BOUNDLESS MATHS

CLASS IX — SCIENCE SAMPLE PAPER (2026-27 SESSION)

MARKING SCHEME

Time: 3 Hours **Maximum Marks: 80**

Marking Principles

1. Marks are given for each correct step, so a student who shows the method but makes an arithmetic slip still earns the method marks.
2. Any other correct method or correct answer in different words is to be accepted and awarded full marks.
3. In numerical questions, the correct formula, the substitution and the final answer with the correct unit carry marks. Award the answer mark only if the unit is given.
4. Where a question asks for 'any two' or 'any five' points, award marks for the first two or five correct points attempted.
5. In questions with internal choice, mark only the choice attempted. If both are attempted, mark the first one.

SECTION A

Q1–Q20, 1 mark each (20 marks)

Q	Answer	Reason
1	(d) Ribosomes	Prokaryotic cells have no membrane-bound organelles, but they do have ribosomes.
2	(a) plasmolysis	Loss of water in a hypertonic solution makes the protoplasm shrink away from the cell wall.
3	(b) phloem	Phloem conducts food (sugars) made in the leaves.
4	(c) It is involuntary, striated and branched.	Cardiac muscle fibres are branched, striated and involuntary.
5	(a) Hydra	Hydra forms buds that detach to become new individuals.
6	(d) fruit	After fertilisation the ovary becomes the fruit and the ovules become seeds.
7	(c) Fungi	Chitin cell wall with absorptive heterotrophic nutrition is typical of fungi.
8	(b) Pteridophyta	Ferns have vascular tissue but produce spores, not seeds.
9	(a) Milk	Milk is a colloid (fat globules dispersed in water).
10	(c) simple distillation	The boiling points differ by more than 25 K, so simple distillation works.
11	(d) 18	Neutrons = mass number − atomic number = 35 − 17 = 18.
12	(b) atomic number	Isotopes have the same number of protons but different numbers of neutrons.
13	(c) constant proportions	A compound always contains the same elements in a fixed mass ratio.

Q	Answer	Reason
14	(a) speed	Slope = distance ÷ time = speed.
15	(d) Newton's first law (law of inertia)	The body of the passenger tends to stay in motion when the bus stops.
16	(b) four times	KE = ½mv², so KE is proportional to v²; doubling v makes KE 4 times.
17	(c) a vacuum	Sound needs a material medium to travel.
18	(a) nitrogen fixation	Rhizobium converts atmospheric nitrogen into usable forms.
19	(a) Both A and R are true, and R is the correct explanation of A.	Atoms are only rearranged, so total mass stays the same.
20	(c) A is true, but R is false.	Ice has a high albedo (it reflects most sunlight), not a low one.

SECTION B

Q21–Q26, 2 marks each (12 marks)

Q21. *Electronic configuration and valency* **[2 marks]**

(a) Atomic number = 12, so the atom has 12 electrons.

Electronic configuration: K = 2, L = 8, M = 2, that is 2, 8, 2 [1]

(b) Valency = 2 [½]

The outermost shell has 2 electrons, which the atom loses to attain a stable octet. [½]

Q22. *Wave speed* **[2 marks]**

Given: f = 500 Hz, λ = 0.68 m

Formula: $v = f \times \lambda$ [½]

$v = 500 \times 0.68$ [½]

v = 340 m/s [1]

Q23. *Loudness and pitch* **[2 marks]**

Loudness: it is the degree of sensation of sound that makes it loud or soft. It depends on the amplitude of the wave. Greater amplitude gives a louder sound. [1]

Pitch: it is the sensation of how high or low (shrill or flat) a sound is. It depends on the frequency of the wave. Greater frequency gives a higher pitch. [1]

OR

Time for the sound to go to the cliff and return = 3 s

Speed of sound, v = 340 m/s

Total distance travelled by the sound = $v \times t = 340 \times 3 = 1020$ m [1]

Distance of the cliff = 1020 ÷ 2 = 510 m [1]

Q24. *Xylem and phloem (any two differences)* **[2 marks]**

Xylem conducts water and minerals from roots to leaves. Phloem conducts food from leaves to other parts. [1]

Xylem is mostly dead tissue (tracheids and vessels). Phloem is living tissue (sieve tubes and companion cells). [1]

Other acceptable points: xylem conducts upwards only, phloem conducts in both directions; xylem has thick lignified walls, phloem has thin walls.

Q25. *Vegetative propagation* **[2 marks]**

Any two methods with one example each; ½ mark for the method and ½ mark for the example. Acceptable answers:

Cutting – rose / sugarcane / money plant

Layering – jasmine / strawberry

Grafting – mango / apple / rose

Runner – grass; tuber – potato; bulb – onion

Any two correct method–example pairs [2]

OR

Pollination: transfer of pollen grains from the anther to the stigma of a flower. [1]

Fertilisation: fusion of the male gamete (from the pollen tube) with the female gamete (egg) inside the ovule, forming a zygote. [1]

Q26. *Potential and kinetic energy* **[2 marks]**

Potential energy: PE = mgh = 2 × 10 × 10 = 200 J [1]

By the law of conservation of energy, the PE lost is gained as KE. [½]

KE just before reaching the ground = 200 J [½]

SECTION C

Q27–Q33, 3 marks each (21 marks)

Q27. *Meristematic tissue* **[3 marks]**

(a) Meristematic tissue is a group of actively dividing, undifferentiated cells found in the growing regions of a plant. [1]

(b) Apical meristem

Location: tips of roots and shoots [½]

Function: increases the length of the plant [½]

Lateral meristem (cambium)

Location: along the sides of stems and roots [½]

Function: increases the thickness (girth) of the plant [½]

Q28. *Events from pollination to fertilisation* **[3 marks]**

Step 1: The pollen grain absorbs the sugary fluid on the stigma and germinates. [1]

Step 2: A pollen tube grows down through the style towards the ovary, carrying the male gametes. [1]

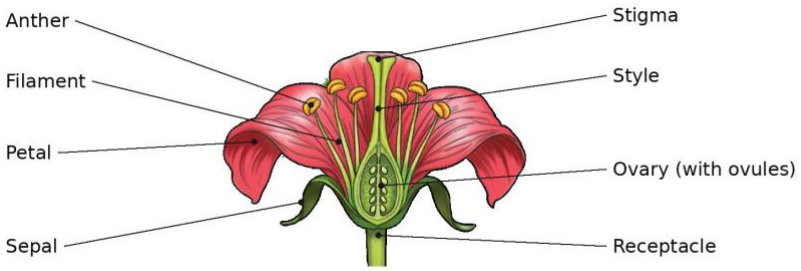
Step 3: The tube enters the ovule through the micropyle and releases the male gametes. One male gamete fuses with the egg to form the zygote (fertilisation). [1]

OR

Neat, proportionate diagram of the longitudinal section of a flower [1]

Any four correct labels, ½ mark each (stigma, style, ovary, ovule, anther, filament, petal, sepal, receptacle) [2]

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Q29. *Mass by mass percentage* **[3 marks]**

Mass of solute (sugar) = 15 g; mass of solvent (water) = 135 g

(a) Mass of solution = 15 + 135 = 150 g [1]

Mass % = (mass of solute ÷ mass of solution) × 100 [½]

= (15 ÷ 150) × 100 = 10% [½]

(b) 10% means 10 g of sugar in every 100 g of solution.

Sugar in 300 g of solution = (10 ÷ 100) × 300 = 30 g [1]

Q30. *Formulae and molecular mass* **[3 marks]**

(a) Aluminium oxide: Al^{3+} and O^{2-}, by criss-cross the formula is Al_2O_3 [½]

Calcium chloride: Ca^{2+} and Cl^{-}, by criss-cross the formula is $CaCl_2$ [½]

(b) Molecular mass of Al_2O_3 = (2 × 27) + (3 × 16) [1]

= 54 + 48 [½]

= 102 u [½]

Q31. *Law of conservation of mass* **[3 marks]**

Law: In a chemical reaction, mass is neither created nor destroyed. The total mass of the reactants equals the total mass of the products. [1]

$CaCO_3 \rightarrow CaO + CO_2$

Mass of reactant = 10 g [½]

Mass of products = 5.6 + 4.4 = 10 g [1]

Mass of reactant = mass of products, so the law is verified. [½]

Q32. *Energy of a falling ball* **[3 marks]**

Given: m = 0.5 kg, h = 20 m, g = 10 m/s²

(a) PE at the top = mgh = 0.5 × 10 × 20 = 100 J [1]

(b) KE just before hitting the ground = PE lost = 100 J [1]

(c) ½mv² = 100

½ × 0.5 × v² = 100 [½]

v² = 400

v = 20 m/s [½]

OR

Given: W = 3000 J, t = 1 min = 60 s

(a) Power = W ÷ t = 3000 ÷ 60 = 50 W [1]

(b) Energy used by the bulb = 3000 J, power of bulb = 200 W

Time = E ÷ P = 3000 ÷ 200 [1]

= 15 s [1]

Q33. *Greenhouse gases* **[3 marks]**

Two greenhouse gases: carbon dioxide and methane (water vapour or nitrous oxide are also acceptable). [1]

Sunlight passes through the atmosphere and warms Earth's surface. Earth gives out this energy as infrared (heat) radiation. [1]

Greenhouse gases absorb part of this heat and radiate it back towards Earth, so the lower atmosphere stays warm. [½]

Human activity: burning of fossil fuels / deforestation / cattle rearing / use of fertilisers (any one). [½]

SECTION D

Q34–Q36, 5 marks each (15 marks)

Q34. *Osmosis with raisins* **[5 marks]**

(a) Beaker A (plain water): the raisins swell and become plump. [1]

Beaker B (concentrated sugar solution): the raisins shrink. [1]

(b) The process is osmosis, the movement of water across a semi-permeable membrane from a region of higher water concentration to a region of lower water concentration. [1]

In A the surrounding is hypotonic, so water enters the raisins. [½]

In B the surrounding is hypertonic, so water leaves the raisins. [½]

(c) The swollen raisins would lose water to the sugar solution and shrink. [1]

OR

Neat, proportionate diagram of a plant cell showing a cell wall, nucleus and large central vacuole [1]

Any four correct labels, ½ mark each (cell wall, cell membrane, cytoplasm, nucleus, nucleolus, large central vacuole, chloroplast, mitochondrion, endoplasmic reticulum, Golgi body, ribosome) [2]

Functions of any two labelled parts, 1 mark each:

Cell wall: gives shape and rigidity and protects the cell [1]

Nucleus: controls all activities of the cell and carries the genetic material (DNA)

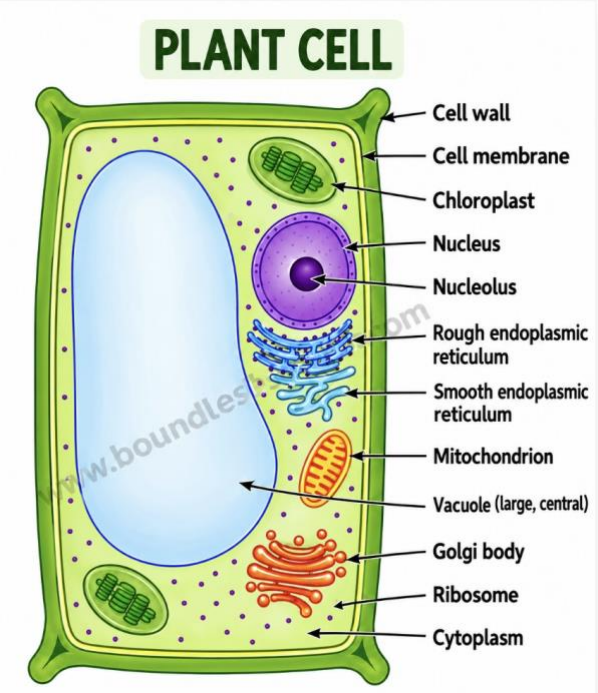
Chloroplast: carries out photosynthesis to make food

Large central vacuole: stores water, nutrients and wastes and keeps the cell firm

Mitochondrion: releases energy from food (respiration)

Cell membrane: controls the entry and exit of substances

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Q35. *Velocity–time graph* **[5 marks]**

(a) Acceleration from 0 s to 4 s:

a = (v − u) ÷ t = (20 − 0) ÷ 4 [½]

a = 5 m/s² [½]

(b) From 10 s to 14 s the velocity falls from 20 m/s to 0:

a = (0 − 20) ÷ 4 = −5 m/s² [½]

Retardation = 5 m/s² [½]

(c) Distance = area under the graph

Area of OAB′ (0–4 s) = ½ × 4 × 20 = 40 m [½]

Area of rectangle (4–10 s) = 6 × 20 = 120 m [½]

Area of triangle (10–14 s) = ½ × 4 × 20 = 40 m [½]

Total distance = 40 + 120 + 40 = 200 m [½]

(d) Average speed = total distance ÷ total time

= 200 ÷ 14 = 14.3 m/s (approximately) [1]

OR

Given: u = 54 km/h, v = 0, a = −3 m/s²

(a) u = 54 × (5 ÷ 18) = 15 m/s [1]

(b) v = u + at

0 = 15 + (−3) × t [1]

t = 5 s [1]

(c) s = ut + ½at²

s = (15 × 5) − (½ × 3 × 25) [1]

s = 75 − 37.5 = 37.5 m [1]

(Or by $v^2 = u^2 + 2as$: $0 = 225 - 6s$, so $s = 37.5$ m.)

Q36. *Recoil of a gun* **[5 marks]**

Given: mass of bullet $m_1 = 20$ g $= 0.02$ kg, velocity $v_1 = 400$ m/s, mass of gun $m_2 = 4$ kg

(a) Law of conservation of momentum: if no external force acts on a system, the total momentum before an interaction is equal to the total momentum after it. [1]

(b) Momentum before firing = 0

Momentum after firing = $m_1v_1 + m_2v_2$

$0 = (0.02 \times 400) + (4 \times v_2)$ [1]

$v_2 = -8 \div 4 = -2$ m/s [1]

The gun recoils at 2 m/s, opposite to the direction of the bullet.

(c) The gun and the bullet have equal and opposite momentum (8 kg m/s). Since the gun is much heavier ($v = p \div m$), its velocity is much smaller. [1]

(d) Newton's third law of motion (action and reaction are equal and opposite). [1]

OR

Given: $F = 20$ N, $m = 5$ kg, $u = 0$, $t = 6$ s

(a) $a = F \div m = 20 \div 5 = 4$ m/s² [1]

(b) $v = u + at = 0 + 4 \times 6 = 24$ m/s [1]

(c) $p = mv = 5 \times 24 = 120$ kg m/s [1]

(d) $s = ut + \frac{1}{2}at^2$

$s = 0 + \frac{1}{2} \times 4 \times 36$ [1]

$s = 72$ m [1]

SECTION E

Q37–Q39, 4 marks each (12 marks)

Q37. *Classification of organisms* **[4 marks]**

(i) Protista (single-celled, eukaryotic, moves by cilia). [1]

(ii) Kingdom Fungi [½]

Mode of nutrition: heterotrophic (saprophytic, absorbing food from dead organic matter). [½]

(iii) Pteridophyta [½]

Reason: it has vascular tissue but bears no flowers or seeds and reproduces by spores. [½]

(iv) Organism S is prokaryotic. It has no well-defined nucleus and no membrane-bound organelles, so it is placed in Monera. [1]

Q38. *Types of mixtures* **[4 marks]**

(i) A is a true solution, B is a suspension and C is a colloid. [1]

(ii) The particles in C (colloid) are large enough to scatter light (Tyndall effect). The particles in A are very small and cannot scatter light. [1]

(iii) Filtration (decantation or sedimentation is also acceptable). [1]

(iv) P – thermometer, Q – water condenser, R – conical flask (receiver collecting the distillate). All three correct for 1 mark; two correct for ½ mark. [1]

OR for (iv):

Centrifugation: when the milk is spun at high speed, the heavier particles are forced to the bottom and the lighter cream collects at the top (or is separated). [1]

Q39. *Atomic particles* **[4 marks]**

(i) Mass number of Q = protons + neutrons = 6 + 8 = 14 [1]

(ii) P and Q are isotopes. [½]

Reason: both have the same atomic number (6) but different mass numbers (12 and 14). [½]

(iii) Q and R are isobars. [½]

Reason: both have the same mass number (6 + 8 = 14 and 7 + 7 = 14) but different atomic numbers. [½]

(iv) R has 7 electrons. Electronic configuration: 2, 5 [1]

OR for (iv): any one use of an isotope, for example:

Iodine isotope in the treatment of goitre, cobalt-60 in the treatment of cancer, uranium as fuel in nuclear reactors, carbon-14 in dating fossils. [1]

BLUEPRINT OF THE PAPER

For teachers: coverage by unit and chapter

Unit	Chapter	Marks	Questions
I — World of Living (27)	Cell: The Building Block of Life	7	Q1, Q2, Q34
	Tissues in Action	7	Q3, Q4, Q24, Q27
	Reproduction: How Life Continues	7	Q5, Q6, Q25, Q28
	Patterns in Life: Diversity and Classification	6	Q7, Q8, Q37
II — Matter (25)	Exploring Mixtures and their Separation	9	Q9, Q10, Q29, Q38
	Journey Inside the Atom	8	Q11, Q12, Q21, Q39
	Atomic Foundations of Matter	8	Q13, Q19, Q30, Q31
III — Motion, Force, Work and Sound (23)	Describing Motion Around Us	6	Q14, Q35
	How Forces Affect Motion	6	Q15, Q36
	Work, Energy and Simple Machines	6	Q16, Q26, Q32
	Sound Waves	5	Q17, Q22, Q23
IV — Earth as a System (5)	Earth as a System: Energy, Matter and Life	5	Q18, Q20, Q33
	Total	80	39 questions

Internal choice is given in 9 questions: Q23, Q25, Q28, Q32, Q34, Q35, Q36, Q38 and Q39.

— End of Marking Scheme —

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