

1. (a) **A** Carries the (genetic) code / genetic instructions / DNA / makes mRNA / transcription / makes ribosomes;
B Links amino acids / synthesises / makes protein;
C Involved in modifying / packaging protein / forms glycoproteins / forms vesicles; 3
- (b) (i) Mitochondrion;
0.01% as opposed to 0.003%;
Accept any valid approach but must be clear as to what the calculations relate 2
- (ii) With electron microscopes sections must be cut;
Cisternae are joined to each other;
Outside plane of section; 2 max
- (iii) Protein synthesis requires energy / ATP;
Mitochondria release energy / make ATP;
From respiration;
Do not award credit for second point if candidate refers to mitochondria making / producing energy 3

[10]

2. (a)
- | <u>Red blood cell</u> | <u>Bacterial cell</u> | |
|----------------------------|------------------------|-------|
| Does not contain ribosomes | Contains ribosomes; | |
| No cell wall | Cell wall; | |
| No capsule | Capsule; | |
| No flagellum | Flagellum; | |
| No mesosomes | Mesosomes; | |
| No plasmid | Plasmid; | |
| No genetic material / DNA | Genetic material / DNA | max 2 |
- [Note: Must compare like with like]*
- (b) No nucleus/ DNA;
(Nucleus) codes for protein/ can't make RNA;
OR No ribosomes / rough endoplasmic reticulum;
Protein is made/ synthesised/ translated (on ribosomes);
OR No mitochondria;
(Mitochondria) supply energy/ ATP for making proteins; max 2
- (c) (i) Red blood cells do not contain endoplasmic reticulum/ do not have membrane-bound organelles;
[Note: Not enough to say 'because there aren't any'] 1
- (ii) Water potential inside cell more negative/ lower;
Water moves in by osmosis/ diffusion. 2
- (d) (i) Have a greater surface area to volume ratio/ shorter distance to centre; 1

- (ii) Cell membrane of abnormal cell not as strong/ spectrin strengthens membrane; 1
- (e) 1 Amino acid based on carbon with four groups attached;
 2 Amino/ NH_2 and carboxyl / COOH ;
 3 R-group/ side chain + hydrogen;
 4 R-group differs from one amino acid to another;
 5 Amino acids joined by condensation;
 6 Bond formed between NH_2 and COOH ;
 7 Involves removal of molecule of water;
 8 H from NH_2 and OH from COOH ; max 6
3. (a) Epithelium of alveolus, capillary wall/epithelium/endothelium, plasma; 1
- (b) Cell wall;
 Capsule;
 Flagellum;
 Mesosomes;
 Plasmid;
 Genetic material/DNA/nucleoid;
 Ribosomes; max 2
- Accept references to size only if some idea of range is given*
- (c) Large (surface) area;
 For diffusion;
 or
 Short distance to centre of cell/to all haemoglobin;
 For diffusion; 2
- (d) (i) Correct answer of approximately 7800/8000 = 2 marks
 Incorrect answer but clearly derived by dividing diameter of cell A by 7 = 1 mark 2
- (ii) Idea of cut through maximum diameter/middle; 1

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(2)
 (Total 7 marks)

4. (a) (i) 31/31.2; 1
- (ii) Ratio would be less/smaller;
 Cell is thin / has large surface area / (adapted) for diffusion; 2
Accept converse. Must relate to concept of ratio.
- (b) (i) 6; 1
- (ii) 11; 1
- (c) Water potential inside vesicle more negative/lower;
 Water moves into vesicle by osmosis/diffusion; 2
- (d) Mitochondria supply energy/ATP;
 For active transport / absorption against concentration gradient / synthesis /
 anabolism / exocytosis / pinocytosis; 2
Do not credit references to making, creating or producing energy.
- (e) 1 Phospholipids forming bilayer/two layers;
 2 Details of arrangement with “heads” on the outside;
 3 Two types of protein specified;
 e.g. passing right through or confined to one layer /
 extrinsic or intrinsic /
 channel proteins and carrier proteins /
 two functional types
 4 Reference to other molecule e.g. cholesterol or glycoprotein;
 5 Substances move down concentration gradient/from high to low concentration;
Reject references to across or along a gradient
 6 Water/ions through channel proteins/pores;
 7 Small/lipid soluble molecules/examples pass between phospholipids/through
 phospholipid layer;
 8 Carrier proteins involved with facilitated diffusion;
Ignore references to active transport.
Credit information in diagrams.

max 6

[15]

5. (a) Large surface area to volume ratio;
For diffusion;
OR
Flat/thin;
So oxygen can reach all haemoglobin/centre rapidly / short pathway; max 2
- (b) (i) Partially permeable / allows water through but not sucrose; 1
Accept semi-permeable / selectively permeable.
- (ii) Phospholipid (in membrane)/bilayer dissolved/broken down;
Allows haemoglobin/contents to leak out; 2
- (c) (i) Monocyte has a nucleus / red blood cell does not; 1
- (ii) Granulocyte has lobed nucleus; 1
Reject C - Shaped
6. (a) (i) Mitochondria site of respiration;
Production of ATP / release of energy;
For contraction; 3
Do not award credit for making or producing energy.
- (ii) Enzymes are proteins;
Proteins synthesised/made on ribosomes; 2
- (b) Lysosomes produce/contain enzymes;
Which break down/hydrolyse proteins/substances/cells of tail; 2
- (c) 1. Chop up (accept any reference to crude breaking up);
2. Cold;
3. Buffer solution;
4. Isotonic / same water potential;
5. Filter and centrifuge filtrate;
6. Centrifuge supernatant;
7. At higher speed;
8. Chloroplasts in (second) pellet; max 6

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7. (a) presence of nuclei; 1
- (b) (i) 1 mark growth clearly calculated from difference
between lengths at beginning and end of lesson
- 2 marks correct answer of 300 μm 2
- (Allow for slight measurement errors)*
- (ii) divide by time (between measurements); 1
- (c) blue-black/dark blue/purple/black;
iodine added to slide/specimen /granules; 2

[6]

8. (a) removes debris/intact cells/sand;
which would contaminate sediment A/interfere with the results; 2
- (b) (i) nuclei; 1
- (ii) ribosomes/endoplasmic reticulum/membrane/Golgi; 1
- (c) density/size/mass/weight; 1
- (d) an electron microscope has a higher resolution;
electrons with shorter wavelength; 2

[7]

9. (a) Measure diameter of field with ruler; And proportion taken up by
the cell; or Measure length with (eyepiece) graticule/eyepiece scale;
Calibrated against stage micrometer/something of known length; 2
- Reject divide apparent length by magnification*
- (b) Membrane/cytoplasm shrinks/pulls away from cell wall/cell
plasmolysed/ goes flaccid; Water moves down water potential
gradient/to lower/more negative water potential; By osmosis; 3
- (c) (i) Reaches equilibrium/no further/maximum change in length; 1
- Reject osmosis takes time*
- (ii) Line/curve of best fit; Extrapolate (and read off)/
find where it crosses x-axis; 2

- (iii) Greater decrease/length smaller; More water removed;
Greater difference in water potential/cell with higher/less
negative water potential; Starch is insoluble/has no effect
on osmosis

max 2

[10]

10. (a) (i) Crista/inner membrane;
(ii) Matrix;

1

1

- (b) B;

1

- (c) (i) Reduce/prevent enzyme activity;

1

- (ii) Prevents osmosis / no (net) movement of water;

So organelle/named organelle does not burst/shrivel;

2

*Q Allow reference to cell rather than organelle for first mark
point only.*

Regard damage as neutral

- (d) (Mitochondria) use aerobic respiration;
Mitochondria produce ATP/release energy;

Energy/ATP required for muscles (to contract);

2 max

Q Do not accept reference to making/producing energy.

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