(d) Peas

Q2. Hybridization in crop improvement refers to: **[1]**

(a) Crossing genetically similar plants

(b) Crossing genetically dissimilar plants

(c) Growing multiple crops together

(d) Using chemical fertilizers

Q3. The temperature at which a liquid changes into gas is called: **[1]**

(a) Melting point

(b) Boiling point

(c) Freezing point

(d) Sublimation point

Q4. Tyndall effect is shown by: **[1]**

(a) True solution

(b) Colloid

(c) Suspension

(d) Both (b) and (c)

Q5. The nucleus of an atom was discovered by: **[1]**

(a) J.J. Thomson

(b) Ernest Rutherford

(c) Niels Bohr

(d) James Chadwick

Q6. Which cell organelle is absent in animal cells? **[1]**

(a) Mitochondria

(b) Cell wall

(c) Golgi apparatus

(d) Lysosome

Q7. Cuticle is present in: **[1]**

(a) Epithelial tissue

(b) Epidermis

(c) Endodermis

(d) Cork

Q8. The retardation of a body is: **[1]**

(a) Positive acceleration

(b) Negative acceleration

(c) Zero acceleration

(d) Uniform acceleration

Q9. Inertia of a body depends on: **[1]**

(a) Mass of the body

(b) Velocity of the body

(c) Acceleration of the body

(d) Force on the body

Q10. The weight of an object on the moon is: **[1]**

(a) Equal to weight on Earth

(b) 1/6th of weight on Earth

(c) 6 times weight on Earth

(d) Zero

Q11. The commercial unit of energy is: **[1]**

(a) Joule

(b) Kilowatt

(c) Kilowatt hour

(d) Watt hour

Q12. The amplitude of a sound wave determines its: **[1]**

(a) Pitch

(b) Loudness

(c) Quality

(d) Speed

Q13. Macronutrients required by plants include: **[1]**

(a) Nitrogen, phosphorus, potassium

(b) Iron, manganese, zinc

(c) Copper, boron, molybdenum

(d) All of the above

Q14. Broilers are poultry birds raised for: **[1]**

(a) Egg production

(b) Meat production

(c) Both eggs and meat

(d) Feather production

Q15. The practice of growing two or more crops simultaneously on the same field is called: **[1]**

(a) Crop rotation

(b) Mixed cropping

(c) Intercropping

(d) Relay cropping

Q16. ASSERTION-REASON TYPE QUESTIONS **[1]**

Assertion (A): Manure improves soil texture and fertility.

Reason (R): Manure adds organic matter and nutrients to the soil.

(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

Q17. ASSERTION-REASON TYPE QUESTIONS **[1]**

Assertion (A): Evaporation causes cooling.

Reason (R): Particles absorb energy from surroundings during evaporation.

(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

Q18. ASSERTION-REASON TYPE QUESTIONS **[1]**

Assertion (A): Neutrons were discovered by James Chadwick.

Reason (R): Neutrons are neutral particles present in the nucleus.

(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

Q19. ASSERTION-REASON TYPE QUESTIONS **[1]**

Assertion (A): An object moving with uniform velocity has zero acceleration.

Reason (R): Acceleration is rate of change of velocity.

(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

Q20. ASSERTION-REASON TYPE QUESTIONS **[1]**

Assertion (A): Intercropping helps in pest and disease control.

Reason (R): Different crops attract different types of pests.

(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 (6 × 2 = 12 Marks)

Q21. Differentiate between Kharif and Rabi crops with two examples each. **[2]**

Q22. What is hybridization? Why is it important in crop improvement? **[2]**

Q23. Define sublimation. Give two examples of substances that undergo sublimation. **[2]**

Q24. Write two differences between atoms and molecules. **[2]**

Q25. What is the difference between distance and displacement? Give one example. **[2]**

Q26. State the universal law of gravitation. Write its formula. **[2]**

SECTION C (7 × 3 = 21 Marks)

Q27. (a) What is the difference between manure and fertilizer? **[3]**

(b) Why is excessive use of fertilizers harmful to soil?

(c) Name two organic manures.

Q28. (a) Differentiate between mixed cropping and intercropping. **[3]**

(b) Write two advantages of crop rotation.

(c) Give one example of crop rotation.

Q29. (a) Define solute, solvent, and solution with examples. **[3]**

(b) Calculate the mass percentage of sugar in a solution containing 20 g sugar in 180 g water.

(c) What is a saturated solution?

Q30. OR **[3]**

(a) Explain the separation of mixtures by chromatography.

(b) What is the principle of centrifugation?

(c) Give two applications of centrifugation.

Q31. (a) What are canal rays? Who discovered them? **[3]**

(b) Write three properties of canal rays.

(c) What particles are present in canal rays?

Q32. OR **[3]**

(a) Define gene. Where are genes located?

(b) What is the function of chromosomes?

(c) How many chromosomes are present in human cells?

Q33. (a) Explain the protective function of epithelial tissue. **[3]**

(b) Where is ciliated epithelium found? Write its function.

(c) Draw and label squamous epithelium.

Q34. A train starting from rest attains a velocity of 90 km/h in 5 minutes. Calculate: **[3]**

(a) The acceleration in m/s^2

(b) The distance covered in this time assuming uniform acceleration

Q35. OR **[3]**

(a) An object falls freely from rest. Calculate its velocity after 3 seconds.

(b) How far will it have fallen in this time?

(c) What will be its velocity after falling 80 m?

[Take g = 10 m/s²]

SECTION D (3 × 5 = 15 Marks)

Q36. (a) What is animal husbandry? Why is it important? **[5]**

(b) Explain the difference between layers and broilers in poultry farming.

(c) What are the desirable traits for high milk-yielding cattle breeds?

(d) Name two exotic and two indigenous breeds of cattle.

OR

(a) What is crop variety improvement? List its main objectives.

(b) Explain hybridization as a method of crop improvement with an example.

(c) What are the desirable agronomic characteristics for:

(i) Cereal crops

(ii) Fodder crops

Q37. (a) Explain the kinetic molecular theory of matter. **[5]**

(b) How does kinetic energy of particles change with temperature?

(c) A gas is heated from 27°C to 127°C. By what factor does the kinetic energy of its molecules increase?

(d) Explain why gases are highly compressible but solids are not.

OR

(a) Describe an activity to demonstrate that particles of matter are continuously moving.

(b) Explain why diffusion is faster in gases than in liquids.

(c) Why do we feel cool when we perspire?

(d) Arrange solids, liquids, and gases in increasing order of:

(i) Interparticle forces

(ii) Interparticle spaces

Q38. (a) What is meant by composition of a mixture? How can we separate a mixture of two miscible liquids? **[5]**

(b) Describe the process of fractional distillation with a labeled diagram.

(c) Why is separation of components necessary in a mixture?

(d) Give two examples where we use separating techniques in daily life.

OR

(a) Draw a well-labeled diagram of prokaryotic cell and eukaryotic cell.

(b) Write four differences between prokaryotic and eukaryotic cells.

(c) Name two organisms with prokaryotic cells and two with eukaryotic cells.

SECTION E (3 × 4 = 12 Marks)

CASE STUDY 1: CROP PRODUCTION AND MANAGEMENT

India is primarily an agricultural country where a major portion of the population depends on agriculture for their livelihood. To meet the food requirements of our growing population, we need to increase food production. This can be achieved through better crop production management practices. Farmers grow different crops in different seasons - Kharif crops are sown in the rainy season (June-October) and include rice, maize, cotton, and soybean. Rabi crops are grown in winter season (November-April) and include wheat, gram, peas, and mustard. Crop production involves several steps including soil preparation, sowing, adding manure and fertilizers, irrigation, protecting crops from weeds and pests, harvesting, and proper storage. Modern farming techniques like use of high-yielding variety seeds, proper irrigation systems, balanced use of fertilizers, and integrated pest management help in increasing crop productivity sustainably.

(i) Name two Kharif crops and two Rabi crops. [1 mark]

(ii) Why are different crops grown in different seasons? [1 mark]

OR

What is the advantage of using high-yielding variety (HYV) seeds? [1 mark]

(iii) (a) What are macronutrients? Name three macronutrients required by plants.
(b) Why is proper storage of grains important? [2 marks]

CASE STUDY 2: STATES OF MATTER AND INTERCONVERSION

Matter exists in three main states - solid, liquid, and gas. Each state has distinct properties based on the arrangement and movement of particles. In solids, particles are tightly packed with strong intermolecular forces, giving them definite shape and volume. In liquids, particles have moderate intermolecular forces allowing them to flow while maintaining a fixed volume. In gases, particles move freely with negligible intermolecular forces, having neither fixed shape nor volume. Matter can change from one state to another when energy in the form of heat is supplied or removed. When ice (solid) is heated, it melts to form water (liquid) at 0°C. Further heating converts water to steam (gas) at 100°C. The reverse processes occur when heat is removed - condensation converts gas to liquid, and freezing converts liquid to solid. Some substances like camphor and dry ice can directly change from solid to gas without passing through the liquid state - this process is called sublimation.

(i) What happens to the interparticle forces when a solid melts into a liquid? [1 mark]

(ii) Define latent heat of vaporization. [1 mark]

OR
Why does temperature remain constant during the change of state? [1 mark]

(iii) (a) Name the process in which a liquid changes into gas at any temperature below its boiling point.
(b) Why do we feel cool when we put some acetone or petrol on our palm? [2 marks]

CASE STUDY 3: NUTRIENT MANAGEMENT IN AGRICULTURE

Plants require sixteen essential nutrients for proper growth and development. Carbon and oxygen are obtained from air, hydrogen and oxygen from water, and the remaining thirteen nutrients from soil. These soil nutrients are classified into macronutrients and micronutrients. Macronutrients include nitrogen (N), phosphorus (P), potassium (K), calcium, magnesium, and sulfur - required in large quantities. Micronutrients include iron, manganese, boron, zinc, copper, molybdenum, and chlorine - required in small quantities. Continuous cultivation of crops depletes soil of these nutrients. To replenish soil fertility, farmers add manure and fertilizers. Manure is organic matter obtained from decomposition of plant and animal wastes, which improves soil texture and water retention. Fertilizers are chemical compounds rich in specific nutrients like NPK fertilizers. However, excessive use of chemical fertilizers can harm soil structure, kill beneficial microorganisms, and cause water pollution. Therefore, balanced use of both organic manures and chemical fertilizers is recommended for sustainable agriculture.

(i) What are the three main macronutrients required by plants? Write their symbols. [1 mark]

(ii) List two advantages of using manure over fertilizers. [1 mark]

OR
Why is excessive use of fertilizers harmful? [1 mark]

(iii) (a) Differentiate between macronutrients and micronutrients with one example of each.
(b) What is vermicompost? How is it beneficial for crops? [2 marks]

*** END OF QUESTION PAPER ***

Total Marks: 80

All the Best!

This completes the 10-paper series!

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🔑 DETAILED ANSWER KEY 🔑

CBSE CLASS 9 SCIENCE - SAMPLE PAPER 10

FINAL PAPER OF THE COMPLETE 10-PAPER SERIES

Complete Step-by-Step Solutions with Marking Scheme

Prepared by Expert Faculty of Math Love Institute

SECTION A - ANSWERS (20 × 1 = 20 Marks)

OBJECTIVE TYPE QUESTIONS - ANSWERS:

Q.No.	Answer	Q.No.	Answer	Q.No.	Answer	Q.No.	Answer
Q1	(c)	Q6	(b)	Q11	(c)	Q16	(a)
Q2	(b)	Q7	(b)	Q12	(b)	Q17	(a)
Q3	(b)	Q8	(b)	Q13	(a)	Q18	(b)
Q4	(b)	Q9	(a)	Q14	(b)	Q19	(a)
Q5	(b)	Q10	(b)	Q15	(b)	Q20	(a)

DETAILED EXPLANATIONS:

Q1. Answer: (c) Paddy

Explanation: Paddy (rice) is a Kharif crop sown in June-July during monsoon and harvested in September-October. Wheat, mustard, and peas are Rabi crops grown in winter.

Q2. Answer: (b) Crossing genetically dissimilar plants

Explanation: Hybridization involves crossing two genetically different varieties to

combine desirable traits from both parents.

Q3. Answer: (b) Boiling point
Explanation: The temperature at which liquid changes to gas is the boiling point.

Q4. Answer: (b) Colloid
Explanation: Colloids show Tyndall effect because their particles scatter light. True solutions are too small and suspensions are too large to show this effect effectively.

Q5. Answer: (b) Ernest Rutherford
Explanation: Rutherford discovered the nucleus through his gold foil alpha scattering experiment.

Q6. Answer: (b) Cell wall
Explanation: Cell wall is present only in plant cells, not in animal cells.

Q7. Answer: (b) Epidermis
Explanation: Cuticle is a waxy layer present on the epidermis of plants to prevent water loss.

Q8. Answer: (b) Negative acceleration
Explanation: Retardation is negative acceleration when velocity decreases.

Q9. Answer: (a) Mass of the body
Explanation: Inertia depends only on mass, not on velocity, acceleration, or force.

Q10. Answer: (b) 1/6th of weight on Earth
Explanation: Moon's gravity is 1/6th of Earth's, so weight on moon is 1/6th of weight on Earth.

Q11. Answer: (c) Kilowatt hour
Explanation: Commercial unit of energy is kilowatt hour (kWh), also called unit.

Q12. Answer: (b) Loudness
Explanation: Amplitude determines loudness of sound. Frequency determines pitch.

Q13. Answer: (a) Nitrogen, phosphorus, potassium
Explanation: N, P, K are macronutrients required in large quantities. Others are micronutrients.

Q14. Answer: (b) Meat production
Explanation: Broilers are raised for meat. Layers are for eggs.

Q15. Answer: (b) Mixed cropping

Explanation: Mixed cropping is growing two or more crops simultaneously on same field.

Q16-Q20. ASSERTION-REASON EXPLANATIONS:

Q16: (a) - Both true and R correctly explains A - Manure adds organic matter which improves soil texture and fertility

Q17: (a) - Both true and R correctly explains A - Particles absorb energy causing cooling

Q18: (b) - Both true but R doesn't explain A - R describes properties but doesn't explain discovery

Q19: (a) - Both true and R correctly explains A - Uniform velocity means no change, so zero acceleration

Q20: (a) - Both true and R correctly explains A - Different crops attract different pests, reducing pest buildup

SECTION B - ANSWERS (6 × 2 = 12 Marks)

Q21. Differentiate between Kharif and Rabi crops with two examples each.

Marking Scheme: 1 mark for differences + 1 mark for examples

Solution:

Kharif Crops	**Rabi Crops**
Sown at beginning of monsoon (June-July)	Sown at beginning of winter (October-November)
Harvested in September-October	Harvested in March-April
Require warm, wet conditions with good rainfall	Require cool climate for growth, warm for ripening
Grow during rainy season	Grow during winter season

Examples of Kharif Crops:

1. Paddy (Rice)
2. Maize

Others: Cotton, Soybean, Groundnut, Jowar, Bajra

Examples of Rabi Crops:

1. Wheat
2. Gram (Chickpea)

Others: Peas, Mustard, Linseed, Barley

Q22. What is hybridization? Why is it important in crop improvement?

Marking Scheme: 1 mark for definition + 1 mark for importance

Solution:

Hybridization:

Hybridization is the process of crossing two genetically different varieties or species of plants to produce offspring (hybrids) that combine desirable characteristics from both parents.

Importance in Crop Improvement:

1. **Higher Yield:** Hybrids often produce 30-50% more yield than traditional varieties

2. **Disease Resistance:** Combines resistance traits with high yield, reducing crop losses

3. **Better Quality:** Improves nutritional value, taste, appearance, and storage properties

4. **Adaptability:** Creates varieties suited to different climates - drought-resistant or flood-tolerant

5. **Desired Characteristics:** Shorter duration, better fertilizer response, lodging resistance

Example: Crossing high-yielding wheat with disease-resistant variety produces hybrid with both traits.

Q23. Define sublimation. Give two examples.

Marking Scheme: 1 mark for definition + 1 mark for examples

Solution:

Sublimation:
Sublimation is the process by which a solid directly changes into gas on heating without passing through the liquid state. On cooling, the gas directly converts back to solid.

Two Examples:

1. Camphor (Kapur):
• Used in religious ceremonies and as moth repellent
• Directly changes from solid to vapor without melting
• Gives characteristic smell as it sublimes

2. Naphthalene (Moth balls):
• Used to protect clothes from insects
• Gradually sublimes at room temperature
• Completely disappears without leaving liquid

Other Examples: Iodine, Dry Ice (solid CO_2), Ammonium chloride

Application: Used to separate sublimable substances from non-sublimable impurities.

Q24. Write two differences between atoms and molecules.

Marking Scheme: 1 mark for each difference

Solution:

Atoms	**Molecules**
Smallest particle of an element	Smallest particle of a substance that can exist independently
May or may not exist independently	Can exist independently
Consists of one type of particle	Made of two or more atoms chemically bonded
Cannot be broken by chemical means	Can be broken into atoms by chemical means
Example: H, O, N, C	Example: H_2, O_2, H_2O, CO_2

Q25. Difference between distance and displacement with example.

Marking Scheme: 1 mark for differences + 1 mark for example

Solution:

Distance:

• Actual length of path traveled

• Scalar quantity (only magnitude)

• Always positive

• Can never be zero for moving body

Displacement:

• Shortest distance between initial and final position

• Vector quantity (magnitude and direction)

• Can be positive, negative, or zero

• Can be zero even if body has moved

Example:
A person walks from A to B (10 m east), then B to C (10 m north), then C back to A.

Distance = AB + BC + CA = 10 + 10 + 14.14 = 34.14 m
Displacement = 0 (final position coincides with initial position)

Q26. State universal law of gravitation. Write its formula.

Marking Scheme: 1 mark for law + 1 mark for formula

Solution:

Universal Law of Gravitation:

Statement: Every object in the universe attracts every other object with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between their centers.

Mathematical Formula:
$F = G \times (m_1 \times m_2)/r^2$

Where:
• F = Gravitational force (Newton, N)
• m_1 = Mass of first object (kg)
• m_2 = Mass of second object (kg)
• r = Distance between centers (m)
• G = Universal gravitational constant = 6.67×10^{-11} N m^2 kg^{-2}

Key Points:
• Universal law - applies to all objects
• Always attractive, never repulsive

• Acts along line joining centers
• Same force on both objects

SECTION C - ANSWERS (7 × 3 = 21 Marks)

Q27. (a) Manure vs fertilizer (b) Harmful effects (c) Two organic manures

Marking Scheme: 1 mark each part

Solution:

(a) Difference Between Manure and Fertilizer:

Manure	**Fertilizer**
Organic substance from plant/animal waste	Inorganic chemical compounds
Contains all nutrients in less quantity	Rich in specific nutrients (N, P, K)
Improves soil texture and water retention	Does not improve soil structure
Provides humus	Does not provide humus
Economical, prepared at farm	Expensive, purchased from market

(b) Why Excessive Fertilizer Use is Harmful:

1. Destroys soil structure and fertility
2. Kills beneficial soil microorganisms
3. Causes water pollution and eutrophication
4. Health hazards through food chain
5. Disrupts nutrient cycles

(c) Two Organic Manures:

1. **Farmyard Manure (FYM):** From cow dung, urine, and straw
2. **Compost:** From decomposition in pits

Q28. (a) Mixed cropping vs intercropping (b) Crop rotation advantages (c) Example

Marking Scheme: 1 mark each part

Solution:

(a) Differences:

Mixed Cropping	Intercropping
Two or more crops simultaneously in random manner	Two or more crops simultaneously in definite row pattern
Seeds mixed before sowing	Seeds sown in alternate rows
Difficult to harvest separately	Easy to harvest separately
Example: Wheat + gram mixed	Example: Maize + soybean in rows

(b) Two Advantages of Crop Rotation:
1. **Maintains Soil Fertility:** Different crops have different nutrient needs; legumes add nitrogen
2. **Disease and Pest Control:** Breaks life cycle of pests, reduces pesticide need

(c) Example:
Rice (Kharif) → Wheat (Rabi) → Mung bean (Summer)

Q29. (a) Solute, solvent, solution (b) Mass percentage (c) Saturated solution

Marking Scheme: 1 mark each part

Solution:

(a) Definitions:
Solute: Substance that is dissolved (smaller quantity). Example: Sugar in sugar solution
Solvent: Substance in which solute dissolves (larger quantity). Example: Water in sugar solution
Solution: Homogeneous mixture of two or more substances. Example: Sugar dissolved in water

(b) Calculate Mass Percentage:
Given: Sugar = 20 g, Water = 180 g
Mass of solution = 20 + 180 = 200 g
Mass % = (20/200) × 100 = **10%**

(c) Saturated Solution:
A solution in which no more solute can be dissolved at a given temperature. Contains maximum amount of solute at that temperature.

Q30. OR - (a) Chromatography (b) Centrifugation principle (c) Applications

Marking Scheme: 1 mark each part

Solution:

(a) Chromatography:
Technique to separate components based on differences in movement through a medium.
Process: Mixture placed on paper, solvent rises by capillary action, components separate at different heights based on solubility.
Applications: Separating colors in dyes, drug testing, analyzing pigments

(b) Principle of Centrifugation:

Denser particles settle faster than lighter particles when subjected to high-speed rotation. Centrifugal force pushes heavier particles outward/downward while lighter particles remain near center.

(c) Two Applications:

1. **Medical:** Separation of blood components (plasma, RBC, WBC)
2. **Dairy:** Cream separation from milk

Q31. (a) Canal rays discovery (b) Three properties (c) Particles

Marking Scheme: 1 mark each part

Solution:

(a) Canal Rays:

Streams of positively charged particles moving toward cathode in discharge tube.
Discovered by: Eugen Goldstein in 1886

(b) Three Properties:

1. **Charge:** Positively charged, deflected toward negative plate
2. **Nature:** Mass and charge depend on gas in tube; much heavier than electrons
3. **Direction:** Travel from anode toward cathode, opposite to cathode rays

(c) Particles Present:

Positively charged ions (cations) of the gas present in the discharge tube.
If hydrogen gas → H^+ ions (protons)
If oxygen gas → O^+ or O^{2+} ions

Q32. OR - (a) Gene and location (b) Chromosome function (c) Human chromosomes

Marking Scheme: 1 mark each part

Solution:

(a) Gene:
Basic unit of heredity; segment of DNA containing instructions for making a specific protein or controlling a characteristic.
Location: On chromosomes in the nucleus of a cell

(b) Function of Chromosomes:
1. **Heredity:** Carry genetic information from parents to offspring
2. **Storage:** Store all information needed to build and maintain organism
3. **Cell Division:** Ensure proper distribution during cell division
4. **Protein Synthesis:** Provide templates for making proteins

(c) Human Chromosomes:
46 chromosomes (23 pairs)
• 22 pairs are autosomes
• 1 pair is sex chromosomes (XX in females, XY in males)
• Gametes have 23 chromosomes (haploid)

Q33. (a) Protective function (b) Ciliated epithelium (c) Diagram

Marking Scheme: 1 mark each part

Solution:

(a) Protective Function of Epithelial Tissue:
Forms protective covering on all external and internal surfaces:
• Forms skin epidermis protecting from mechanical injury, microorganisms, water loss, UV radiation
• Lines internal organs protecting from physical damage, chemicals, digestive enzymes
• Different types provide specific protection (keratinized, mucus-secreting)

(b) Ciliated Epithelium:

Location: Respiratory tract (trachea, bronchi), Fallopian tubes, nasal passage

Structure: Cells with hair-like projections called cilia

Function:

• In respiratory tract: Cilia move mucus with trapped dust/bacteria upward, preventing particles from reaching lungs

• In Fallopian tubes: Help move egg from ovary to uterus

(c) Diagram of Squamous Epithelium:

[Diagram should show single layer of thin, flat, scale-like cells with labels: Squamous epithelial cells, Nucleus, Basement membrane, Cell boundaries]

Location: Blood vessels, alveoli, heart lining

Function: Allows easy diffusion

Q34. Train: rest to 90 km/h in 5 min. Calculate (a) acceleration (b) distance

Marking Scheme: 1.5 marks each calculation

Solution:

Given: u = 0, v = 90 km/h, t = 5 minutes

Convert: v = 90 × (5/18) = 25 m/s, t = 5 × 60 = 300 s

(a) Acceleration:

v = u + at

25 = 0 + a × 300

a = 25/300 = 1/12

a = 0.083 m/s²

(b) Distance:

s = ut + ½at²

s = 0 + ½ × (1/12) × (300)²

s = (1/24) × 90000

s = 3750 m or 3.75 km

Q35. OR - Free fall: (a) v after 3s (b) distance (c) v after 80m [g=10 m/s²]

Marking Scheme: 1 mark each calculation

Solution:

Given: u = 0, g = 10 m/s²

(a) Velocity after 3 seconds:

v = u + gt = 0 + 10 × 3

v = 30 m/s

(b) Distance fallen in 3 seconds:

s = ut + ½gt² = 0 + ½ × 10 × 9

s = 45 m

(c) Velocity after falling 80 m:

v² = u² + 2gs = 0 + 2 × 10 × 80

v² = 1600

v = 40 m/s

SECTION D - ANSWERS (3 × 5 = 15 Marks)

Q36. Animal husbandry, layers/broilers, cattle traits, breeds

Total: 5 marks (1.5 + 1 + 1.5 + 1)

(a) Animal Husbandry and Importance:

Definition: Scientific management, breeding, and care of farm animals for maximum benefits.

Importance:

• Food production (milk, meat, eggs - protein sources)

• Economic benefits (income, employment, GDP contribution)

• Agricultural support (draught animals, manure)

• Industrial raw materials (wool, leather)

(b) Layers vs Broilers:

Layers	**Broilers**
Raised for egg production	Raised for meat production
Kept for 1-2 years	Marketed at 6-8 weeks
Fed calcium-rich diet	Fed protein-rich diet
Lighter body weight	Heavier with more meat

(c) Desirable Traits for High Milk-Yielding Cattle:

• High milk production per lactation

• Extended lactation period

• Large well-developed udder

• Good health and disease resistance

• Docile temperament

• Early maturity and regular breeding

(d) Breeds:

Exotic: 1. Jersey (USA, brown, high milk) 2. Holstein-Friesian (Netherlands, black/white)

Indigenous: 1. Sahiwal (Punjab, reddish brown) 2. Gir (Gujarat, curved horns)

Q36. OR - Crop variety improvement, hybridization, characteristics

Total: 5 marks (2 + 2 + 1)

(a) Crop Variety Improvement:

Process of developing new and better varieties with desirable characteristics.

Objectives:

1. Higher yield (increase productivity, HYV)
2. Improved quality (nutrition, taste, shelf life)
3. Disease and pest resistance
4. Environmental adaptation (drought/salinity tolerance)
5. Desirable agronomic traits (shorter duration, lodging resistance)

(b) Hybridization:

Crossing two genetically different varieties to produce offspring with combined superior traits.

Process: Select parent varieties → Cross-pollinate → Collect seeds → Grow and evaluate → Select best hybrids

Example: High-yielding wheat × Disease-resistant wheat = Hybrid with both high yield AND disease resistance

(c) Desirable Characteristics:

Cereal crops: Dwarfness, high tillers, profuse branching, fertilizer responsiveness

Fodder crops: Tall plants, profuse branching, succulent stems, high protein, quick regrowth

Q37. Kinetic molecular theory, temperature effect, KE calculation, compressibility

Total: 5 marks (1.5 + 1 + 1 + 1.5)

(a) Kinetic Molecular Theory:

• Matter is made of tiny particles (atoms/molecules) in constant motion
• Particles have kinetic energy due to motion
• Particles attract each other (intermolecular forces)
• In solids: particles vibrate at fixed positions (strong forces, close-packed)
• In liquids: particles slide past each other (moderate forces, some freedom)

• In gases: particles move freely (weak forces, far apart)

(b) KE and Temperature:

Kinetic energy of particles is directly proportional to absolute temperature (Kelvin).

KE increases with temperature → particles move faster

KE decreases with temperature → particles move slower

(c) KE Increase Factor:

$T_1 = 27°C = 300\ K$

$T_2 = 127°C = 400\ K$

$KE \propto T$

$KE_2/KE_1 = T_2/T_1 = 400/300 = 4/3$

KE increases by factor of 4/3 or 1.33

(d) Compressibility:

Gases highly compressible: Large interparticle spaces allow compression

Solids not compressible: Particles closely packed with negligible space, cannot be pushed closer

Q37. OR - Particle movement activity, diffusion, perspiration, arrangement

Total: 5 marks (1.5 + 1 + 1 + 1.5)

(a) Activity to Demonstrate Particle Movement:

Experiment: Drop potassium permanganate crystals in water

Observation: Purple color spreads throughout water even without stirring

Conclusion: Particles of matter are continuously moving, causing diffusion

OR: Smell of perfume spreading in a room demonstrates particle movement

(b) Diffusion Faster in Gases:

• Gas particles have more kinetic energy than liquid particles

• Large interparticle spaces in gases allow free movement

• Weak intermolecular forces in gases

• Liquid particles restricted by stronger forces and closer packing

(c) Cooling from Perspiration:
Sweat (perspiration) evaporates from skin surface. Evaporation is a cooling process because particles absorb energy from skin to escape as vapor, making us feel cool.

(d) Increasing Order:
(i) Interparticle forces: Gases < Liquids < Solids
(ii) Interparticle spaces: Solids < Liquids < Gases

Q38. Mixture composition, fractional distillation, separation necessity, daily examples

Total: 5 marks (1 + 2 + 1 + 1)

(a) Composition and Separation:
Mixture composition refers to the proportion of different components.
Separating Miscible Liquids: Use fractional distillation (for liquids with different boiling points)

(b) Fractional Distillation:
Process:
• Mixture heated in distillation flask
• Component with lower boiling point vaporizes first
• Vapors rise through fractionating column
• Cooled in condenser, collected as liquid
• Second component vaporizes at higher temperature
Example: Separating alcohol (78°C) from water (100°C)
[Diagram should show: Flask, fractionating column, thermometer, condenser, beaker]

(c) Necessity of Separation:
• Obtain pure substances
• Remove harmful/unwanted components
• Extract useful components
• Identify mixture components

(d) Daily Life Examples:

1. Filtering tea leaves from tea
2. Separating stones from rice/grains

Q38. OR - Prokaryotic vs Eukaryotic cells: diagrams, differences, examples

Total: 5 marks (2 + 2 + 1)

(a) Diagrams:

Prokaryotic Cell: [Show cell wall, plasma membrane, cytoplasm, nucleoid (no membrane), ribosomes, flagellum]

Eukaryotic Cell: [Show cell wall (plant), plasma membrane, nucleus with membrane, mitochondria, ER, Golgi, lysosomes, vacuole]

(b) Four Differences:

Prokaryotic Cells	Eukaryotic Cells
No membrane-bound nucleus	Membrane-bound nucleus present
No membrane-bound organelles	Membrane-bound organelles present
DNA in nucleoid region	DNA in nucleus
Small (1-10 μm)	Large (10-100 μm)

(c) Examples:

Prokaryotic: 1. Bacteria (E. coli) 2. Blue-green algae (Cyanobacteria)

Eukaryotic: 1. Plant cells 2. Animal cells

SECTION E - ANSWERS (3 × 4 = 12 Marks)

Q39. CASE STUDY 1 - CROP PRODUCTION - ANSWERS:

Total: 4 marks

(i) Name two Kharif and two Rabi crops. [1 mark]
Kharif Crops: Paddy (Rice), Maize
Rabi Crops: Wheat, Gram (Chickpea)

(ii) Why are different crops grown in different seasons? [1 mark]
Different crops have different climatic requirements for growth. Kharif crops need warm and wet conditions (monsoon), while Rabi crops need cool climate for growth and warm for ripening. Growing crops in their suitable seasons ensures better growth and higher yields.

OR: Advantage of HYV seeds? [1 mark]
High-Yielding Variety (HYV) seeds produce significantly higher yields (30-50% more) than traditional varieties, helping meet food demands of growing population. They also have better disease resistance and shorter duration.

(iii) (a) Macronutrients (b) Grain storage importance [2 marks]
(a) Macronutrients: Nutrients required by plants in large quantities.
Three macronutrients: **Nitrogen (N), Phosphorus (P), Potassium (K)**
Others: Calcium, Magnesium, Sulfur

(b) Proper Storage Importance:
• Prevents damage from moisture, insects, rats, and microorganisms
• Prevents grain spoilage and quality deterioration
• Ensures food security throughout the year
• Reduces economic losses for farmers
• Maintains nutritional value

Q40. CASE STUDY 2 - STATES OF MATTER - ANSWERS:

Total: 4 marks

(i) What happens to interparticle forces when solid melts? [1 mark]

When solid melts into liquid, the interparticle forces weaken (become less strong). The forces are still present but particles gain enough energy to overcome some of the strong forces, allowing them to move more freely.

(ii) Define latent heat of vaporization. [1 mark]

Latent heat of vaporization is the amount of heat energy required to change 1 kg of a liquid into vapor at its boiling point without any change in temperature. For water, it is 22.5×10^5 J/kg or 540 cal/g.

OR: Why temperature remains constant during change of state? [1 mark]

During change of state, the heat energy supplied is used to overcome intermolecular forces (breaking bonds) rather than increasing kinetic energy of particles. This energy is called latent heat. Since temperature depends on kinetic energy, it remains constant.

(iii) (a) Liquid to gas process (b) Why acetone/petrol feels cool [2 marks]

(a) Process Name: Evaporation is the process in which a liquid changes into gas at any temperature below its boiling point from the surface.

(b) Cooling Effect:

Acetone and petrol are volatile liquids (evaporate easily at room temperature). When we put them on our palm:

• They evaporate rapidly from the skin

• During evaporation, particles absorb heat energy from our palm (skin) to escape as vapor

• This loss of heat energy from skin makes us feel cool

• The faster the evaporation, the more cooling we feel

Q41. CASE STUDY 3 - NUTRIENT MANAGEMENT - ANSWERS:

Total: 4 marks

(i) Three main macronutrients with symbols. [1 mark]

The three main macronutrients required by plants are:

1. **Nitrogen (N)**
2. **Phosphorus (P)**

3. **Potassium (K)**

These are also called NPK nutrients.

(ii) Two advantages of manure over fertilizers. [1 mark]

1. **Improves Soil Structure:** Manure improves soil texture, water retention capacity, and adds humus, making soil more fertile long-term

2. **Environmentally Friendly:** Does not cause water pollution, safe for soil microorganisms, and economical as it can be prepared at farm

OR: Why excessive fertilizer use harmful? [1 mark]

Excessive fertilizer use:

• Destroys soil structure and kills beneficial microorganisms

• Causes water pollution through leaching into groundwater

• Leads to eutrophication in water bodies (algal bloom)

• Creates health hazards as chemicals enter food chain

• Reduces long-term soil fertility

(iii) (a) Macro vs micronutrients (b) Vermicompost benefits [2 marks]

(a) Difference:

Macronutrients	**Micronutrients**
Required in large quantities	Required in small quantities
Example: Nitrogen (N)	Example: Iron (Fe)

(b) Vermicompost:

Vermicompost is organic manure prepared by decomposition of organic waste through earthworms.

Benefits for Crops:

• Rich in nutrients (N, P, K) and plant growth hormones

• Improves soil structure, porosity, and water-holding capacity

• Increases beneficial soil microorganisms

• Environmentally friendly and sustainable

• Improves crop yield and quality

• No harmful chemicals

📚 END OF ANSWER KEY 📚

🎉 COMPLETION OF 10-PAPER SERIES 🎉

Total Marks: 80

Section A: 20 marks | Section B: 12 marks | Section C: 21 marks

Section D: 15 marks | Section E: 12 marks

Comprehensive answer key with detailed step-by-step solutions
following strict CBSE marking schemes for optimal scoring

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