



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

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GCE

Biology/ Human Biology A

Unit BYA1

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Unit 1: Molecules, Cells and Systems

Question 1

- (a) (i) Short wavelength; [*Allow: small wavelength*]
 Good/ high resolution; [*Allow: description of resolution*] 2
- (ii) Cut through a different plane; 1
- (b) (i) Mitochondria supply energy/ ATP;
 For active transport of mineral ions/
 Absorption of ions against concentration gradient;
 Movement/ contraction of muscles; 3
 [*Reject: thermodynamically incorrect answers about 'making' or 'producing' energy*]

Total 6 marks

Question 2

- (a) (Molecules) with little (kinetic) energy;
 Move slowly;
 Few collisions (between enzyme and substrate)/fewer enzyme-substrate complexes formed; 3
 (Note: Question refers to slow rate at 5°C and answer must be in this context.)
- (b) Heating would cause bonds (maintaining tertiary structure)/named bonds to break;
 Denaturing enzyme/ altering tertiary structure;
 Altering shape of active site; max 2
 (Note: if answers clearly relate to lactose, they are incorrect)

Total 5 marks

Question 3

- (a) (i) Arteries divide to form arterioles; 1
- (ii) Blood goes to (an organ) along an artery and leaves by a vein; 1
- (b) (i) Multiply (mean) length by total cross-sectional area; 1
- (ii) 2 marks - Correct answer of 6.45/6.5%; [*Accept: 6.4%/6%*]
 1 mark - Incorrect answer but clearly derived from volume of blood in capillaries divided by total volume of blood in all vessels; 2
- (c) (i) Muscle/ skin/ lungs/ heart; 1
- (ii) Muscle;
 Contracts;
 Vasoconstriction/ reduces diameter (of arteriole supplying capillaries); 3

Total 9 marks

Question 4

- (a) Mauve/ purple/ violet/ lilac;
It is a protein; 2
[Reject: blue or pink colour]
- (b) (i) Fell as it was used up/ broken down/ changed; 1
- (ii) Substrate becomes limiting/ falls/ gets less;
Fewer collisions/ complexes formed; 2
- (iii) Initial rate slower;
Levelling out at same value; 2
- (c) Enables a comparison to be made;
As the rate/concentration changes as reaction progresses;
Cells/ catalase may become damaged/affected by heat; max 2

Total 9 marks

Question 5

- (a) $\frac{A \times (C_1 - C_2)}{t}$ [Allow: words] 1
- (b) (i) Large surface area for diffusion; 1
- (ii) Red blood cells close to capillary wall/ thin capillary wall;
Short diffusion path/ distance for oxygen to diffuse;
Longer time for diffusion to take place/ diffusion is slow; 3
- (c) Less oxygen/ concentration gradient lower;
Therefore less diffusion; 2
[Accept: reverse argument for carbon dioxide]

Total 7 marks

Question 6

- (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/ 2.5×10^{-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;
Tail hydrophobic/ avoids/ shuns water/ non-polar; 2
[Allow: only one mark for limited references to 'loving' and 'hating' water]

Total 9 marks

Question 7

- | | | | |
|-----|---|--|-------|
| (a) | <u>Red blood cell</u>
Does not contain ribosomes
No cell wall
No capsule
No flagellum
No mesosomes
No plasmid
No genetic material/ DNA
<i>[Note: Must compare like with like]</i> | <u>Bacterial cell</u>
Contains ribosomes;
Cell wall;
Capsule;
Flagellum;
Mesosomes;
Plasmid;
Genetic material/ DNA; | max 2 |
| (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;
<i>[Note: not enough to say 'because there aren't any']</i> | | 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 |

 Total 15 marks

Question 8

- (a) (i) B/aorta; 1
- (ii) D/pulmonary vein; 1
- (b) Filling because valve between artery and ventricle closed;
Valve between atrium and ventricle/ cuspid valve open; 2
[Note: All answers must be in context of filling.
Answers specifically relating to left side are incorrect.]
- (c) Pressure increases and volume stays constant; 1
- (d) Pressure in ventricle (becomes) higher than pressure in aorta;
[Or converse] 1
- (e) ventricle contracts;
Produces increase in pressure;
Blood leaves ventricle/ goes into aorta (and volume falls);
Through open valve; max 3
- (f) 1 (Wall of) capillary consists of single layer of cells;
2 These cells are flattened/ very thin/ squamous/ pavement;
3 Fluid/ small molecules can pass through;
4 Proteins/ red blood cells cannot pass through;
5 (Fluid) out by hydrostatic/ blood pressure;
6 Water potential/ osmosis draws (fluid) back in;
7 Link between osmosis / water potential and blood proteins;
8 As hydrostatic pressure greater than osmotic effect; max 6

Total 15 marks