



General Certificate of Education

Biology/Human Biology
5411/5413
Specification A

BYA1 Molecules, Cells and Systems

Mark Scheme

2007 examination - January series

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Question 1

- (a) Mix with ethanol/alcohol/meths then water;
Milky/white (emulsion)/ emulsion produced; 2
Do not accept unqualified reference to cloudy.
Ignore incorrect references to precipitate etc.
"Do the emulsion test" gets mark for result.
- (b) (i) Glycerol; 1
- (ii) Has a phosphate/ (only) two fatty acids; 1
Unqualified references refer to the phospholipids shown in the diagram
- (iii)
$$\begin{array}{c} \text{H} - \text{C} - \text{H} \\ | \\ \text{H} - \text{C} - \text{H} \\ | \\ \text{H} - \text{C} - \text{H} \\ | \\ \text{H} \end{array}$$

/ $\text{CH}_2\text{CH}_2\text{CH}_3$; 1
- (iv) Hydrophobic/"hate" water/ non-polar;
Attracted to tails of other phospholipids /
tails face inwards/away from water; 2
- Total 7**

Question 2

- (a) (i) Decreases then increases; 1
- (ii) Move up/out;
Increasing volume; 2
- (b) Rate of diffusion is proportional to;
Accept equals
(Surface) area x difference in concentration/concentration gradient
Thickness (of exchange surface) ; 2
- (c) (i) Smaller area;
Therefore (rate of) diffusion (of oxygen) will be lower; 2
- (ii) Breathing out removes carbon dioxide (from the lungs);
Increases difference in concentration / increases concentration gradient; 2
- Total 9**

Question 3

- (a) (i) **E**/exocytosis; 1
- (ii) **C**/osmosis; 1
- (iii) **D**/active transport: 1
- (b) (i) Movement is against concentration gradient;
As hardly any potassium ions in external solution /
final concentration very low; 2
- (ii) Final concentration high(er)/same as original / less taken up;
Link between oxygen and respiration;
Less/no ATP/energy released; 3
Do not credit last point if answer refers to 'making energy'
- (c) Water has been absorbed (increasing the calcium concentration); 1

Total 9**Question 4**

- (a) (i) Left ventricle; 1
- (ii) Higher pressure / stronger contraction to pump blood round/to body; 1
- (b) (i)

Open	Closed
Semi-lunar valve	Atrio-ventricular valve;

Accept other non ambiguous names for these valves or descriptions of valve locations 1

- (ii) Heart rate increases / length of cardiac cycle shorter / curve narrower;
(Stroke) volume / (ventricular) volume increased / curve taller; 2
- (iii) Cardiac output = heart rate x stroke volume;
Heart rate correctly calculated as 75;
Correct answer of 6000 cm³ / 6 litres/dm³ per minute;
Correct answer of 6000 gains 3 marks 3

Total 8

Question 5

(a)

Feature	Leaf Cell	Red Blood Cell	Bacterial Cell
Plasma membrane	✓	✓	✓
Mitochondrion	✓	✗	✗
Chromosomes containing both DNA and protein	✓;	✗;	✗;

One mark for each correct column

3

Do not accept marks as bring equivalent to crosses

(b)

Light microscope has low resolution;

Light has long wavelengths;

Accept converse providing candidate is referring to optical microscope

2

(c)

Specimen thin / plane / section; *Ignore "plane of focus"*

May not go through branch / only go "across" mitochondrion;

2

Total 7**Question 6**

(a)

Lowers activation energy (of reaction);

More molecules able to react;

By splitting the reaction into stages;

Allows E-S complex to be formed;

Provide a surface/place for reaction;

2 max

(b)

(i)

Sand + (boiled potato) + hydrogen peroxide/substrate;

To show that the enzyme produced the reaction / sand had no effect / see if sand has an effect;

2

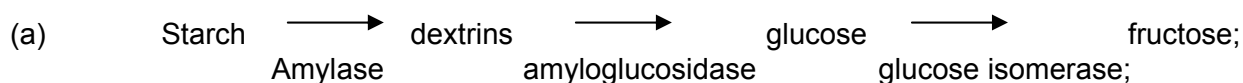
(ii)

High temperature denatures / temperature affects rate of reaction /

volume of gas affected by heat / only one variable;

1

Total 5

Question 7

2

*Accept any version of a flow chart, ignoring additional information.**Where enzymes and products are not distinguished allow max 1 for products*

- (b) Elements/atoms/C, H and O arranged in a different way / they are isomers / they have different structural formulae; 1

- (c) Starch/substrate has a specific shape/structure;
 Allows binding to/fitting with/ forming E-S complex with active site;
 or
 Active site has specific shape;
 Allows binding to/fitting with/ forming E-S complex with substrate/starch; 2
Complementary $\equiv$ shape

- (d) (i) Condensation; 1

- (ii) Nitrogen/N; 1

- (e) (i) 7/7.1/ 7.14; 1

- (ii) 0.05 / 0.06 / 0.055 / 0.056 / $1/18$; 1

- (f) 1 Formed from α glucose;
 2 Joined by condensation/ by the removal of a water molecule/ glycosidic bonds;
 3 Between (carbons) 1 and 4 (and 1 and 6);
 4 Coiled chain;)
 5 (Allows) storage of large amount in a small space;)
 6 Insoluble so has no effect on osmosis/water potential;
 7 Branches;)
 8 (Allows) rapid breakdown/release of glucose / hydrolysis;) 6 max
Accept information shown clearly in a diagram
Reject easily/readily broken down
) *indicates linked marks*
)

Total 15

Question 8

- (a) Flows from high to low pressure / down pressure gradient / pressure higher at top / lower at bottom; 1
- (b) (i) Two marks for correct answer of 1.2 mm;
Accept limits of 1.1 – 1.3
One mark for incorrect answer showing evidence of dividing by 100; 2
- (ii) Divide length/answer to (b) (i) by time / 1.3; 1
- (iii) Allows time for e.g. substances to be forced out/ diffusion; 1
- (c) (i) One mark for an answer which merely describes the change in terms of a decrease
Two marks for an answer which describes the rate of decrease becoming steeper with distance. 2
- (ii) Friction;
From contact with wall;
Decrease in volume of blood;
Fluid/water is forced out/lost;
During tissue fluid formation; 2 max
- (d) 1 At arteriole end high hydrostatic pressure/blood pressure;
2 Hydrostatic pressure higher than effect of osmosis;
3 Forces out;
4 Small molecules/named example;
5 Proteins remain in blood/ not removed as they are large;
6 Proteins lower water potential of blood;
7 Water/fluid moves back into blood;
8 Water moves by osmosis; 6 max

Total 15