

Model Question Paper 1
Half-Yearly Examination 2026-27
SCIENCE

Time Allowed: 3 Hours

Maximum Marks: 80

General Instructions:

1. This question paper has 5 sections: A, B, C, D and E.
2. Section A has 20 objective type questions carrying 1 mark each.
3. Section B has 6 questions carrying 2 marks each. Answers to these should not exceed 40-50 words each.
4. Section C has 7 questions carrying 3 marks each. Answers to these should not exceed 60-80 words each.
5. Section D has 3 questions carrying 5 marks each. Answers to these should not exceed 120 words each.
6. Section E has 3 source/case-based questions carrying 4 marks each with sub-parts.
7. There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the choices in such questions.
8. Wherever necessary, neat and labelled diagrams should be drawn.

SECTION A

Question numbers 1 to 20 carry 1 mark each. Choose the most appropriate answer.

1. Before testing an idea through experiments, a scientist first frames a tentative, testable explanation based on existing observations. This tentative explanation is called a: [1]
(a) Law
(b) Hypothesis
(c) Theory
(d) Model
2. A student wants to know roughly how many grains of rice are in a large sack without counting every single grain. She counts the grains in a small measured cup, then multiplies by the number of such cups the sack holds. This method of arriving at an approximate value is called: [1]
(a) Measurement
(b) Estimation
(c) Hypothesis testing
(d) Extrapolation error
3. The cell organelle that breaks down glucose to release energy for the cell's activities, and is therefore called the 'powerhouse of the cell', is the: [1]
(a) Nucleus
(b) Ribosome
(c) Mitochondria
(d) Golgi apparatus
4. Bacteria are classified as prokaryotic organisms mainly because their cells lack a: [1]
(a) Cell membrane
(b) Nuclear membrane enclosing the genetic material
(c) Cell wall
(d) Cytoplasm

5. A dried raisin left overnight in a bowl of plain water swells up and becomes plump. This happens because water molecules move into the raisin's cells from a region of: [1]
- (a) Lower water concentration outside to higher water concentration inside
 - (b) Higher water concentration outside to lower water concentration inside
 - (c) Equal concentration on both sides
 - (d) Higher solute concentration outside to lower solute concentration inside
6. The tissue found at the tip of a root or a shoot, whose cells divide continuously to bring about growth in length, is: [1]
- (a) Permanent tissue
 - (b) Apical meristem
 - (c) Epithelial tissue
 - (d) Connective tissue
7. The thin, continuous layer of cells that lines the inner walls of blood vessels as well as the tiny air sacs (alveoli) of the lungs, allowing smooth flow of fluids and easy diffusion of gases, belongs to which type of tissue? [1]
- (a) Muscular tissue
 - (b) Nervous tissue
 - (c) Epithelial tissue
 - (d) Connective tissue
8. A gardener notices that when a stem is wounded, some fully mature, specialised cells near the cut regain the ability to divide repeatedly and form new tissue that seals the wound. This change of mature permanent cells back into a dividing (meristematic) state is called: [1]
- (a) Differentiation
 - (b) Redifferentiation
 - (c) Dedifferentiation
 - (d) Specialisation
9. A car covers equal distances in equal intervals of time while travelling along a straight highway. Its motion is best described as: [1]
- (a) Non-uniform motion
 - (b) Uniform motion
 - (c) Accelerated motion
 - (d) Retarded motion
10. A cyclist covers a distance of 300 m in 1 minute while moving at a constant speed. Her speed is: [1]
- (a) 3 m/s
 - (b) 5 m/s
 - (c) 18 m/s
 - (d) 0.2 m/s
11. A scooter starting from rest accelerates uniformly at 2 m/s^2 . The distance it covers in the first 5 seconds is: [1]
- (a) 10 m
 - (b) 20 m
 - (c) 25 m
 - (d) 50 m

12. This question consists of two statements — Assertion (A) and Reason (R). Choose the correct option: [1]

Assertion (A): A car moving at a constant speed of 40 km/h around a circular roundabout is said to be undergoing accelerated motion.

Reason (R): Acceleration occurs whenever the velocity of a body changes, and velocity changes if either the speed or the direction of motion changes, even if speed alone stays constant.

- (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

13. Which of the following is a homogeneous mixture? [1]

- (a) Sand and water
- (b) Oil and water
- (c) Sugar dissolved completely in water
- (d) Milk

14. Milk, fog and shaving cream all consist of particles that are larger than those in a true solution, do not settle down on standing, and scatter a beam of light passed through them. Such mixtures are classified as: [1]

- (a) Suspensions
- (b) Colloids
- (c) True solutions
- (d) Pure compounds

15. A chemist needs to separate two miscible liquids whose boiling points differ by only about 5°C. The most suitable technique for this is: [1]

- (a) Simple distillation
- (b) Fractional distillation
- (c) Filtration
- (d) Sublimation

16. The property of a body by virtue of which it resists any change in its state of rest or of uniform motion along a straight line is called: [1]

- (a) Momentum
- (b) Inertia
- (c) Acceleration
- (d) Gravity

17. A force of 10 N acts on a body of mass 2 kg that is initially at rest. The acceleration produced in the body is: [1]

- (a) 2 m/s²
- (b) 5 m/s²
- (c) 10 m/s²
- (d) 20 m/s²

18. This question consists of two statements — Assertion (A) and Reason (R). Choose the correct option: [1]

Assertion (A): A rocket is able to accelerate forward in empty space by expelling burnt gases at high speed from its rear nozzle.

Reason (R): According to Newton's third law of motion, the force with which the rocket pushes the gases backward is equal and opposite to the force with which the gases push the rocket forward.

- (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

19. Work is said to be done on an object by a force only when: [1]

- (a) The force acts on the object but the object does not move at all
- (b) The force causes a displacement of the object in the direction of the force (or a component of it)
- (c) The force acts exactly perpendicular to the displacement
- (d) The object moves due to its own inertia with no force acting

20. A boy lifts a schoolbag of mass 5 kg from the floor to a shelf 2 m high, at a slow, constant speed. Taking $g = 10 \text{ m/s}^2$, the work done by him against gravity is: [1]

- (a) 10 J
- (b) 50 J
- (c) 100 J
- (d) 250 J

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. State two differences between prokaryotic and eukaryotic cells on the basis of (a) the nuclear region and (b) membrane-bound organelles. [2]

22. A doctor examining an X-ray explains that bones are hard and rigid, while the flexible tip of the nose or the outer ear is made of a softer, bendable connective tissue. State two differences between bone and cartilage as connective tissues. [2]

23. A car's speed increases uniformly from 20 m/s to 32 m/s in 6 seconds. Calculate its acceleration. [2]

24. A shopkeeper accidentally mixes iron filings with sulphur powder while packing chemicals. Suggest a suitable method to separate them and explain briefly why it works. [2]

25. A truck of mass 2000 kg moving at 20 m/s is brought to rest by applying brakes for 5 seconds. Calculate (a) its acceleration (deceleration), and (b) the force applied by the brakes. [2]

26. A crane does 6000 J of work in lifting a load through a height of 3 m. Taking $g = 10 \text{ m/s}^2$, calculate the weight of the load. [2]

SECTION C

Question numbers 27 to 33 carry 3 marks each.

27. A student measures the length of her classroom five times with a metre scale and obtains the readings: 8.20 m, 8.22 m, 8.19 m, 8.21 m and 8.23 m. (a) Calculate the mean (average) value of the length. (b) Give one reason why scientists prefer to take several repeated readings rather than rely on a single measurement. [3]

28. With reference to cell organelles: (a) Name the organelle that packages and dispatches materials manufactured within the cell. (b) Name the organelle responsible for intracellular digestion of unwanted material. (c) Explain briefly why the mitochondrion is called the 'powerhouse of the cell'. [3]

29. Differentiate between striated (skeletal), unstriated (smooth) and cardiac muscle tissue on the basis of (a) shape of cells and (b) whether their action is voluntary or involuntary. [3]

30. A ball is thrown vertically upward with an initial velocity of 20 m/s. Taking $g = 10 \text{ m/s}^2$ as the retardation acting on it, calculate (a) the maximum height it reaches, and (b) the time taken to reach the highest point. [3]

31. A tea-stall vendor boils tea leaves, milk, sugar and water together, then pours the tea through a fine strainer before serving. (a) Name the separation technique used here. (b) Explain briefly why this technique separates out the tea leaves but cannot separate the sugar dissolved in the tea. [3]

32. A ball of mass 2 kg moving at 6 m/s collides with a stationary ball of mass 4 kg moving in the same direction. After the collision, the first ball continues moving at 4 m/s in the same direction. Using the law of conservation of momentum, calculate the velocity of the second ball after the collision. [3]

33. A pendulum bob is pulled to one side and released, so it swings back and forth. (a) At the extreme positions of the swing, which form of mechanical energy is maximum, and why? (b) At the lowest (mean) position, which form of energy is maximum, and why? (c) State how this illustrates the law of conservation of energy. [3]

SECTION D

Question numbers 34 to 36 carry 5 marks each.

34. A car travels from Town A to Town B, 60 km apart, in 1.5 hours at a steady speed. Due to heavy traffic, it returns from B to A along the same route in 2 hours. (a) Calculate the average speed for the onward journey. (b) Calculate the average speed for the return journey. (c) Calculate the average speed for the entire round trip. (d) Explain briefly why the average speed for the whole trip is NOT simply the arithmetic mean of the two speeds found in (a) and (b). [5]

OR

A block of mass 10 kg is placed on a horizontal frictionless surface, and a constant horizontal force of 25 N is applied to it. (a) Calculate the acceleration produced. (b) If this force acts for 4 seconds starting from rest, calculate the final velocity attained by the block. (c) Calculate the distance covered by the block in these 4 seconds. (d) State Newton's second law of motion in the form $F = ma$, and briefly explain what each symbol represents.

35. A pump is used to lift 300 kg of water through a height of 10 m in 25 seconds. Taking $g = 10 \text{ m/s}^2$, calculate: (a) the work done in lifting the water. (b) the power of the pump in watts. (c) the power of the pump in kilowatts. (d) State the law of conservation of energy, and identify the main energy transformation taking place in this process. [5]

OR

A worker uses a simple lever to lift a heavy stone of weight 600 N by applying an effort of 100 N at the other end. (a) Calculate the mechanical advantage of the lever. (b) If the effort arm is 1.5 m long, calculate the load arm, using the principle that $\text{load} \times \text{load arm} = \text{effort} \times \text{effort arm}$. (c) Define mechanical advantage. (d) Give one reason why simple machines like levers are useful in everyday life even though they do not reduce the total work that must be done.

36. A student places three similar-sized potato cubes in three beakers: Beaker A with distilled water, Beaker B with a concentrated salt solution, and Beaker C with a salt solution whose concentration is the same as the potato cell sap. After two hours, she compares the size of each cube. (a) Predict and explain what happens to the cube in Beaker A. (b) Predict and explain what happens to the cube in Beaker B. (c) Predict what happens in Beaker C, and explain why. (d) Name the process responsible for these changes and define it. [5]

OR

A cross-section of a young dicot stem examined under a microscope shows: an outer single layer of closely packed cells; several layers of large, thin-walled cells with unusually thickened corners just beneath it; scattered vascular bundles (each containing two types of conducting tissue); and a central region of loosely packed cells. (a) Identify the outermost layer and state its main function. (b) Identify the thick-cornered tissue and state one function that suits its structure. (c) Name the two conducting tissues found in each vascular bundle and state one substance each transports. (d) Explain how the structure of xylem vessels (dead, hollow, lignified cells joined end to end) suits their function.

SECTION E

Question numbers 37 to 39 are source/case-based questions carrying 4 marks each with four sub-parts each.

Case Study 1 — Question 37 [4 Marks]

At a school science fair, a group of students is given a sample of muddy pond water, a mixture of common salt and sand, and a sample of black ink, and asked to separate/purify each using techniques they have learnt in the chapter on mixtures and separation.

- (i) Name the technique the students should use first to remove the visible mud/suspended particles from the pond water. [1]
- (ii) Suggest a method to obtain pure drinking water free of dissolved salts from the filtered pond water, and briefly state the principle involved. [1]
- (iii) Describe briefly how the students should separate the mixture of common salt and sand. [1]
- (iv) Name and briefly describe the technique the students should use to separate the different coloured dyes present in the black ink sample. [1]

OR Common salt and ammonium chloride are both soluble in water and cannot be separated efficiently by evaporation alone. Explain why, and name the technique you would recommend instead.

Case Study 2 — Question 38 [4 Marks]

A cyclist starts from rest and rides along a straight road. A sports app on his phone plots his velocity against time: from $t = 0$ s to $t = 4$ s his velocity increases uniformly from 0 to 8 m/s; from $t = 4$ s to $t = 10$ s his velocity stays constant at 8 m/s; and from $t = 10$ s to $t = 12$ s he brakes and his velocity uniformly drops from 8 m/s to 0.

- (i) Calculate the cyclist's acceleration during the first 4 seconds. [1]
- (ii) What type of motion does the cyclist have between $t = 4$ s and $t = 10$ s? Calculate the distance covered in this interval. [1]
- (iii) Calculate the cyclist's retardation (deceleration) while braking, between $t = 10$ s and $t = 12$ s. [1]
- (iv) Calculate the total distance covered by the cyclist during the entire 12-second journey. [1]

OR Describe the shape of the distance-time graph you would expect for the constant-velocity phase ($t = 4$ s to $t = 10$ s) of this journey, and justify its shape.

Case Study 3 — Question 39 [4 Marks]

Modern cars are fitted with seat belts and airbags. During a sudden collision, a car moving at high speed stops abruptly, but an unbelted passenger continues moving forward due to inertia and may strike the dashboard or windscreen. Seat belts and airbags are designed to increase the time over which the passenger's momentum changes, thereby reducing the force experienced.

(i) Which of Newton's laws explains why an unbelted passenger keeps moving forward when the car stops suddenly? [1]

(ii) Using the relationship between force, change in momentum and time taken, explain why increasing the time taken to stop the passenger (using a seat belt/airbag) reduces the force experienced. [1]

(iii) State Newton's second law of motion in words. [1]

(iv) A passenger of mass 70 kg, moving at 20 m/s, is brought to rest in 0.2 s by an airbag. Calculate the average force exerted on the passenger by the airbag. [1]

OR If the same passenger, without a seat belt or airbag, were instead stopped by hitting the dashboard in just 0.02 s, calculate the average force experienced, and comment on why this would be more dangerous.

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