Biology Paper 1 Mark Scheme

Sample assessment 2026–27

Time allowed: 2 hours Total marks: 70

STAFF ONLY

Credit valid equivalent scientific responses where they meet the approved set-specific marking criteria. Reconcile every maximum mark to the candidate paper and answer booklet.

Section A · Multiple-choice questions

Award 1 mark for each correct answer.

Question	Correct answer
A1	B · New cells arise from existing cells.. Cell theory includes the origin of cells from pre-existing cells.
A2	C · A ribosome. Both cell types contain ribosomes for protein synthesis.
A3	A · Its ability to distinguish two close points as separate. Resolution concerns distinguishable detail, not image enlargement alone.
A4	D · The Golgi apparatus. The Golgi apparatus modifies and sorts proteins into vesicles.
A5	B · Its hydrophilic head. The polar head interacts with water; the non-polar tails face the bilayer interior.
A6	A · A receptor protein. A membrane receptor recognises an appropriate signal.
A7	C · Active transport. Active transport can move a solute against its gradient using energy.
A8	D · Exocytosis. Exocytosis releases vesicle contents outside the cell.
A9	A · Net movement of water from higher to lower water potential through a partially permeable membrane. Osmosis is a net movement of water down a water-potential gradient.
A10	B · S phase. DNA replication occurs in S phase before nuclear division.
A11	C · Sister chromatids separate.. Sister chromatids move towards opposite poles in anaphase.
A12	D · It can form cell types from all three embryonic germ layers.. Pluripotent cells have a broader differentiation potential than tissue-restricted multipotent cells.

Question	Correct answer
A13	B · Pepsin. Pepsin hydrolyses proteins in the acidic stomach environment.
A14	C · Villi and microvilli. Villi and microvilli increase the area of the absorptive surface.
A15	A · Coordinated contraction and relaxation of muscles in its wall. Muscular waves move the food bolus along the alimentary canal.
A16	D · The pulmonary vein. Pulmonary veins return oxygenated blood to the left atrium.
A17	B · The sinoatrial node. The sinoatrial node acts as the normal pacemaker.
A18	C · An increase in carbon dioxide concentration. The Bohr effect links increased carbon dioxide and reduced oxygen affinity.
A19	D · ×2,000. 48 mm = 48,000 µm; 48,000 / 24 = 2,000.
A20	A · 0.80 s. 60 / 75 = 0.80 seconds per beat.

Section B · Extended-response marking map

Question B1 · 10 marks

(a) 4 marks
1 mark: Ribosomes synthesise the polypeptide/protein.
1 mark: Rough endoplasmic reticulum receives and transports/folds the protein.
1 mark: The Golgi apparatus modifies and sorts/packages the protein.
1 mark: Secretory vesicles transport the protein to the cell surface and fuse with the membrane to release it.
Mapping: LO1; AO1 4

(b) 2 marks
1 mark: Converts 36 mm to 36,000 µm, or 3.0 µm to 0.0030 mm, and uses image size / actual size.
1 mark: Correct magnification ×12,000.
Mapping: LO1; AO2 2

(c) 2 marks
1 mark: Electrons have a shorter wavelength than visible light.
1 mark: This gives greater resolving power, allowing smaller/closer internal structures to be distinguished.
Mapping: LO1; AO1 2

(d) 2 marks
1 mark: Selecting only the largest objects biases the estimated mean upwards, or one image may not represent the tissue.
1 mark: Use a systematic/random selection of mitochondria across multiple representative cells/fields rather than choosing by size.
Mapping: LO1; AO3 2

Alternative valid responses / allocation: (a) One mark per organelle role; naming an organelle without its role is insufficient.
Award the final accuracy mark for the correct answer with the correct unit. Award the method mark only where sufficient relevant working is shown; a correct substitution followed by an arithmetic error earns the method mark. Magnification has no length unit.
(d) Credit a matched limitation and improvement; two unrelated criticisms do not earn the improvement mark.

Question B2 · 10 marks

(a) 2 marks
1 mark: Phospholipids form a bilayer.
1 mark: Hydrophilic heads face the aqueous environments and hydrophobic tails face inwards towards each other.
Mapping: LO3; AO1 2

(b) 2 marks
1 mark: Facilitated diffusion uses a membrane channel or carrier protein; simple diffusion passes through the lipid bilayer.
1 mark: Both are passive/down the relevant concentration gradient, but facilitated diffusion allows passage of substances that do not readily cross the lipid interior.
Mapping: LO4; AO1 2

(c) 2 marks
1 mark: Uses 100 × (2.20 − 2.50) / 2.50.
1 mark: Correct result −12.0% (a 12% loss).
Mapping: LO4; AO2 2

(d) 2 marks
1 mark: The external solution had lower/more negative water potential than the potato cells under these conditions.
1 mark: Water moved out by osmosis through partially permeable membranes, reducing tissue mass.
Mapping: LO4; AO2 2

(e) 2 marks
1 mark: Variation between tissue pieces cannot be distinguished from the concentration effect, or variability/anomalies cannot be assessed from one result.
1 mark: Use several separate comparable pieces per concentration and compare the mean with a measure of spread.
Mapping: LO4; AO3 2

Alternative valid responses / allocation: (b) Credit a clear comparative explanation. Do not credit a claim that facilitated diffusion requires ATP.
A correct signed result or explicit 12% loss with sufficient relevant working earns both marks. A correct magnitude without sign or direction earns one accuracy mark; do not award the method mark without working.
(e) Repeated weighing of the same piece alone does not provide independent tissue replication.

Question B3 · 10 marks

(a) 4 marks
1 mark: Chromosomes condense and/or the spindle forms.
1 mark: Chromosomes align at the equator, with sister chromatids attached towards opposite poles.
1 mark: Sister chromatids separate and move to opposite poles.
1 mark: New nuclear envelopes form around the two chromosome sets.
Mapping: LO5; AO1 4

(b) 2 marks
1 mark: Meiosis produces haploid rather than diploid nuclei/cells.
1 mark: Meiosis produces genetically varied rather than genetically identical products, or four rather than two products.
Mapping: LO5; AO1 2

(c) 2 marks
1 mark: Embryonic stem cells are pluripotent, whereas adult tissue stem cells usually have a more restricted/multipotent range.
1 mark: They could therefore generate a wider range of replacement cell types, including types not available from the adult source.
Mapping: LO6; AO2 2

(d) 2 marks
1 mark: Identifies a relevant concern, such as destruction/use of embryos or informed consent from embryo donors.
1 mark: Explains the competing interest or consequence, such as differing views of embryo moral status versus potential benefit, or the need for voluntary informed permission.
Mapping: LO6; AO3 2

Alternative valid responses / allocation: (a) One mark for each distinct correct event. DNA replication is not an event within mitosis; do not credit it here.
(b) One mark per distinct paired difference; allow nuclear products where cytokinesis varies.
(c) Credit a linked advantage; do not accept a claim that benefit or safe treatment is guaranteed.
(d) Credit reasoned positions for or against use. Two named concerns without explanation earn a maximum of one mark.

Question B4 · 10 marks

(a) 4 marks
1 mark: Amylase hydrolyses starch to maltose/shorter carbohydrates.
1 mark: Maltase hydrolyses maltose to glucose.
1 mark: Proteases hydrolyse proteins to shorter peptides.
1 mark: Peptidases hydrolyse peptides to amino acids.
Mapping: LO7; AO1 4

(b) 4 marks
1 mark: ATP is required by the sodium–potassium pump on the basolateral membrane.
1 mark: Reduced pumping allows intracellular sodium concentration to rise/reduces the sodium electrochemical gradient.
1 mark: Sodium entry from the lumen through the cotransporter is driven by this gradient.
1 mark: Less sodium-driven cotransport reduces glucose uptake into the epithelial cells.
Mapping: LO4, LO7; AO2 4

(c) 2 marks
1 mark: Calculates the amount taken up as 18.0 − 12.0 = 6.0 mg.
1 mark: Divides by 5.0 minutes to give 1.2 mg min^{-1}.
Mapping: LO7; AO2 2

Alternative valid responses / allocation: (a) Credit equivalent scientifically accurate stages. Do not credit bile as an enzyme.
(b) Credit the linked mechanism. Cotransport does not itself directly hydrolyse ATP. Do not require an exact ion stoichiometry.
(c) A correct result with units and sufficient relevant working earns both marks. A correct numerical result without units earns one mark; award no method mark without working.

Question B5 · 10 marks

(a) 4 marks
1 mark: During ventricular systole, ventricular pressure exceeds atrial pressure and atrioventricular valves close.
1 mark: When ventricular pressure exceeds arterial pressure, semilunar valves open and blood is ejected.
1 mark: As ventricles relax and their pressure falls below arterial pressure, semilunar valves close.
1 mark: When ventricular pressure falls below atrial pressure, atrioventricular valves open to allow ventricular filling.
Mapping: LO9; AO1 4

(b) 2 marks
1 mark: 120 × 85 = 10,200 $cm^3\ min^{-1}$.
1 mark: 10,200 / 1,000 = 10.2 $dm^3\ min^{-1}$.
Mapping: LO9; AO2 2

(c) 3 marks
1 mark: A dense capillary network provides a large exchange surface/short distance to cells.
1 mark: The capillary wall is thin/one endothelial cell thick, giving a short diffusion path.
1 mark: Blood flow replenishes oxygen while cellular use lowers tissue oxygen concentration, maintaining a diffusion gradient.
Mapping: LO8; AO2 3

(d) 1 mark
1 mark: A confounding factor such as training status could influence both, or observational association does not control alternative causes.
Mapping: LO8; AO3 1

Alternative valid responses / allocation: (a) Credit correct pressure-linked valve behaviour. Do not credit claims that valves contract actively.
A correct result with units and sufficient relevant working earns both marks. A correct product with a conversion error earns the method mark.
(c) Each mark requires the feature linked to exchange; do not award isolated terms with no relationship to oxygen delivery.
(d) Accept an equivalent valid causal limitation; small sample alone limits generalisation but does not explain confounding.

Marking principles

Award one mark for the single correct MCQ option; otherwise award zero. No negative marking. If an answer is clearly replaced, mark the final unambiguous choice.

For Section B, use the stated point allocations and specific calculation rules. Credit equivalent scientifically correct responses; do not double-credit a repeated point.

Where a later calculation uses an earlier incorrect value correctly, credit the independent subsequent method unless this makes the task trivial. Do not award the final accuracy mark for an incorrect result.

Do not penalise spelling unless meaning is unclear or a different scientific term is given. Assess scientific content rather than agreement with a preferred ethical position.

All raw marks, marker identities, moderation decisions and release approvals must be recorded through the controlled pack processes.

Section A item map (1 mark each): A1–A4 LO1/AO1; A5–A6 LO3/AO1; A7–A9 LO4/AO1; A10–A11 LO5/AO1; A12 LO6/AO1; A13 and A15 LO7/AO1; A14 LO7/AO1; A16 LO8/AO1; A17 LO9/AO1; A18 LO8/AO1; A19 LO1/AO2 (magnification calculation); A20 LO9/AO2 (cardiac-cycle calculation). Section A totals: AO1 18, AO2 2. Section B item mappings total AO1 24, AO2 19, AO3 7. Paper mapping: AO1 42, AO2 21, AO3 7; total 70.