

FORM 4 BIOLOGY
MID TERM 2 EXAM 2026
MARKING SCHEME

SECTION A (40 MARKS)

Question 1 (8 marks)

The diagram below shows a plant cell as seen under an electron microscope.

(a) Name the structures labeled A, B, C and D. (4 marks)

Label	Structure Name
A	Nucleus
B	Mitochondrion
C	Chloroplast
D	Vacuole

(b) Name the structure that would NOT be found in an animal cell. (1 mark)

Answer: Chloroplast / Vacuole (large/true vacuole)

- Award 1 mark for any correct answer

(c) State the function of the structure named in (b) above. (3 marks)

- If answer is Chloroplast:
 - Photosynthesis/Making food/Producing glucose/Making energy (1 mark)
 - In the presence of light (1 mark)
 - Contains chlorophyll which traps/absorbs light energy (1 mark)
- If answer is Vacuole:
 - Storage of cell sap/water/solutes (1 mark)
 - Maintains turgor/keeps cell rigid (1 mark)
 - Maintains osmotic pressure/regulation of water balance (1 mark)

Question 2 (8 marks)

The diagram shows a mitochondrion as seen under an electron microscope.

(a) Label the parts marked 1 and 2. (2 marks)

Number	Structure
1	Outer membrane/Cristae/Inner membrane
2	Matrix

(b) State two ways in which a mitochondrion is adapted for respiration. (2 marks)

- Has folded inner membranes/cristae that increase surface area for the production of ATP/location of electron transport chain (1 mark)
- Contains enzymes for aerobic respiration in the matrix/on the inner membranes (1 mark)

(c) Explain the relationship between the structure of a mitochondrion and its function. (4 marks)

- Folded inner membranes/cristae increase surface area (1 mark)
- Large surface area increases sites for attachment of enzymes/ATP synthase (1 mark)
- More ATP is produced during aerobic respiration (1 mark)
- This allows cells with high energy demands to function effectively (1 mark)

Question 3 (8 marks)

Below is a diagram of a transverse section of a leaf blade.

(a) Name the tissues labeled X, Y and Z. (3 marks)

Label	Tissue
X	Spongy tissue/Spongy mesophyll (1 mark)
Y	Palisade tissue/Palisade mesophyll (1 mark)
Z	Lower epidermis/Epidermis (1 mark)

(b) Identify two adaptations of the tissue labeled Y for photosynthesis. (2 marks)

- Contains many chloroplasts for photosynthesis/high chlorophyll content (1 mark)
- Tightly packed cells increase number of chloroplasts per unit area (1 mark)

(c) What is the function of the structure labeled Z? (3 marks)

- Protection of leaf tissues (1 mark)
- Prevents water loss from the leaf (1 mark)
- Contains stomata for gas exchange/allows CO₂ entry and O₂ exit (1 mark)

Question 4 (8 marks)

An experiment was carried out to investigate the effect of enzyme concentration on the rate of enzyme activity.

(a) Explain why increasing enzyme concentration increases the rate of enzyme activity. (3 marks)

- More enzyme molecules are available (1 mark)
- More active sites are available to bind with substrate molecules (1 mark)
- More enzyme-substrate complexes are formed per unit time, increasing product formation (1 mark)

(b) What would happen to the rate if enzyme concentration was increased beyond 50%? Give a reason. (2 marks)

- Rate would remain constant/plateau/decrease (1 mark)
- All substrate molecules are already bound to enzyme active sites/substrate becomes limiting (1 mark)

(c) Name one other factor that affects enzyme activity. (1 mark)

- Temperature / pH / Presence of inhibitors / Cofactors / Coenzymes (Any one) (1 mark)

(d) State the meaning of the term "enzyme". (2 marks)

- Biological catalyst made of protein (1 mark)
- That speeds up biochemical reactions without being used up/consumed (1 mark)

Question 5 (8 marks)

The diagram below shows a reflex arc.

(a) Identify the parts labeled A, B, C, D and E. (5 marks)

Label	Structure
A	Receptor (1 mark)
B	Sensory neuron/Afferent neuron (1 mark)
C	Synapse/Relay neuron (1 mark)
D	Motor neuron/Efferent neuron (1 mark)
E	Effector/Muscle (1 mark)

(b) State one advantage of reflex arcs. (3 marks)

- Reflex actions are automatic/do not require conscious control (1 mark)

SECTION B (40 MARKS)

Question 6: Photosynthesis (10 marks)

The diagram below shows a chloroplast.

(a) Name the structures labeled 1, 2 and 3. (3 marks)

Number	Structure
1	Thylakoid/Granum/Grana (1 mark)
2	Granum/Grana/Stack of thylakoids (1 mark)
3	Stroma (1 mark)

(b) In which structure does the light-dependent reaction occur? (1 mark)

- Thylakoid/Granum/Grana (1 mark)

(c) Explain how the structure labeled 2 is adapted for photosynthesis. (4 marks)

- Stacked arrangement/multiple grana increase surface area (1 mark)
- Large surface area for absorption of light by chlorophyll molecules (1 mark)

(d) Name the products of the light-independent reaction. (2 marks)

- Glucose/Carbohydrates/Sugars (1 mark)
- Accept: Glyceraldehyde-3-phosphate/G3P/glycerol-3-phosphate (1 mark)

Question 7: Reproduction (10 marks)

The diagram below shows a vertical section through a flower.

(a) Identify the parts labeled A, B, C and D. (4 marks)

Label	Part
A	Anther (1 mark)
B	Stigma (1 mark)
C	Style (1 mark)

D	Ovary (1 mark)
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(b) Which part produces male gametes? (1 mark)

- Anther/Pollen sacs (1 mark)

(c) Describe the process of double fertilization in flowering plants. (5 marks)

- Pollen grain lands on the stigma (1 mark)
- Pollen tube grows through the style to reach the ovule (1 mark)
- First fusion: Male gamete fuses with egg cell/ovum to form zygote (1 mark)
- Second fusion: Second male gamete fuses with polar nuclei to form endosperm nucleus (1 mark)
- Zygote develops into embryo and endosperm nucleus develops into endosperm (1 mark)

Question 8: Excretion (10 marks)

(a) Define excretion. (2 marks)

- The removal of metabolic waste products from the body (1 mark)
- Products of metabolic processes not required by the organism (1 mark)

(b) Name three substances excreted and the organ responsible. (6 marks)

Substance	Organ	Marks
Urea/Urine	Kidneys	1 mark
Carbon dioxide	Lungs	1 mark
Sweat	Skin	1 mark

- (Accept any three correct answers)

(c) Explain why plants produce less nitrogenous waste. (2 marks)

- Plants use proteins mainly for growth, not energy (1 mark)
- Animals break down proteins for energy, producing more nitrogenous waste (1 mark)

Question 9: Respiration (10 marks)

(a) Distinguish between aerobic and anaerobic respiration. (4 marks)

Aspect	Aerobic	Anaerobic
Oxygen requirement	Requires oxygen	No oxygen needed
Energy produced	Large amount (38 ATP)	Small amount (2 ATP)

- Award 1 mark for each correct distinction

(b) Write the word equation for anaerobic respiration in yeast. (2 marks)

- Glucose → Ethanol + Carbon dioxide + Energy/ATP (2 marks)

(c) Explain why the RQ of a plant using carbohydrates and fats differs. (4 marks)

- RQ for carbohydrates = 1.0 (CO₂ released = O₂ consumed) (1 mark)
- RQ for fats = 0.7 (less CO₂ released per molecule of O₂ consumed) (1 mark)

