Model Question Paper 2

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. A student builds a small working model of the solar system to explain how planets move around the Sun, since the actual motion cannot be shown directly in a classroom. Such a simplified representation used to explain a real phenomenon is called a: *[1]*

(a) Hypothesis
(b) Model
(c) Law
(d) Random guess
Answer: (b) — Model — a simplified representation used to explain or predict a real phenomenon.

2. Which of the following is the correct first step of the scientific method? *[1]*

(a) Forming a final conclusion
(b) Making careful observations and asking a question
(c) Publishing the results in a journal
(d) Testing the hypothesis with an experiment
Answer: (b) — Making careful observations and asking a question — the starting point of scientific inquiry.

3. The jelly-like substance that fills the interior of a cell, within which the nucleus and other organelles remain suspended, is the: *[1]*

(a) Cytoplasm
(b) Cell wall
(c) Chromoplasm
(d) Vacuole
Answer: (a) — Cytoplasm — the fluid medium enclosed by the cell membrane, in which organelles are suspended.

4. Which cell organelle possesses its own DNA and is believed, according to the endosymbiotic theory, to have originated from a free-living bacterium engulfed by an early ancestral cell? *[1]*

(a) Ribosome
(b) Golgi body
(c) Mitochondria
(d) Lysosome

Answer: (c) — Mitochondria — contain their own DNA and ribosomes, supporting an endosymbiotic bacterial origin.

5. A plant cell placed in pure (distilled) water swells but does not burst, whereas a red blood cell placed in pure water swells and eventually bursts. The main reason the plant cell does not burst is that it has a: *[1]*

(a) Smaller nucleus
(b) Rigid cell wall outside the cell membrane that resists excessive swelling
(c) Thicker cell membrane only
(d) Absence of cytoplasm
Answer: (b) — The rigid cellulose cell wall resists the pressure of water entering by osmosis, preventing the cell from bursting.

6. The tissue made of long, spindle-shaped, uninucleate cells that brings about slow, involuntary movement of internal organs such as the stomach and intestines is: *[1]*

(a) Skeletal (striated) muscle
(b) Smooth (unstriated) muscle
(c) Cardiac muscle
(d) Nervous tissue
Answer: (b) — Smooth (unstriated) muscle — involuntary, found in the walls of internal organs.

7. The tissue made up of specialised cells called neurons, responsible for carrying electrical impulses throughout the body, is: *[1]*

(a) Muscular tissue
(b) Connective tissue
(c) Nervous tissue
(d) Epithelial tissue
Answer: (c) — Nervous tissue — made of neurons; conducts nerve impulses.

8. In grasses and bamboo, growth in length occurs not only at the tip but also just above each node, allowing the plant to grow taller even after the tip has stopped elongating. The dividing tissue responsible for this growth at the nodes is: *[1]*

(a) Apical meristem
(b) Lateral meristem
(c) Intercalary meristem
(d) Cork cambium
Answer: (c) — Intercalary meristem — located at the base of nodes/internodes in grasses, responsible for growth there.

9. The physical quantity that has both magnitude and direction, and represents the shortest straight-line distance between an object's initial and final positions, is called: *[1]*

(a) Distance
(b) Speed
(c) Displacement
(d) Time period
Answer: (c) — Displacement — a vector quantity, the shortest distance between initial and final positions.

10. A train travels 240 km in 4 hours at a constant speed. Its speed is: *[1]*

(a) 40 km/h
(b) 60 km/h
(c) 80 km/h
(d) 120 km/h
Answer: (b) — Speed = distance/time = 240/4 = 60 km/h.

11. The velocity-time graph of an object is a straight line inclined to the time axis, showing the velocity increasing steadily. The object's motion is: *[1]*

(a) Uniform velocity
(b) Uniformly accelerated
(c) Non-uniformly accelerated
(d) At rest
Answer: (b) — Uniformly accelerated motion — velocity changes at a constant rate, shown by a straight, inclined v-t graph.

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

Assertion (A): The odometer fitted in a car's dashboard measures the total distance travelled, not the car's displacement.

Reason (R): Distance is a scalar quantity representing the total path length covered, whereas displacement is a vector quantity that can be zero at the end of a journey even though the distance travelled is not zero, such as in a round trip back to the starting point.

(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
Answer: (a) — Both true; R correctly explains why an odometer (measuring distance) and displacement can give very different values.

13. Which of the following is an example of a heterogeneous mixture? *[1]*

(a) A solution of common salt in water
(b) Air
(c) A mixture of sand and water
(d) A solution of sugar in water
Answer: (c) — Sand and water — the components remain visibly separate and are not uniformly distributed.

14. A solution in which no more of a solute can dissolve at a given temperature is called a: *[1]*

(a) Dilute solution
(b) Saturated solution
(c) Suspension
(d) Colloid
Answer: (b) — Saturated solution — holds the maximum amount of solute that can dissolve at that temperature.

15. To separate camphor, which sublimes on heating, from a mixture with common salt, which does not, the most suitable technique is: *[1]*

(a) Filtration
(b) Sublimation
(c) Simple distillation
(d) Chromatography
Answer: (b) — Sublimation — camphor turns directly to vapour and can be collected separately, leaving the salt behind.

16. According to Newton's first law of motion, a body at rest will remain at rest, and a body in motion will continue moving with the same velocity, unless it is acted upon by: *[1]*

(a) Its own inertia
(b) Gravity alone
(c) An unbalanced external force
(d) Friction only
Answer: (c) — An unbalanced (net) external force is required to change a body's state of rest or uniform motion.

17. A force of 15 N produces an acceleration of 3 m/s^2 in an object. The mass of the object is: *[1]*

(a) 3 kg
(b) 5 kg
(c) 15 kg
(d) 45 kg
Answer: (b) — m = F/a = 15/3 = 5 kg.

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

Assertion (A): It is easier to push an empty shopping cart than a fully loaded one, even when the same force is applied.

Reason (R): A body with a larger mass has greater inertia, and therefore a greater force is required to produce the same acceleration in it, as compared to a body with smaller mass.

(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
Answer: (a) — Both true; R correctly explains A — greater mass means greater inertia, so more force is needed for the same acceleration.

19. The energy possessed by a body on account of its motion is called: *[1]*

(a) Potential energy
(b) Kinetic energy
(c) Chemical energy
(d) Heat energy
Answer: (b) — Kinetic energy — energy due to motion.

20. A commercial unit of power, commonly used for rating large engines and motors, and equal to about 746 W, is the: *[1]*

(a) Watt
(b) Kilowatt
(c) Horsepower
(d) Joule per second
Answer: (c) — Horsepower (1 hp ≈ 746 W).

SECTION B

Question numbers 21 to 26 carry 2 marks each.

21. State two functions of the cell membrane. *[2]*

Marking Scheme / Value Points:

- It regulates the entry and exit of substances into and out of the cell (selective permeability) — 1 mark
- It gives the cell its shape/outer boundary and protects/holds together the cell contents — 1 mark

22. A gymnast's tendons connect her muscles to bones, while ligaments connect bone to bone at each joint. Name the connective tissues being referred to here, and state one property common to both that suits them for this role. *[2]*

Marking Scheme / Value Points:

- Tendon (dense, fibrous connective tissue) connects muscle to bone; Ligament (elastic connective tissue) connects bone to bone at joints — 1 mark
- Both are strong and tough, able to withstand considerable pulling/stretching forces without tearing (ligaments are more elastic than tendons) — 1 mark

23. A bus decelerates uniformly from 25 m/s to 5 m/s in 4 seconds. Calculate its retardation (deceleration). *[2]*

Marking Scheme / Value Points:

- a = (v − u)/t = (5 − 25)/4 — 1 mark

• a = −20/4 = −5 m/s², i.e. a retardation of 5 m/s² — 1 mark

24. A student needs to separate a mixture of oil and water in the laboratory. Name the apparatus/technique she should use, and state the principle behind it. *[2]*

Marking Scheme / Value Points:

• Separating funnel — 1 mark

• Oil and water are immiscible liquids of different densities that form distinct layers; opening the stopcock allows the denser liquid (water) to be drained off first, leaving the oil behind — 1 mark

25. A force of 20 N acts on a body of mass 4 kg, initially at rest, for 5 seconds. Calculate (a) the acceleration produced, and (b) the momentum gained by the body after 5 seconds. *[2]*

Marking Scheme / Value Points:

• (a) a = F/m = 20/4 = 5 m/s² — 1 mark

• (b) v = u + at = 0 + 5×5 = 25 m/s; momentum = mv = 4 × 25 = 100 kg m/s — 1 mark

26. A boy weighing 400 N climbs a vertical ladder of height 5 m in 10 seconds. Calculate (a) the work done by him, and (b) his power. *[2]*

Marking Scheme / Value Points:

• (a) W = Force × distance = 400 × 5 = 2000 J — 1 mark

• (b) P = W/t = 2000/10 = 200 W — 1 mark

SECTION C

Question numbers 27 to 33 carry 3 marks each.

27. A student times the swing of a pendulum five times under identical conditions and records: 2.1 s, 2.0 s, 2.2 s, 2.0 s and 2.1 s. (a) Find the mean value of the time period. (b) Explain why a single measurement is generally considered less reliable than the mean of several repeated measurements. *[3]*

Marking Scheme / Value Points:

• (a) Mean = (2.1+2.0+2.2+2.0+2.1)/5 = 10.4/5 = 2.08 s — 1.5 marks

• (b) Every measurement is subject to small, random errors (in reaction time while starting/stopping a stopwatch, in reading the scale, etc.); averaging several readings reduces the effect of such random errors and gives a value closer to the true one — 1.5 marks

28. State one difference each between a plant cell and an animal cell with respect to (a) presence of a cell wall, (b) size/presence of a vacuole, and (c) presence of plastids. *[3]*

Marking Scheme / Value Points:

• (a) Plant cells have a rigid cell wall (made of cellulose) outside the cell membrane; animal cells lack a cell wall — 1 mark

• (b) Plant cells usually have one large, permanent central vacuole; animal cells have small or few temporary vacuoles, if any — 1 mark

• (c) Plant cells contain plastids (e.g. chloroplasts); animal cells lack plastids — 1 mark

29. List any three functions of epithelial tissue in the human body, giving one example location for each. *[3]*

Marking Scheme / Value Points:

• Protection — e.g. skin epidermis protects underlying tissues from damage/infection — 1 mark

• Absorption — e.g. epithelium lining the small intestine absorbs digested food — 1 mark

• Secretion — e.g. glandular epithelium in salivary glands secretes saliva — 1 mark

30. A stone dropped from the top of a tower takes 4 seconds to reach the ground. Taking g = 10 m/s², calculate (a) the height of the tower, and (b) the velocity with which the stone strikes the ground. *[3]*

Marking Scheme / Value Points:

- (a) $h = ut + \frac{1}{2}gt^2 = 0 + \frac{1}{2} \times 10 \times 16 = 80$ m — 1.5 marks
- (b) $v = u + gt = 0 + 10 \times 4 = 40$ m/s — 1.5 marks

31. Name the technique used to separate two miscible liquids whose boiling points differ by more than about 25°C (for example, acetone and water), and briefly describe how it works. *[3]*

Marking Scheme / Value Points:

- Simple distillation — 1 mark
- The mixture is heated; the liquid with the lower boiling point vaporises first, its vapour is cooled and condensed in a condenser and collected separately, while the liquid with the higher boiling point remains behind in the flask — 2 marks

32. A ball of mass 0.5 kg moving at 10 m/s strikes a stationary ball of the same mass (0.5 kg) head-on. After the collision, the first ball comes to rest. Using the law of conservation of momentum, calculate the velocity of the second ball after the collision. *[3]*

Marking Scheme / Value Points:

- Momentum before collision = $(0.5 \times 10) + (0.5 \times 0) = 5$ kg m/s — 1 mark
- Momentum after collision = $(0.5 \times 0) + (0.5 \times v) = 0.5v$; by conservation, $0.5v = 5$ — 1 mark
- Solving: $v = 10$ m/s — 1 mark

33. State the law of conservation of energy. A ball of mass 2 kg is dropped from a height of 5 m. Taking $g = 10$ m/s² and ignoring air resistance, calculate its kinetic energy just before it strikes the ground. *[3]*

Marking Scheme / Value Points:

- Law: Energy can neither be created nor destroyed; it can only be transformed from one form to another, the total energy remaining constant — 1 mark
- By conservation of energy, KE gained just before hitting the ground = PE lost = $mgh = 2 \times 10 \times 5$ — 1 mark
- KE = 100 J — 1 mark

SECTION D

Question numbers 34 to 36 carry 5 marks each.

34. A cricket ball of mass 0.15 kg, moving at 20 m/s, is struck by a bat and rebounds along the same straight line at 25 m/s in the opposite direction. The bat remains in contact with the ball for 0.01 s. (a) Calculate the change in momentum of the ball. (b) Calculate the impulse imparted to the ball by the bat. (c) Calculate the average force exerted by the bat on the ball. (d) State Newton's third law of motion and identify the reaction force in this situation. *[5]*

OR

Two cyclists A and B start from the same point at the same time and move in the same direction along a straight road. Cyclist A moves at a constant velocity of 6 m/s throughout. Cyclist B starts from rest and accelerates uniformly at 1.5 m/s². (a) Write the expression for the distance covered by each cyclist after time t. (b) Find the time at which cyclist B catches up with cyclist A. (c) Find the distance from the starting point at which B catches up with A. (d) Who is ahead during the first few seconds, and why?

Marking Scheme / Value Points:

- (a) Taking the ball's initial direction as positive: initial momentum = $0.15 \times 20 = 3$ kg m/s; final momentum = $0.15 \times (-25) = -3.75$ kg m/s; change in momentum = $-3.75 - 3 = -6.75$ kg m/s (magnitude 6.75 kg m/s) — 1.5 marks
- (b) Impulse = change in momentum = 6.75 kg m/s, directed away from the bat (in the ball's final direction of motion) — 1 mark
- (c) Average force = impulse/time = 6.75/0.01 = 675 N — 1.5 marks
- (d) For every action, there is an equal and opposite reaction; here, the reaction force is the force exerted by the ball on the bat, equal in magnitude (675 N) but opposite in direction to the force of the bat on the ball — 1 mark

OR (value points):

- (a) Distance covered by A: sA = 6t; Distance covered by B: sB = ½ × 1.5 × t² = 0.75t² — 1 mark
- (b) B catches up when sA = sB: 6t = 0.75t² ⇒ 6 = 0.75t (dividing by t, t ≠ 0) ⇒ t = 8 s — 1.5 marks
- (c) Distance = 6 × 8 = 48 m (check: 0.75 × 8² = 48 m) — 1.5 marks
- (d) Cyclist A is ahead during the first few seconds, because A already has a constant, non-zero velocity from t = 0, whereas B starts from rest and needs time to build up speed before catching up — 1 mark

35. A machine is used to raise a load of 500 N to a height of 4 m by applying an effort of 125 N through a distance of 20 m along an inclined plane. (a) Calculate the work output (useful work done on the load). (b) Calculate the work input (work done by the effort). (c) Calculate the efficiency of the machine. (d) Explain briefly why the efficiency of a real machine is always less than 100%. *[5]*

OR

A weightlifter lifts an 80 kg barbell from the ground to a height of 2 m in 2 seconds, holds it stationary there for 3 seconds, then lowers it back to the ground in 2 seconds. Taking g = 10 m/s², calculate: (a) the work done in lifting the barbell. (b) the power developed while lifting. (c) the work done while holding it stationary for 3 seconds. (d) the work done (with sign) while lowering the barbell back down, taking upward lifting as positive work, with a brief explanation.

Marking Scheme / Value Points:

- (a) Work output = Load × height raised = 500 × 4 = 2000 J — 1 mark
- (b) Work input = Effort × distance moved by effort = 125 × 20 = 2500 J — 1 mark
- (c) Efficiency = (work output/work input) × 100 = (2000/2500) × 100 = 80% — 1.5 marks
- (d) In any real machine, some of the input energy is used up in overcoming friction and other resistances and is converted to heat/sound rather than useful work, so the useful output is always somewhat less than the input — 1.5 marks

OR (value points):

- (a) W = mgh = 80 × 10 × 2 = 1600 J — 1 mark
- (b) P = W/t = 1600/2 = 800 W — 1 mark
- (c) Work done = 0 J, since there is no displacement of the barbell while it is held stationary — 1.5 marks
- (d) Work done while lowering = −1600 J; the force applied by the weightlifter still acts upward (to control the descent) while the displacement is downward, so the force and displacement are in opposite directions, making the work done by the weightlifter negative — 1.5 marks

36. A student examines a permanent slide of the cross-section of a leaf under a microscope. She observes: an upper and lower single-layered covering with tiny pores; a layer of closely packed, column-shaped green cells just beneath the upper covering; a layer of loosely arranged green cells with air spaces beneath that; and vein-like structures running through the middle. (a) Identify the outer covering layer and the pores present in it, and state one function of the pores. (b) Identify the closely packed, column-shaped cell layer and state its main function. (c) Identify the loosely packed layer with air spaces, and explain how its structure suits gas exchange. (d) Identify the vein-like structures, and name the two types of conducting tissue found within them. *[5]*

OR

A researcher treats two identical samples of onion peel cells under a microscope: Sample 1 with a strong sugar solution, and Sample 2 with distilled water. (a) Describe and explain the change observed in Sample 1. (b) Describe and explain the change observed in Sample 2. (c) Name the process responsible for both observations, and define it in terms of water movement across a membrane. (d) Explain why this process is important in helping a plant's stems and leaves stay firm/upright.

Marking Scheme / Value Points:

- (a) Epidermis; the pores are stomata; they allow gaseous exchange (CO_2 in, O_2 out during photosynthesis) and the loss of water vapour (transpiration) — 1.5 marks
- (b) Palisade mesophyll (palisade parenchyma); its main function is photosynthesis, as it contains the most chloroplasts and cells are closely packed for maximum light absorption — 1 mark
- (c) Spongy mesophyll; the loosely arranged cells leave large interconnected air spaces, allowing gases (CO_2, O_2, water vapour) to diffuse easily between the stomata and the photosynthesising cells — 1.5 marks
- (d) Vascular bundles (veins); xylem (transports water and minerals) and phloem (transports food) — 1 mark

OR (value points):

- (a) The cells shrink and the cell membrane pulls away from the cell wall — plasmolysis; this happens because the surrounding sugar solution has a lower water concentration (hypertonic) than the cell sap, so water moves out of the cells by osmosis — 1.5 marks
- (b) The cells swell and become turgid, because distilled water has a higher water concentration (hypotonic) than the cell sap, so water moves into the cells; the cell wall prevents the cell from bursting — 1 mark
- (c) Osmosis — the movement of water molecules from a region of higher water concentration to a region of lower water concentration through a semi-permeable membrane — 1 mark
- (d) Water entering plant cells by osmosis builds up turgor pressure against the cell wall, keeping the cells firm/turgid; this turgidity provides support to non-woody parts such as stems and leaves, and its loss causes wilting — 1.5 marks

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]

In a biology lab, students prepare a temporary mount of onion peel, staining it with iodine solution, and observe it under a compound microscope. They also observe a prepared, stained slide of human cheek cells for comparison.

(i) Why is a stain such as iodine solution or methylene blue used while preparing a temporary mount for microscopic observation? *[1]*

Answer: Stains improve the contrast of otherwise nearly transparent cell structures (such as the nucleus and cytoplasm), making them clearly visible under the microscope.

(ii) State two structural differences the students would observe between the onion peel cells and the human cheek cells. *[1]*

Answer: Onion peel cells show a distinct, rigid cell wall and a regular, brick-like/rectangular shape, and often a large vacuole; cheek cells lack a cell wall, appear irregular/flattened in shape, and show no large visible vacuole.

(iii) Both cell types show a dense, rounded, deeply stained structure. Name this structure and state its main function. *[1]*

Answer: Nucleus; it controls the cell's activities and contains the genetic material (DNA) that carries hereditary information.

(iv) Explain briefly why the discovery of the cell, and the later formulation of the cell theory (that all organisms are made of cells and that cells arise only from pre-existing cells), is considered a major milestone in biology. *[1]*

OR Both onion peel cells and cheek cells are eukaryotic. State one feature that would distinguish either of them from a bacterial (prokaryotic) cell.

Answer: It showed that, despite the enormous diversity of living organisms, all of them are fundamentally built from and function through the same basic structural and functional unit — the cell — unifying the study of life and laying the foundation for later advances in genetics, physiology and medicine.

OR Answer: Eukaryotic cells (onion/cheek) have a true, membrane-bound nucleus and membrane-bound organelles, while bacterial (prokaryotic) cells lack a nuclear membrane and membrane-bound organelles.

Case Study 2 — Question 38 [4 Marks]

A dairy cooperative receives raw milk that sometimes carries dust or dirt collected during milking, so it is passed through a fine cloth strainer before processing. To train new lab technicians in classifying mixtures, the cooperative also has them compare milk (itself a mixture) with a sugar solution and a chalk-water mixture.

(i) Name the process used to remove visible dirt/dust particles from raw milk using a cloth strainer. *[1]*

Answer: Filtration (straining).

(ii) Milk is classified as a colloid rather than a true solution or a suspension. State one property of milk that supports this classification. *[1]*

Answer: Milk shows the Tyndall effect (it scatters a beam of light passed through it) and its particles do not settle on standing, unlike a suspension — yet it looks opaque/is not perfectly clear like a true solution, since its particles are larger than those in a true solution.

(iii) A chalk-water mixture settles at the bottom on standing, unlike milk. Identify the type of mixture chalk-water represents, and name the process by which the settled chalk can be separated from the water above it. *[1]*

Answer: Suspension; decantation (carefully pouring off the clear water) or filtration.

(iv) When a beam of light is passed through sugar solution, milk, and the chalk-water mixture in a dark room, each behaves differently. Describe what would be observed in each case, relating it to the particle size in each mixture. *[1]*

OR Suggest one everyday example, seen in nature or daily life, of the Tyndall effect that milk exhibits.

Answer: Sugar solution: the light passes through without any visible scattering (its path is not seen), since the dissolved particles are extremely small (true solution). Milk: the path of the light beam becomes clearly visible as a scattered, glowing cone (Tyndall effect), since colloidal particles are intermediate in size. Chalk-water: the large, often-settling particles scatter/block light irregularly and the mixture appears cloudy/opaque, since suspension particles are comparatively large.

OR Answer: Example: sunlight becoming visible as a scattered beam when it passes through dust or fog particles in the air, or headlight beams becoming visible through fog — both natural examples of the Tyndall effect.

Case Study 3 — Question 39 [4 Marks]

During a school sports day, a 50 kg athlete runs up a staircase of vertical height 6 m in 5 seconds during a 'stair-climb' event. Later, on the playground, the same athlete balances a see-saw (a simple lever) with a younger, lighter child, and the sports teacher uses both events to explain work, energy and simple machines.

(i) Define power, and state its SI unit. *[1]*

Answer: Power is the rate of doing work (or the rate of transfer of energy); its SI unit is the watt (W).

(ii) Calculate the work done by the athlete against gravity while climbing the staircase. (Take g = 10 m/s².) *[1]*

Answer: W = mgh = 50 × 10 × 6 = 3000 J.

(iii) Calculate the power developed by the athlete during the climb. *[1]*

Answer: P = W/t = 3000/5 = 600 W.

(iv) On the see-saw, the heavier athlete sits closer to the pivot than the lighter child, in order to balance it. Using the principle of moments for a lever, explain why sitting closer to the pivot allows a heavier person to balance a lighter person sitting farther away. *[1]*

OR If the athlete's weight is 500 N and she sits 1 m from the pivot, how far from the pivot, on the other side, should a child weighing 250 N sit to balance the see-saw?

Answer: For balance, the turning effect (moment = force × distance from the pivot) must be equal on both sides: (heavier weight) × (shorter distance) = (lighter weight) × (longer distance). Since the athlete's weight is larger, a smaller distance from the pivot still produces the same moment as the child's smaller weight acting at a larger distance, keeping the see-saw balanced.

OR Answer: Using load × load arm = effort × effort arm: 500 × 1 = 250 × d ⇒ d = 2 m. The child should sit 2 m from the pivot.