



General Certificate of Education

Biology/Human Biology 5411/5413 *Specification A*

BYA1 Molecules, Cells and Systems

Mark Scheme

2005 examination – June series

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.

BYA1

Question 1

- | | | |
|---------|---|---------|
| (a) | presence of nuclei; | 1 |
| (b) (i) | 1 mark growth clearly calculated from difference between lengths at beginning and end of lesson | |
| | 2 marks correct answer of 300 μm
<i>(Allow for slight measurement errors)</i> | 2 |
| (ii) | <u>divide</u> by time (between measurements); | 1 |
| (c) | blue-black/dark blue/purple/black;
iodine added to slide/specimen /granules; | 2 |
| | | Total 6 |
-

Question 2

- | | | |
|---------|--|----------|
| (a) (i) | C and D ; | 1 |
| (ii) | left ventricle with thicker wall/more muscle / (muscle in) left ventricle contracts <u>more</u> forcefully/beats more strongly; | 1 |
| (b) | higher in atria/lower in ventricles;
atrioventricular valves/valves between atria and ventricles open;
<i>(position of valves must be identified. Do not accept an unqualified reference to valves. Assume pronouns refer to atria.)</i> | 2 |
| (c) (i) | atrioventricular node/AVN; | 1 |
| (ii) | bundle of His/Purkyne tissue/Purkynje tissue; | 1 |
| (d) (i) | allows blood to pass into ventricles/from atria/so that atria can empty;
before ventricles contract; | 2 |
| (ii) | ventricle contracts from base /upwards;
blood pushed through B and C /arteries/all blood ejected; | 2 |
| | | Total 10 |
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Question 3

- | | | | |
|-----|------|--|---------|
| (a) | (i) | less at A /more at B ;
<i>(accept inspiration and expiration as equivalent to A and B)</i> | 1 |
| | (ii) | carbon dioxide diffuses/passes/ into alveoli/from blood;
as higher concentration in blood/low concentration in alveolus;
<i>*(first mark for site and direction, second for cause)</i> | 2 |
| (b) | | curve increases;
<i>(reject if decreases)</i>
then levels out; | 2 |
| (c) | (i) | contract;
ribs move upwards/out;
increasing volume/decreasing pressure in chest/thorax/lungs; | 3 |
| | (ii) | intercostal muscles relax;
<i>(if you can ignore ref to internal contracting, do so)</i> | 1 |
| | | | Total 9 |

Question 4

- | | | |
|-----|---|---------|
| (a) | diagram showing molecule A fitting in inhibition site;
distortion of active site; | 2 |
| (b) | molecules moving less/slower;
reduces chance of collision (between enzyme and substrate)/of
enzyme-substrate complexes being formed;
<i>(reject converse)</i> | 2 |
| (c) | these bonds hold/maintain tertiary/globular structure (of enzyme);
enzyme denatured/tertiary structures destroyed;
(shape of) active site distorted/changes;
substrate no longer fits/enzyme-substrate complex not formed; | 3 max |
| | | Total 7 |

Question 5

- (a) removes debris/intact cells/sand;
which would contaminate sediment A/interfere with the results; 2
- (b) (i) nuclei; 1
- (ii) ribosomes/endoplasmic reticulum/membrane/Golgi; 1
- (c) density/size/mass/weight; 1
- (d) an electron microscope has a higher resolution;
electrons with shorter wavelength; 2
- Total 7
-

Question 6

- (a) made of (different) tissues/specified tissues; 1
- (b) (i) 20 μm as it consists of endothelium only/does not contain muscle,
connective tissues and elastic tissue; 1
(consider other answers and credit understanding.)
- (ii) 1 mark calculation derived from diameter - ($2 \times$ wall thickness)/
answer of 3mm; 2
2 marks 2mm/2000 μm ; 2
- (c) stretches as a result of high pressure/surge of blood;
then recoils; 2
- Total 6
-

Question 7

- (a) (i) both are polymers/polysaccharides/built up from many sugar units/
both contain glycosidic bonds/
contain (C)arbon, (H)ydrogen and (O)xygen; 1
- (ii) hemicellulose shorter/smaller than cellulose/fewer carbons;
hemicellulose from pentose/five-carbon sugars and cellulose from
hexose/glucose/six-carbon sugars; 2
(only credit answers which compare like with like.)
- (b) protein/nucleic acid/enzyme/RNA/DNA/starch/amylose/amylopectin/
polypeptide; 1
- (c) (i) to make sure that all the water has been lost; 1
- (ii) only water given off below 90°C;
(above 90°C) other substances straw burnt/oxidised/broken down;
and lost as gas/produce loss in mass; 2 max
- (d) enzymes are specific;
shape of lignin molecules;
will not fit active site (of enzyme);
- OR*
- shape of active site (of enzyme);
will not fit molecule; 2 max
- (e) 1. made from β-glucose;
2. joined by condensation/removing molecule of water/glycosidic bond;
3. 1 : 4 link specified or described;
4. "flipping over" of alternate molecules;
5. hydrogen bonds linking chains/long straight chains;
6. cellulose makes cell walls strong/cellulose fibres are strong;
7. can resist turgor pressure/osmotic pressure/pulling forces;
8. bond difficult to break;
9. resists digestion/action of microorganisms/enzymes; 6 max
(allow maximum of 4 marks for structural features)

Total 15

Question 8

- (a) greater rate of oxygen consumption/leads to greater rate of respiration/
and greater rate of uptake;
*(allow this mark even if spread through account but cause and effect
must be within the correct context)*
oxygen required for respiration;
respiration produces ATP/releases energy;
(ignore ref to producing or making energy)
potassium ions taken up by active transport/against concentration
gradient; 4
- (b) (i) 0.25 (mol dm⁻³); 1
- (ii) 1 mark Incorrect answer but derived from ratio of 1.2 and initial length
of 90 mm
2 marks Correct answer of 108 mm; 2
- (iii) water potential inside potato higher/less negative than in solution;
water moves out by osmosis; 2
- (c) 1. hydrostatic pressure greater than osmotic effect (at arteriole end);
2. forces;
3. small molecules/ions/water/named examples out;
4. proteins too large to move out/stay in blood because of large size;
5. lower/more negative water potential at venule end (than at arteriole end);
6. (at venule end) osmotic “effect” greater than hydrostatic pressure;
7. water moves back in;
8. by osmosis; 6 max

Total 15
