GCSE and IGCSE Biology: Cells and Microscopy Worksheet - Mark Scheme

Year 10-11 · GCSE (AQA 4.1.1) and Cambridge IGCSE 0610 topic 2 · Exam-style questions

Section A: Cell structure [25 marks]

1	Nucleus: contains DNA / controls the cell; animal Yes, plant Yes, bacterium No. Cell membrane: controls what enters and leaves; Yes, Yes, Yes. Cell wall: strengthens the cell (cellulose in plants); No, Yes, Yes (not cellulose). Chloroplast: photosynthesis; No, Yes, No. Mitochondria: aerobic respiration releases energy; Yes, Yes, No. Ribosome: protein synthesis; Yes, Yes, Yes. Permanent vacuole: contains cell sap and keeps the cell firm; No, Yes, No. Guidance: 1 mark for each correct function and 1 mark for each correct Yes or No (21 marks in total: 7 functions, 14 Yes/No boxes).	**21**
2	Eukaryotic cells have a nucleus containing DNA (1); prokaryotic cells have no nucleus and the DNA is a single circular loop in the cytoplasm (1).	**2**
3	Any two: plasmids; circular DNA (nucleoid); slime capsule; flagellum; cell wall not made of cellulose. Guidance: 1 mark each.	**2**

Section B: Specialised cells [13 marks]

4	Sperm: tail to swim; many mitochondria for energy; acrosome with enzymes to digest egg membrane; streamlined head. Nerve: long axon to carry impulses; branched dendrites to connect to other neurones; insulating myelin sheath. Root hair: long extension gives a large surface area; thin wall; many mitochondria for active transport. Xylem: hollow tube with no end walls; thickened with lignin for strength. Guidance: 1 mark for each correct adaptation.	**8**
5	Cell differentiation is when a cell changes to become specialised for its job (1). Animal cells mostly differentiate early; plant cells can differentiate throughout life (1). In plants, stem cells are found in meristems at the tips of roots and shoots (1).	**3**
6	cell, tissue, organ, organ system, organism Guidance: 2 marks all correct; 1 mark if one pair is wrong.	**2**

Section C: Microscopy and calculations [14 marks]

7	Electron microscope has a much higher magnification (1) and higher resolution (1) so it shows sub-cellular structures such as ribosomes and plasmids in detail (1); light microscope shows nucleus, cell wall and chloroplasts only (1).	**4**
8(a)	Real size = 45 ÷ 300 = 0.15 mm (2). 0.15 × 1000 = 150 µm (1). Guidance: Allow 2 marks for method with answer in mm.	**3**
8(b)	40 mm = 40 000 µm (1); 40 000 ÷ 8 (1) = ×5000 (1)	**3**
8(c)	7×10^{-6} m (1); 7 µm (1)	**2**
8(d)	1000 µm; 1000 nm	**2**

Section D: Practical skills [11 marks]

9	Peel a thin layer of epidermis from the onion (1); place on a drop of water or iodine on a slide (1); lower a coverslip at an angle with a mounted needle to avoid air bubbles (1); view at low power then high power, focusing with the fine focus (1).	**4**
10	(a) To kill other microorganisms / sterilise the loop (1). (b) To keep contaminants out but allow oxygen in so harmful anaerobic bacteria do not grow (1). (c) A lower temperature reduces the growth of pathogens that grow best at body temperature (1).	**3**
11	r = 6 mm (1); area = ? × 6^2 = 113 mm^2 (1)	**2**
12	Advantage: makes the structures visible / adds contrast (1). Disadvantage: kills the cell / may produce artefacts (1).	**2**

Total: 63 marks. Accept any scientifically correct alternative wording.