version 1.1

GCE 2005
January Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Biology Specification A

BYA1 Molecules, Cells and Systems

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

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales 3644723 and a registered charity number 1073334. Registered address AQA, Devas Street, Manchester. M15 6EX. *Dr Michael Cresswell Director General*

BYA1

Question 1

(a)		(Small alveoli with) large surface area; For diffusion;		2
(b)	(i)	Epithelium / epithelial/squamous/pavement cells; *Reject endothelium.*		1
	(ii)	0.11 μm;		1
(c)	(i)	Less oxygen / more carbon dioxide / more water vapour; *Two differences required, but only one mark for this part of the question.*		1
	(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

Total 9 marks

Question 2

(a)	(i)	(Grinding) breaks open cells / increases surface area (of liver); Releases catalase/enzyme/more catalase / allows more hydrogen peroxide into liver;		2
	(ii)	Heating causes bonds (maintaining tertiary structure) to break; Denatures / changes tertiary structure; Active site changed; Substrate no longer fits / ES complex not formed;	max	3
(b)		(Control) to show that sand did not affect reaction (with ground liver);		1
(c)	(i)	Lower activation energy / less energy required to bring about reaction;		1
	(ii)	Energy in products/water and oxygen less than energy in substrate/ reactants/hydrogen peroxide; (Difference) given out as heat / exothermic;		2

Total 9 marks

Question 3

(a) (i) (Molecule) made up of many identical/similar molecules/monomers/ subunits; 1
Not necessary to refer to similarity with monomers.

(ii) Cellulose / glycogen / nucleic acid / DNA / RNA; 1

(b) (i) To keep pH constant;
A change in pH will slow the rate of the reaction / denature the amylase / optimum for reaction; 2

(ii) Purple/lilac/mauve/violet; 1
Do not allow blue or pink.

(iii) Protein present;
The enzyme/amylase is a protein;
Not used up in the reaction / still present at the end of the reaction; max 2

Total 7 marks

Question 4

(a) Any two from:

Loop of DNA;	Non-cellulose cell wall;
Plasmid;	Capsule;
Flagellum;	Mesosome;

2
Accept small ribosomes

(b) (i) (Granules) turn blue-black/dark blue/black/purple with iodine; 1

(ii) Cellulose / pectin; 1

(c) Use principle:
Feature of starch;
Consequence in terms of storage;

e.g.
Insoluble;
Therefore will not "wash" out of cell / affect water potential / affect osmosis;
OR
Molecule coiled/branched;
Therefore large amount stored in small space / compact
OR
Does not affect water potential;
So no effect on entry of water (into cell); 2

Total 6 marks

Question 5

(a) Does not have the resolution / cannot distinguish between points this close together;
As light has longer wavelength; 2
The key ideas in marking this part of the question are resolution and wavelength.

(b) Lipid soluble / small / non-polar / not charged; 1

(c) (i) Concentration <u>of sodium ions</u> (outside cell);
As concentration/independent variable increases so does the rate of diffusion; 2

(ii) Sodium ions are passing through the channels/pores;
At their maximum rate;
Rate is limited by the number of sodium channels / another limiting factor; max 2

Total 7 marks

Question 6

(a) (i) Impulse to diaphragm;
Diaphragm contracts/flattens; 2
Ignore references to intercostal muscles.

(ii) Muscles (associated with breathing) relax; 1

(b) Produces lower pressure (and air moves in down pressure gradient); 1

(c) (i) Rate of diffusion $\propto$ /= $\frac{\text{(Surface) area x Difference in concentration / Conc. Gradient}}{\text{Thickness (of exchange surface)}}$ 1

(ii) Rate of diffusion is proportional to concentration gradient / difference in concentration;
Breathing changes air / maintains gradient; 2

Total 7 marks

Question 7

(a)		Lymphocyte has round nucleus; Granulocyte has lobed nucleus;		2
(b)	(i)	Mitochondria site of respiration; Production of ATP / release of energy; For contraction; *Do not award credit for making or producing energy.*		3
	(ii)	Enzymes are proteins; Proteins synthesised/made on ribosomes;		2
(c)		Lysosomes produce/contain enzymes; Which break down/hydrolyse proteins/substances/cells of tail;		2
(d)		1. Chop up (accept any reference to crude breaking up); 2. Cold; 3. Buffer solution; 4. Isotonic / same water potential; 5. Filter and centrifuge filtrate; 6. Centrifuge supernatant; 7. At higher speed; 8. Chloroplasts in (second) pellet;	max	6

Total 15 marks

Question 8

(a)		0.1 – 0.6 seconds; Volume (in left ventricle) increasing / ventricle filling;		2
(b)	(i)	2 marks for correct answer of 75 (beats) per minute; 1 mark if heart beat correctly identified as lasting 0.8 seconds;		2
	(ii)	70 cm^3;		1
(c)		Multiply them;		1
(d)		750; *Accept a small increase – up to 800 cm^3*		1
(e)	(i)	4 : 1 / 4; *Ratio must be expressed in simplest terms*		1
	(ii)	18 cm^3;		1
(f)		1. Thick wall of artery; 2. Allowing it to withstand (higher) pressure; OR 1. Thin wall of vein; 2. Does not 'need' to withstand pressure; 3. Both have endothelium/epithelium; 4. Consisting of squamous/flat cells; 5. Reduces friction with blood / allows smooth flow of blood; 6. Muscle which may contract and alter vessel diameter / divert blood; 7. Elastin smoothes out pressure / stretches and recoils; 8. Valves in veins; 9. Prevent backflow of blood;	max	6

Total 15 marks