



## **General Certificate of Education**

# **Biology / Biology (Human) 5411 / 5413**

## *Specification A*

**BYA1      Molecules, Cells and Systems**

# **Mark Scheme**

*2008 examination - January series*

*For confidential packs*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: [www.aqa.org.uk](http://www.aqa.org.uk)

Copyright © 2008 AQA and its licensors. All rights reserved.

#### COPYRIGHT

AQA retains the copyright on all its publications. However, registered centres for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to centres to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

**Question 1**

(a)	(i)	Hydrogen/H (bond);	1
	(ii)	Binds cellulose (molecules) together/forms fibrils ( <i>reject fibres</i> ); Strengthens wall/cellulose fibres are strong; Can resist turgor pressure/osmotic pressure/pulling forces;	2 max
(b)	(i)	N(itrogen);	1
	(ii)	Condensation/Polymerisation	1
(c)	(i)	Glycogen;	1
	(ii)	Starch/amylose/amylopectin;	1
			Total 7

**Question 2**

(a)	(i)	Right atrium;	1
	(ii)	Pulmonary artery;	1
(b)		Thicker muscle/wall/stronger contraction; Of left ventricle;	2
(c)		Delay at atrioventricular node/AVN; Travels to apex/bottom of heart/down bundle of His/Purkyne tissue;	2
(d)	(i)	Parasympathetic/vagus;	1
	(ii)	Sinoatrial node/SAN sends fewer impulses/waves of excitation; Heart rate slower/beats less often; Cardiac output = heart rate x stroke volume;	2 max
			Total 9

**Question 3**

- |     |                                                                                                                                                                                                                                             |       |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (a) | Group of similar cells/cells with same origin (performing a particular function);                                                                                                                                                           | 1     |
| (b) | 7.5;                                                                                                                                                                                                                                        | 1     |
| (c) | (i) <b>B</b> ;                                                                                                                                                                                                                              | 1     |
|     | (ii) Increased rate of diffusion/more oxygen diffuses/diffusion depends on surface area;<br><i>Accept diffusion quicker/more efficient. Reject easier</i>                                                                                   | 1     |
| (d) | Sucrose solution has lower/more negative <u>water potential</u> / red blood cell has higher/less negative <u>water potential</u> ;<br><u>Water</u> moves <u>out</u> of cell by <u>osmosis</u> ;<br><u>Volume of cytoplasm</u> becomes less; | 2 max |
| (e) | Dissolves (phospho)lipids in plasma/cell membrane/bilayer;<br>Haemoglobin released into solution/ red due to haemoglobin;                                                                                                                   | 2     |
|     | Total                                                                                                                                                                                                                                       | 8     |

**Question 4**

- |     |                                                                                                                                                                                              |   |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| (a) | Warm/heat/boil with Benedict's solution;<br>Stays blue/test is negative/does not turn red/orange etc;<br><i>Do not allow unqualified references to water baths</i>                           | 2 |
| (b) | <b>Y</b> ;<br>As three spots present/sucrose, glucose and fructose/both products;                                                                                                            | 2 |
| (c) | Run chromatogram with fructose;<br>Calculate Rf value (from fructose chromatogram);<br>As distance moved by substance divided by distance moved by solvent front;<br>Find spot with same Rf; | 3 |
|     | Total                                                                                                                                                                                        | 7 |

**Question 5**

- (a) (i) Accept any answer between 0.001 and 0.9 as thinner than that of artery (and thicker than that of capillary); 1
- (ii) Accept any answer less than 4.0 as blood pressure in vein must be lower than in capillary/blood only flows down a pressure gradient/ pressure lost in capillary; 1
- (b) (Leg) muscles contract;  
Giving high pressure/ increase pressure of blood in vein;  
Valve behind/below closes and prevents backflow/ only valve in front/ above will open; 3
- Total 5

**Question 6**

- (a) (i) 0; 1
- (ii) Amount of substrate/hydrogen peroxide less;  
Fewer collisions with active site (of enzyme)/ fewer E-S complexes formed; 2
- (b) Allow 1 mark for a curve showing a decrease but no increase  
Allow 2 marks for a curve showing a decrease with maximum at start and falling to zero; 2
- (c) Add biuret;  
Lilac/purple/mauve; 2  
*Ignore references to precipitate; do not accept blue or pink although blue-purple would be acceptable.*
- (d) Rate of reaction will be lower if pH not at optimum/ works best at optimum;  
Shape/charge on active site changed/ enzymes denatured/  
loses tertiary structure;  
Substrate will not fit/bind/form E-S complexes; 2 max
- Total 9

**Question 7**

- (a) (i) Large surface area/ SA:volume ratio;  
For diffusion/ gas exchange/ oxygen absorption;  
A lot of oxygen used in respiration; 2 max
- (ii) Alveolar epithelium;  
Capillary epithelium/endothelium; 2
- (iii) Diffusion rate proportional to concentration gradient;  
Capillaries remove oxygenated blood/maintain (oxygen) gradient/replace  
deoxygenated blood;

OR

Diffusion rate proportional to surface area;  
Large amount of capillary surface; 2 max  
*Accept full statement of Fick's law for first marking points but must relate to  
diffusion and be correct In the expression do not credit the following  
Ficks law rather than rate of diffusion  
= rather than is proportional to  
Concentration rather than differences in concentration*

- (b) 75 times;  
Pulmonary ventilation = breathing rate x tidal volume; 2
- (c) Pulmonary vein, aorta; *Ignore other correct information* 1
- (d) 1 Impulses from medulla linked to inspiration; *reject messages and signals*  
2 Contraction of diaphragm/intercostal muscles; *ignore external/internal*  
3 Diaphragm flattens/ribs move up and out;  
4 Volume of lungs increases and pressure falls;  
5 Stretch receptors stimulated;  
6 Lack of impulses from medulla linked to expiration;  
7 Relaxation of diaphragm/intercostal muscles;  
8 Internal intercostal muscles contract during deeper expiration/exercise;  
9 Phrenic nerve identified; 6 max  
*If not awarded for inspiration points 3,4 and 5 can be awarded for expiration*

Total 15

**Question 8**

- (a) Cell S has more rough endoplasmic reticulum;  
Ribosomes are site of protein/enzyme synthesis/  
where enzymes are made; 2
- (b) (i) Inner membrane folded/forms cristae; 1
- (ii) Fewer folds/cristae in cell R;  
*Accept converse; unqualified descriptions refer to cell R.* 1
- (c) Only eukaryotic cells have membrane bound organelles;  
Nucleus/nuclear envelope;  
Endoplasmic reticulum;  
Mitochondria;  
Lysosomes;  
Smaller percentage of membrane is plasma membrane;  
Do not have mesosomes; 2  
*Accept converse; unqualified descriptions relate to cell R. Note that this is an animal cell. Do not accept general statement about membrane-bound organelles in addition to rough endoplasmic reticulum/mitochondria and lysosomes.*
- (d) Rate of uptake increases then levels out;  
At approximately 3 (mmol dm<sup>-3</sup>); 2
- (e) Limited by carrier molecules/ proteins/ carriers are saturated; 1
- (f) 1 Homogenise/chop (or otherwise crudely break) leaves;  
2 Suspend in/mix with buffer;  
3 Cold and isotonic;  
4 Filter and centrifuge filtrate;  
5 At low speed;  
6 Discard pellet/keep supernatant;  
7 Centrifuge again at faster speed  
8 Chloroplasts are in pellet (formed by second centrifugation); 6 max
- Total 15