

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; 1  
*[Note: Not enough to say 'because there aren't any']*
- (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<sub>2</sub> 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<sub>2</sub> and COOH;  
7 Involves removal of molecule of water;  
8 H from NH<sub>2</sub> and OH from COOH; max 6

[15]

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

[8]

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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  $\mu\text{m}$  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;

1

(ii) Matrix;

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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