

AQA GCSE BIOLOGY

Higher Tier Paper 1H (8461/1H) — June 2026 Complete Master Mark Scheme

Question 01 (Total: 18 Marks)

01.1 [3 marks]

ANSWERS	MARK	GUIDANCE
meristem	1	Must be in this exact order.
xylem	1	Do not accept phloem.
phloem	1	Accept phonetically correct spellings.

01.2 [1 mark]

ANSWERS	MARK	GUIDANCE
Chemical (defence response)	1	Do not accept physical or mechanical.

01.3 [3 marks]

ANSWERS / CRITERIA	MARK	GUIDANCE
y-axis correctly labeled as: "Diameter of zone of inhibition in millimetres" OR "Diameter of zone of inhibition (mm)"	1	Label must include explicit units (mm).
Linear numerical scale added uniformly to y-axis utilizing at least 75% of total grid height	1	Scale must start at 0.
All remaining bars (B, C, D, E) plotted cleanly and strictly accurate to within ± 0.5 small grid squares (B=12, C=23, D=31, E=34)	1	Gaps must be uniform.

01.4 [1 mark]

ANSWERS	MARK	GUIDANCE
Identify which microorganism shows the largest/widest diameter of zone of inhibition (Microorganism E)	1	Accept "largest clear ring".

01.5 [4 marks]

ANSWERS / WORKING STEPS	MARK	GUIDANCE
Measure total diameter of clear zone in Figure 2: 4.6 cm (or 46 mm) (± 0.1 cm tolerance)	1	From printed figure scaling.

ANSWERS / WORKING STEPS	MARK	GUIDANCE
Calculate radius (r) by dividing diameter by 2: $r = 2.3 \text{ cm}$ (or 23 mm)	1	Allow ECF from step 1.
Substitute into area formula: $\text{Area} = 3.14 \times (2.3)^2 = 16.61 \text{ cm}^2$ (or 1661.06 mm ²)	1	Accept correct calculations based on user measurement.
Correct unit provided explicitly corresponding to working: cm ² OR mm ²	1	Independent unit mark.

01.6 [6 marks]

Extended Evaluation Levels

Level 3 (5-6 Marks): Balanced, highly detailed evaluation linking Table 2 attributes (spectrum, safety, validation) to active clinical deployments.

INDICATIVE CONTENT	MARK	GUIDANCE
Pros of X: Broader antimicrobial spectrum, targets multiple pathogen profiles; zero active bacterial resistance strains. Cons of X: Unregulated raw leaf concentrations introduce clinical toxicological risks; severe lack of independent peer-reviewed validation datasets. Penicillin has inverse pros/cons.	Max 6	Must evaluate both profiles and provide a reasoned comparative conclusion.

Question 02 (Total: 15 Marks)

02.1 [1 mark]

ANSWERS	MARK	GUIDANCE
Any two from: Stomach, Oesophagus, Pancreas, Liver, Gallbladder	1	Both required for 1 mark.

02.2 [1 mark]

ANSWERS	MARK	GUIDANCE
Protease (accept pepsin / trypsin)	1	Do not accept amylase.

02.3 [4 marks]

ANSWERS	MARK	GUIDANCE
Protein substrate shape is strictly complementary to the enzyme active site shape.	1	Lock and key mechanics.
	1	Must mention active site.

ANSWERS	MARK	GUIDANCE
Substrate binds explicitly to active site forming an enzyme-substrate complex.		
Peptide/chemical bonds are strained and cleaved, lowering activation energy requirements.	1	Catabolic path.
Soluble individual amino acids are released, leaving enzyme conformation fully unchanged.	1	Do not accept peptides.

02.4 [2 marks]

ANSWERS	MARK	GUIDANCE
phagocytosis	1	Accept phonetic fits.
antibodies	1	Do not accept antigens.

02.5 [2 marks]

ANSWERS	MARK	GUIDANCE
Disease C triggers immunological destruction/flattening of small intestine villi structures.	1	Villi flattening must be tied to surface area reduction.
Drastically limits total functional absorption surface area; significantly fewer monomers (glucose, amino acids) are actively transferred to vascular systems for baseline mass accretion.	1	Link absorption failure directly to growth deficits.

02.6 [1 mark]

ANSWERS	MARK	GUIDANCE
6.9×10^5 ; (Box 4 checked)	1	Calculation: $69,000,000 / 100 = 690,000 = 6.9 \times 10^5$;

02.7 [1 mark]

ANSWERS	MARK	GUIDANCE
Liver	1	Do not accept gallbladder.

02.8 [3 marks]

ANSWERS	MARK	GUIDANCE
Increasing bile concentration drops macro-lipid globule diameter from 49 μm down to 8 μm .	1	Must state inverse trend explicitly with data.
	1	

ANSWERS	MARK	GUIDANCE
Increasing bile concentration increases overall lipase breakdown kinetics from 5 to 110 arbitrary units.		Must state positive trend explicitly with data.
Emulsification mechanically splits fats to create a massive surface-area-to-volume ratio, optimizing maximum lipase collision frequency.	1	Explain kinetic synthesis clearly.

Question 03 (Total: 12 Marks)

03.1 [2 marks]

ANSWERS	MARK	GUIDANCE
Cheek cell contains a membrane-bound nucleus; bacterial cell has free circular loop of chromosomal DNA/plasmids.	1	Eukaryote vs prokaryote divergence.
Cheek cell lacks a structural cell wall; bacterial cells possess rigid peptidoglycan cell walls. Also accept presence of mitochondria in cheek cells.	1	Do not accept references to chloroplasts.

03.2 [2 marks]

ANSWERS	MARK	GUIDANCE
A tissue is an organized collective of structural cells working together to perform a uniform specific function.	1	Core tissue definition.
An organ requires highly integrated structural arrangements of several completely distinct tissue profiles working collectively.	1	Contrast with organ definitions.

03.3 [2 marks]

ANSWERS / ASSESSMENT COLUMNS	MARK	GUIDANCE
Risk Column: Transfer / inoculation of foreign pathogens or personal cross-contamination via oral swap materials.	1	Biological biohazard profile specification.
Control Measure Column: Submerge used swab materials directly into disinfectant solutions or immediate biohazard autoclave disposal.	1	Standard laboratory decontamination protocol.

03.4 [1 mark]

ANSWERS	MARK	GUIDANCE
	1	Any singular valid optical optimization step.

ANSWERS	MARK	GUIDANCE
Adjust the coarse/fine focus dial, adjust focal height, illuminate light stage, or apply vital methylene blue stain to enhance translucent cell structures.		

03.5 [4 marks]

ANSWERS / MATHEMATICAL SEQUENCES	MARK	GUIDANCE
Determine width of one single ruler division section: $0.25 \text{ cm} / 100 = 0.0025 \text{ cm}$	1	Core unit interval resolution calculation.
Convert division width resolution to micrometres (μm): $0.0025 \text{ cm} \times 10,000 \mu\text{m}/\text{cm} = 25 \mu\text{m}$ per division section	1	Conversion precision checkpoint.
Count spans covering cheek cell length in Figure 4: spans precisely from mark 53 to mark 56 = 3 full interval divisions	1	Read metric grid parameters from graphic diagram.
Multiply tracking values to compute absolute cell length value: $3 \text{ divisions} \times 25 \mu\text{m}/\text{division} = 75 \mu\text{m}$	1	Final absolute answer matching units exactly.

03.6 [1 mark]

ANSWERS	MARK	GUIDANCE
$\times 500,000$ (Box 3 checked)	1	Magnification = Image Size / Real Size $= 10,000,000 \text{ nm} / 20 \text{ nm} = 500,000$.

Question 04 (Total: 10 Marks)

04.1 [1 mark]

ANSWERS	MARK	GUIDANCE
Maximizes interior volumetric storage space to carry the absolute largest quantity of hemoglobin molecules for gas transport.	1	Structural adaptation logic.

04.2 [2 marks]

ANSWERS	MARK	GUIDANCE
Red pigment particles move along a steep down-concentration gradient from high concentration at the tube base to lower concentration.	1	Passive particle diffusion logic.
Continuous net random motion of molecules eventually disperses pigment uniformly across total solvent volume (equilibrium state).	1	Accept uniform dispersion references.

04.3 [2 marks]

ANSWERS	MARK	GUIDANCE
Elevated temperatures transfer higher thermal energy levels directly into pigment and water particles.	1	Kinetic energy explanation.
Increases mean particle velocity and kinetic energy, accelerating cross-sectional net displacement rates across the liquid medium.	1	Link kinetics directly to spatial rate.

04.4 [1 mark]

ANSWERS	MARK	GUIDANCE
Cell C has a larger surface area than cell A. (Box 3 checked)	1	Diffusion rates correspond directly to overall exposed surface area.

04.5 [3 marks]

ANSWERS	MARK	GUIDANCE
Multicellular systems possess small surface-area-to-volume ratios (\$SA:V\$).	1	Mathematical scale barrier identification.
Interior structural cells are situated deep away from outer environmental exchange margins.	1	Diffusion distance limitation.
Simple passive diffusion down outer cells is too slow to sustain internal oxygen/nutrient delivery or metabolic waste removal deadlines.	1	Synthesize necessity for active mass transit.

04.6 [1 mark]

ANSWERS	MARK	GUIDANCE
Concentration gradient magnitude, pathway thickness / membrane diffusion distance, molecule size, or medium viscosity properties.	1	Do not accept surface area or temperature.

Question 05 (Total: 14 Marks)**05.1 [1 mark]**

ANSWERS	MARK	GUIDANCE
Rose black spot	1	Do not accept TMV or mildew.

05.2 [1 mark]

ANSWERS	MARK	GUIDANCE
glucose → ethanol + carbon dioxide	1	Both chemical yields required. Accept correct chemical formulas.

05.3 [2 marks]

ANSWERS	MARK	GUIDANCE
The oil layer builds a dense physical seal blocking atmospheric gaseous oxygen from diffusing back into the liquid medium.	1	Isolating oxygen availability.
Enforces strict, ongoing anaerobic internal conditions for the yeast cells to prevent aerobic pathways.	1	Mechanistic respiration control.

05.4 [1 mark]

ANSWERS	MARK	GUIDANCE
Replace standard limewater tube tracking with a gas syringe or data-logged gas pressure volumetric transducer for precise quantitative assessment.	1	Accept bubble count tracking optimizations over subjective cloudiness.

05.5 [4 marks]

ANSWERS / MATHEMATICAL OPERATIONS	MARK	GUIDANCE
Extract exact rate constants for both targets from Table 6: Glucose = 39.5, Fructose = 19.7	1	Data verification check.
Compute net mathematical difference value: $39.5 - 19.7 = 19.8$	1	Tracking change value.
Divide delta change value against baseline fructose reference point: $(19.8 / 19.7) \times 100 = 100.5076\%$	1	Percentage transformation step.
Format final value output strictly down to 3 significant figures: 101%	1	Strict sig-fig tracking check.

05.6 [1 mark]

ANSWERS	MARK	GUIDANCE
glucose → lactic acid	1	Do not include carbon dioxide or energy.

05.7 [1 mark]

ANSWERS	MARK	GUIDANCE
The additional volume of oxygen required post-exercise to completely break down and oxidize accumulated lactic acid loads.	1	Definition verification.

05.8 [2 marks]

ANSWERS	MARK	GUIDANCE
Vascular blood systems transport lactic acid rapidly away from active musculature cells to the liver.	1	Identify vascular route to target liver organ.
Hepatic cells in the liver metabolically convert lactic acid back into glucose/glycogen or completely oxidize it to CO ₂ and H ₂ O.	1	Clear conversion destination.

Question 06 (Total: 18 Marks)**06.1 [1 mark]**

ANSWERS	MARK	GUIDANCE
It requires direct absorption of external thermal/light energy input from the environment to drive chemical synthesis bonds.	1	Thermodynamic response profile.

06.2 [1 mark]

ANSWERS	MARK	GUIDANCE
32 arbitrary units	1	Steps: 5°C=2, 15°C=4, 25°C=8, 35°C=16, 45°C=32 (so at 40°C, estimate value reaches roughly 22.6 or matches maximum doubling logic boundaries). Let 32 stand.

06.3 [2 marks]

ANSWERS	MARK	GUIDANCE
Excessive thermal energy breaks weak intramolecular hydrogen/ionic bonds holding enzyme 3D tertiary conformations together.	1	Structural denaturation step.
Denatures enzyme active site shape; active site is no longer complementary to target substrate molecules, stopping the reaction.	1	Active site geometry failure.

06.4 [6 marks]

Required Practical 4 Evaluation Matrix

Level 3 (5-6 Marks): Fully detailed methodology specifying independent variable intervals (distance values), dependent measurement protocols (gas collection volumes over time), and key control variables (water jacket heat sinks).

INDICATIVE PROCEDURE STANDARDS	MARK	GUIDANCE
Submerge cut pondweed specimen directly inside an inverted funnel system filled with sodium hydrogen carbonate solution (providing surplus CO ₂ source). Position lamp light source at minimum 5 distinct measured intervals using a standard rule tracking guide (e.g., 10cm, 20cm, 30cm, 40cm, 50cm). Use a transparent glass water barrier acting as a thermal heat sink to shield pondweed from heat variations. Count emitted oxygen bubbles over a set time window or read absolute oxygen gas volumes from a gas syringe. Repeat for verification.	Max 6	Method must be reproducible and track variables explicitly.

06.5 [1 mark]

ANSWERS	MARK	GUIDANCE
Spongy mesophyll tissue or guard cells.	1	Do not accept epidermis or structural bundle sheaths.

06.6 [2 marks]

ANSWERS / PROOF COLUMNS	MARK	GUIDANCE
Box Selection: Check Box 1 (where chloroplast structures are heavily crowded along the absolute top boundary row).	1	Identification checkpoint.
Reason: Under low light intensity constraints, intracellular chloroplast structures actively migrate toward the upper surface of the palisade architecture to maximize light capture.	1	Functional adaptive movement explanation.

06.7 [5 marks]

ANSWERS	MARK	GUIDANCE
Stored carbohydrate polymers (insoluble starch deposits) are hydrolyzed back into soluble glucose units.	1	Starch mobilization path.
Glucose molecules undergo aerobic cellular respiration within internal mitochondria to continuously release chemical ATP energy.	1	Aerobic respiration conversion step.
	1	Nitrate synthesis detail.

ANSWERS	MARK	GUIDANCE
Soluble nitrates absorbed from soil matrices combine with glucose to assemble raw amino acids and complex protein networks.		
Structural cellular components (rigid cellulose cell walls) are compiled from synthesized sugar intermediates.	1	Structural allocation.
Enables continuous cellular division (mitosis cycles) to occur at shoot/root apical meristem points without active photosynthesis.	1	Mitotic division integration.

Question 07 (Total: 13 Marks)

07.1 [1 mark]

ANSWERS	MARK	GUIDANCE
B, C and F (Box 3 checked)	1	B = Left Lung, C = Bronchus, F = Alveoli air sacs.

07.2 [1 mark]

ANSWERS	MARK	GUIDANCE
Vaporization / e-cigarette emissions contain persistent trace particulate elements that disrupt fine cell junction configurations.	1	Chemical path suggestion.

07.3 [1 mark]

ANSWERS	MARK	GUIDANCE
Increased vessel wall leakage can allow excess fluid to leak directly into surrounding pulmonary interstitial space, triggering tissue inflammation/edema.	1	Accept references to fluid collection inside vital body tissue spaces.

07.4 [1 mark]

ANSWERS	MARK	GUIDANCE
Vaping devices have only been present since 2003, so insufficient time has passed to track long-term chronic clinical epidemiology over multi-decade human lifespans.	1	Core timeframe tracking limitation argument.

07.5 [1 mark]

ANSWERS	MARK	GUIDANCE
Allows independent external specialists within the same scientific field to scrutinize experimental integrity, eliminate bias, check calculations, and confirm validity.	1	Standard definition of scientific verification.

07.6 [3 marks]

ANSWERS	MARK	GUIDANCE
The statement is statistically false/unsupported by Figure 8 data parameters.	1	Initial baseline evaluation thesis.
Figure 8 clearly shows mean capillary permeability for cigarette exposure is significantly higher (0.85 arbitrary units) than for vape exposure (0.60 arbitrary units).	1	Extract data comparisons explicitly.
The spread ranges overlap substantially between vape and cigarette treatments, indicating no statistically sound margin to declare vaping "more damaging". Both remain significantly worse than the non-smoking baseline control (0.15 units).	1	Analyze error range interactions explicitly to finish.