

1. (a)

✗	✓
✗	✓
✓	✗

(All symbols in a column need to be correct for a mark) 2

- (b) (i) chloroplast;
grana / thylakoids; 2
- (ii) nucleus;
chromosomes / chromatin / chromatids; 2

[6]

2. (a) (i) ATP used;
movement is against a concentration gradient; 2
- (ii) stops / less movement of ions;
movement of ions needs ATP;
ATP / production linked to respiration /
electron carrier system; max. 2

- (b) (i) greater concentration difference / increased gradient therefore more
molecules move in external concentration limiting factor /
increased concentration increases rate; 1
- (ii) (limit imposed in situation B by)
limited number of molecules can move through the pores in unit time /
pores are full / number of pores is limiting factor; 1

[6]

3. (a) Two marks for correct answer of 3000;
One mark if answer obtained by dividing actual length by 20 m; 2
- (b) (i) Letter **A** indicating cytoplasm; 1
- (ii) Letter **B** indicating ribosome; 1

- (c) Cristae are site of ATP synthesis/oxidative phosphorylation;
by electron/hydrogen carriers;
Metabolism requires energy input/ATP; max 2

[6]

4. (a) 4 micrometres = 2 marks (*Allow 3.9 - 4.1*)
Correct method of scaling, but incorrect conversion to micrometres = 1 2
- (b) (i) not in nucleus / single (loop) chromosome. 1

- (ii) not attached to ER / smaller (70S). 1
- (iii) not in mitochondria / attached to mesosomes. 1
- (c) increases concentration (of solutes) inside bacteria / decreases water potential inside bacteria; less / no net water loss to external solution or uptake of water to more conc. solution inside. 2
- [7]
5. (a) Bacteria do not have a nucleus/nuclear membrane, eukaryote does; Bacteria do not have membrane-bound organelles, eukaryote does; Bacteria do not have mitochondria, eukaryote does; Bacteria has 70S/smaller ribosomes, eukaryote has 80S/larger; Bacteria] cell-, have murein/peptidoglycan cell wall, eukaryotes do not-. Bacterial cells are very much smaller than eukaryotic cells; Bacteria have circular DNA, eukaryotes have linear DNA; Bacteria may have capsules, eukaryotes do not; 2
- (b) (i) flagellum
(ii) ribosome
(iii) plasmid 3
- [5]
6. (a) (i) Crista 1
- (ii) (Mitochondria) provide energy / ATP; liver cells have high energy requirement for metabolism- reactions specific liver function, eg. glycogen synthesis or deamination (*not just: active transport/ growth*) 2
- (iii) Principle - protein synthesis; Function of protein in mitochondria - e.g. synthesis of (respiratory) enzymes / growth / repair / replication.
or:
DNA has genetic information; ribosomes produce proteins / allows replication of mitochondria. 2
- (b) Maintain concentrations/water potential same inside & outside (cells / mitochondria) / prevent osmosis; Prevent bursting / shrinkage of mitochondria/organelles (*not cells*) 2

	(c)	Eukaryotic ribosomes denser/ heavier (<i>not just 'larger'</i>).	1	
				[8]
7.	(a)	(i) Nucleus;	1	
		(ii) Correct answer ($3\mu\text{m} = 2$ marks) error with measurement, but clearly derived by dividing drawing size by magnification = 1 mark;	2	
	(b)	(i) Ice-cold – prevents <u>enzymes</u> working/autolysis/ <u>self</u> digestion;		
		(ii) Isotonic – prevents osmotic effects to organelles/osmosis/bursting/ shrinking;	2	
	(c)	A; Nucleus is largest/densest/heaviest organelle (sediments first/lowest spin speed); (Reject reference to plant organelles/cell wall)	2	
	(d)	O ₂ uptake / ATP production / CO ₂ production (not respiration / heat);	1	
				[8]
8.	(a)	A ribosome (<i>RER neutral</i>);	1	
		B vacuole;	1	
		C <u>smooth</u> ER / SER;	1	
	(b)	(i) support / strength / shape / prevents osmotic lysis; (<i>protection, permeability neutral</i>)	1	
		(ii) photosynthesis / light energy → chemical energy; (<i>makes food/sugar neutral</i>)	1	
	(c)	0.2 – 0.24 gains 2 marks; ELSE evidence of observed measurement (5 – 6 mm / 0.5 – 0.6 cm) ÷ 25 000 gains one mark;	2	
				[7]

9. (a) (i) microvilli; (*reject brush border*) 1
(ii) increased surface area (for diffusion); 1
- (b) (i) $\frac{16 \times (1000)}{0.1}$ / principle of $\frac{\text{measuring scale bar}}{\text{dividing by 0.1}}$; (*15 –17 tolerance*)
160000; (correct answer award 2 marks) 2
(ii) electron microscope has a greater resolving power / objects closer together can be distinguished;
electron (beams) have a shorter wavelength; 2
- (c) short diffusion pathway /short pathway to the centre / large SA:V ratio for faster, more diffusion; 1
- [7]**
10. (a) Glycerol / glyceride; 1
- (b) (i) Phospholipid has (one) phosphate / Phosphoric acid;
replacing fatty acid; 2
(ii) Saturated – all valencies of C filled / saturated with hydrogen / all (C–C) single bonds / no double bonds;
fatty acid 1 is saturated/fatty acids 2 and 3 are unsaturated; 2
- [5]**
11. (a) (Crush in) ethanol / alcohol;
Add (to) water (*Order of adding is critical for this point*);
Emulsion / white colour; 3
- (b) (i) Glycerol / glyceride; 1
(ii) Phospholipid has phosphate / phospholipid only has two fatty acids; 1
(iii) Phosphorus / P; 1
- (c) (i) Both membranes contain phospholipid / lipid (bilayer); 1
(ii) Glucose unable to pass through artificial membrane as not lipid soluble;
Glucose transported by proteins;
(Proteins) found in plasma membrane /
not found in artificial membrane; max 2
- [9]**
12. (a) (i) 4; 1
(ii) Not made of identical units/ monomers/ made of fatty acids and glycerol; 1

- (b) (i) A O(xygen);
B C(arbon); 2
- (ii) No double bonds/ every carbon joined to two hydrogens/ four-other atoms; 1
- (c) (i) 2 marks - Correct answer of $0.0000025 / 2.5 \times 10^{-6}$;;
1 mark - Incorrect answer but clearly derived from volume divided
by surface area; 2
[Note: Assume units are mm unless otherwise stated]
- (ii) Head hydrophilic/ attracted to water/ polar; 2
Tail hydrophobic/ avoids/ shuns water/ non-polar;
[Allow: only one mark for limited references to “loving”
and “hating” water]

[9]

13. (a) (i) More “free” water molecules outside cell / in distilled water;
water molecules inside cell “bound” to solute molecules;
link between water molecules, pressure they exert and water potential;
water potential of distilled water =0;
presence of solute reduces water potential; max 2
- (ii) Partially permeable / only allows water molecules through /
does not allow solute molecules though; 1
- (b) Passive / does not require ATP; **R** energy not required
movement down gradient; **R** across
does not require carrier molecules / not facilitated; max 2

[5]

14. (a) (Small alveoli with) large surface area;
For diffusion; 2
- (b) (i) Epithelium / epithelial/squamous/pavement cells;
Reject endothelium. 1
- (ii) $0.11 \mu\text{m}$; 1
- (c) (i) Less oxygen / more carbon dioxide / more water vapour; 1
Two differences required, but only one mark for this part of the question.
- (ii) Gas exchange takes place in alveoli / does not take place in trachea; 1

- (d) (i) Pulmonary artery; 1
- (ii) Concentrations reach equilibrium/become equal;
Diffusion occurs when there is a concentration gradient (so some will remain in blood);
OR
Lung cells/vessel cells respire;
Add/produce carbon dioxide; 2

[9]

15. (a) *two of the following:*
form(water) impermeable barrier to water-soluble substances / selectively permeable / allows non-polar molecules to pass through;
allows cell to maintain different concentrations either side;
makes membranes self-sealing/able to fuse with other membranes/able to form vesicles / gives flexibility/fluidity; 2 max

- (b) (surface/extrinsic protein) for cell recognition / binding to hormones/identification 1

- (c) (i) involves carrier/transmembrane/transport proteins;
(*reject channel proteins*) 1

- (ii) requires energy/requires use of ATP / moves substances/ions/molecules against a concentration gradient; 1

- (iii) the curve levels off above a certain external concentration of substance;
as channel proteins are saturated with molecules
(and no more can be carried); 2

[7]

16. (a) effective water / sewage treatment / prevent water contamination / improved hygiene / vaccination / quarantining of affected area; (*any two*) 1

- (b) oral rehydration therapy/ORT;
replaces lost water and salts;
OR
drinking large amounts of water;
with salts/minerals; 2

- | | | | |
|-----|------|---|---|
| (c) | (i) | (protein/poison) excreted / secreted by bacteria; | 1 |
| | (ii) | receptor / proteins on membrane;
complementary shape of exotoxin; | 2 |
| (d) | (i) | active transport;
using ATP / carrier proteins; | 2 |
| | (ii) | higher solute concentration / water potential lowered in small intestine;
osmotic loss of water; | 2 |

[10]