BIOLOGY FORM 4

MID TERM 1 2026

MARKING SCHEME

1. Branches of Biology
   - (a) Cytology: Study of cells.
   - (b) Entomology: Study of insects.
2. Kingdom Monera Characteristics (Any 2 x 1 = 2 marks)
   - Prokaryotic (lack nuclear membrane).
   - 70S ribosomes.
   - Circular DNA (naked).
   - Asexual reproduction (binary fission).
   - Cell wall made of peptidoglycan/murein.
3. Niche Explanation (1 mark)
   - Competitive Exclusion Principle: If two species occupy the same niche, they will compete for resources; the better adapted species survives while the other is eliminated.
4. Functions of Aerenchyma (2 marks)
   - Provides buoyancy to hydrophytes.
   - Stores gases/oxygen for gaseous exchange/respiration.
5. Cell Diagram
   - (a) Nature of solution: Hypertonic. (1 mark)
   - (b) Force X: Turgor Pressure. Develops when vacuole absorbs water, pushing cytoplasm against cell wall. (2 marks)
6. Organelles
   - (a) Liver cell: Mitochondria or Lysosomes.
   - (b) Palisade cell: Chloroplasts.
7. Scientific Names
   - (a) Latin: It is a dead language (unchanging/universal).
   - (b) Canis: Genus.
   - (c) Most closely related: Leopard and Lion (*Panthera pardus* and *Panthera leo*) because they belong to the same genus.
8. Word Equation (Water -> Hydrogen + Oxygen)

- (a) Process: Photolysis of water. (1 mark)
- (b) Site: During the light stage of photosynthesis (in the chloroplast).
- (c) Conditions: Presence of light and Chlorophyll.

9. Heartbeat
   - (a) Importance: Creates pressure differences facilitating blood flow. (1 mark)
   - (b) Explanation: The heart has an intrinsic rhythm (myogenic nature) initiated by the pacemaker (Sino-atrial node). (1 mark)
10. Habitat vs Niche
    - Habitat: A specific place where an organism lives.
    - Niche: The role/profession of an organism in its habitat.
11. Cell Division
    - (a) Stage: Anaphase. (1 mark)
    - (b) Reasons: Chromatids separate at centromere; move to opposite poles.
    - (c) Significance: Ensures daughter cells receive equal chromosomes.
12. Causative Agents
    - (a) Typhoid: *Salmonella typhi*.
    - (b) Amoebic dysentery: *Entamoeba histolytica*.
13. Diagram (Heart)
    - Identify labeled parts A, B, X (e.g., Aorta, Vena Cava, Valves).
14. Insect Respiration
    - (a) Respiratory surface: Tracheal system / Tracheoles.
    - (b) Adaptations: Highly branched (reach all cells); Thin walls; Moist; Numerous (large SA).
15. Enzyme Graph
    - (a) Region B-C: Active sites are saturated/occupied by substrate. Substrate conc is no longer limiting factor.
    - (b) Increase rate after B: Increase enzyme concentration.
16. Terms
    - (a) Basal Metabolic Rate: Minimum rate of energy expenditure in a resting organism.
    - (b) Oxygen Debt: Amount of oxygen required to oxidize lactic acid accumulated during anaerobic respiration.
17. Reeds Experiment

- (a) Na^+ ions: Active transport (against gradient).
- Mg^{2+} ions: Diffusion (down gradient).
- (b) Reduced oxygen effect: Uptake of Sulphate ions would decrease/stop.
- Explanation: Sulphate uptake is active; requires energy (ATP) from respiration which needs oxygen.

18. Nephron Diagram
    - (a) Differences (P vs R): P (Glomerulus) has larger diameter/lumen than R (Efferent arteriole); P has lower pressure than R.
    - (b) Feature in Q: Podocytes.
19. Arteries vs Veins
    - Arteries: Thick muscular walls, narrow lumen, high pressure, no valves.
    - Veins: Thin walls, wide lumen, low pressure, have valves.
20. Experiment (Potometer)
    - (a) Process: Transpiration.
    - (b) Precaution: Cut shoot underwater. Reason: Prevent air bubbles (embolism).
    - (c) Temperature effect: Increased temp increases rate (bubble moves faster) due to faster evaporation.
21. Cell Size Calculation
    - Field of view = 4 mm = 4000 µm.
    - Cells = 8.
    - Size = 4000 / 8 = 500 µm.
22. Root Hair Adaptations
    - Long/thin extension (increase SA for absorption).
    - Large vacuole with concentrated sap (increase osmotic pressure).
    - Thin cell wall (easy passage).
23. High Humidity Effect
    - Reduces transpiration rate (decreases diffusion gradient between leaf and air).
24. Differences Aerobic vs Anaerobic
    - Aerobic: Requires Oxygen, produces CO_2 and H_2O, high energy (38 ATP), occurs in mitochondria/cytoplasm.
    - Anaerobic: No oxygen, produces CO_2/Ethanol/Lactic acid, low energy (2 ATP), occurs in cytoplasm.
25. Uses of Plant Excretory Products
    - (i) Tannin: Tanning leather, dyes.

- (ii) Colchicine: Inducing polyploidy, treating gout.
- (iii) Quinine: Treating malaria.

26. Leaf Adaptations for Gaseous Exchange (Any 3)
    - Broad lamina (large SA).
    - Thin lamina (short distance).
    - Stomata (pores).
    - Intercellular air spaces (circulation).
    - Spongy mesophyll.
27. Types of Asexual Reproduction
    - Binary fission, Budding, Spore formation, Vegetative propagation, Parthenogenesis.
28. Sources of Water Pollution
    - Sewage, Industrial effluents, Agricultural runoff, Oil spills, Soil erosion.
29. Blood Group Antigens
    - Antigen A and Antigen B.
30. Ileum Functions
    - Action of pepsin stops: Alkaline environment (pH ~8) of duodenum denatures pepsin.
    - Functions of Ileum: Digestion of food; Absorption of digested food.
