



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme

June 2002

GCE

Biology A / Human Biology

Unit BYA1

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Question 1

(a)

| Cell | Feature | | |
|------------------------------------|-----------------|---------|-----------|
| | Plasma membrane | Nucleus | Cell wall |
| Red blood cell | ✓ | ✗ | ✗ |
| Lymphocyte | ✓ | ✓ | ✗ |
| Photosynthesising cell from a leaf | ✓ | ✓ | ✓ |
| Bacterium | ✓ | ✗ | ✓ |

*Mark down, one mark for each correct column.***3**(b) (i) *Any two from:*Cellulose / starch / amylose / amylopectin;
*Do not allow starch with amylose or amylopectin.***1**

(ii) 1500 = 2 marks;;

Error with units but answer clearly derived by dividing drawing size by actual size = 1 mark;

2 max

(iii) (Focused) at different level / depth;

Looking at different structures / parts of structure;

2**Total 8 marks****Question 2**

(a) (i) (Polypeptide is) coiled / folded;

1

(ii) Way in which whole molecule is folded / globular shape / folding of secondary structure / further folding /

*Do not accept 3D shape if not further explained.*Structure held by ionic / disulphide bonds; *reject hydrogen bonds / peptide bonds only.***1**

(iii) Causes bonds which hold the tertiary structure / named bond;

To break;

Shape no longer maintained / protein denatured;

2 max

(b) (i) 5;

1

(ii) Substrates / active sites with shapes;

Active site / substrate with complementary (shape);

Fitting / binding / forming E-S complex;

3**Total 8 marks**

Question 3

- (a) Bilayer / two molecules thick;
“Heads” / hydrophilic parts outwards / “Tails” / hydrophobic parts inward; **2**
Credit information provided in a diagram, labelling essential for second marking point.
Reject ‘water loving’ / ‘water hating’.
- (b) Only parts of membrane with receptors / molecules into which surface proteins will fit / recognition / binding sites; **1**
- (c) Endocytosis / phagocytosis / pinocytosis; **1**
Reject ‘cytosis’.
- (d) (i) Lysosome; **1**
- (ii) Enzymes;
Digests / breaks down / hydrolyses (other molecules); **2**
Reject ‘cholesterol’.
- Total 7 marks
-

Question 4

- (a) Thin / single layer of cells / large surface area; **1**
Do not accept references to ‘moist surface’.
- (b) Smaller surface area;
For diffusion of carbon dioxide from blood / into lungs / diffusion slower; **2**
Reject second point if answer referring to oxygen only.
- (c) (i) Greater concentration / number of red blood cells;
More haemoglobin (to carry oxygen); **2**
- (ii) (For the body to produce) more red blood cells;
Link established between red blood cells and transport of oxygen; **2**
- Total 7 marks
-

Question 5

- | | | | |
|-----|-------|---|--------------|
| (a) | (i) | Activation energy / amount of energy required for reaction; | 1 |
| | (ii) | Curve starting and finishing at correct energy levels; Activation energy lower (i.e. less than x); | 2 |
| | (iii) | Energy in products less (than in substrate / hydrogen peroxide); Energy given off / lost as heat / exergonic / exothermic; | 2 |
| (b) | | (Molecules have) less (kinetic) energy; Move slower; Fewer collisions / fewer enzyme-substrate complexes formed; | 2 max |
- Total 7 marks
-

Question 6

- | | | | |
|-----|------|--|--------------|
| (a) | (i) | Units include both volume and time; | 1 |
| | (ii) | Heart beats faster so more blood leaves heart in given time / increased cardiac output; <i>Needs reference to given time in order to explain rate.</i> | 1 |
| (b) | | 1. Impulses; 2. Along sympathetic / (cardiac) accelerator nerve; 3. Increases rate of discharge / contraction; 4. Of SAN / pacemaker; 5. No / fewer impulses; 6. Along parasympathetic / vagus nerve; | 3 max |
| (c) | | Amount of oxygen (falls) in veins from muscles; | 1 |
| (d) | | More blood is flowing to lungs; More oxygen can diffuse / pass into blood from alveoli / lungs; More oxygen in blood in pulmonary vein / arteries to body; | 2 max |
- Total 8 marks
-

Question 7

- (a) (i) Atoms / named atoms arranged differently / isomers; **1**
- (ii) C₁₂; H₂₂ O₁₁; **2**
- (b) (i) Facilitated diffusion is movement from high to low concentration / down concentration gradient; *reject* 'across' / 'along'
Facilitated diffusion does not require energy / ATP / is passive; **2**
- (ii) Produces greater water potential gradient / lower / more negative water potential in cells / less negative / higher water potential in intestine;
Water moves (into cells) by osmosis / diffusion; **2**
- (c) Based on central carbon atom / α -carbon;
COOH group;
NH₂ / amino group;
H; **2 max**
Allow information on diagram. Do not accept 'both have an R-group'.
- (d) *Method*
1. Load;
 2. Method of producing small spot;
 3. Repetition to concentrate;
 4. Assemble apparatus with solvent below origin;
 5. Leave until solvent near top of paper;
 6. Use reagent to identify / show up sugars / mark solvent front;
 7. Turn through 90° / separate further with / use another solvent with 2-dimensional chromatography;
- Maximum of 4 marks from this section*

Identification

8. Calculate R_f value;
 9. By dividing distance moved by spot by distance moved by solvent;
 10. Look up in table / compare with standard values;
- OR*
11. Compare distance moved;
 12. With distance moved by known substance;
 13. On same chromatogram;
- Maximum of 2 marks from this section* **6 max**

Total 15 marks

Question 8

- (a) (i) Filling time stays constant / increases very little / as heart rate increases;
Decrease in contraction time as heart rate increases;
Allow maximum of 1 mark if no reference to heart rate. **2**
- (ii) Work out time for one heart beat / one heart beat takes 1 second;
Subtract filling time / 0.38s;
Credit these basic points however determined. If the calculation has been done, credit any point in method clearly explained.
OR
Plot contraction time against heart rate;
Read off value for 60 beats per minute; **2**
- (iii) Stroke volume / volume of blood pumped out at each beat; **1**
- (b) (i)
- | Valve located between | Open | Closed |
|--------------------------------------|------|--------|
| Left atrium and left ventricle | | ✓ |
| Left ventricle and aorta | ✓ ; | |
| Right atrium and right ventricle | | ✓ |
| Right ventricle and pulmonary artery | ✓ ; | |
- 2**
- (ii) Pressure constant / smooth in vein / only have pressure surges in artery; **1**
- (iii) Contraction of ventricle / systole / entry of blood into aorta; **1**
- (c)
1. At (arteriole) end of capillary;
 2. Hydrostatic / blood pressure;
 3. Forces out soluble / small molecules;
 4. And water;
 5. Protein remains in blood / plasma;
 6. Molecules too large;
 7. More negative / lower water potential at (venule) end;
 8. Water drawn in by osmosis / diffuses in;
 9. Some fluid returned (to blood) by lymphatic system;
- 6 max**

Total 15 marks