



**General Certificate of Education**

**Human Biology 1406**

**HBIO1      The body and its diseases**

**Mark Scheme**

*2009 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.

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

Copyright © 2009 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	Part	Sub Part	Marking Guidance	Mark	Comments
1	a		X = mitochondria; Y = (rough) endoplasmic reticulum;	2	<i>Accept ribosomes/ER/RER for Y</i> <i>Reject smooth endoplasmic reticulum for Y</i>
1	b	i	(Sections cut at) different angles/in different planes;	1	<i>Ignore name given to organelle</i>
1	b	ii	Z modifies/packages/transportes/secretetes mucus/ Z adds sugars to proteins; X provides ATP/energy( for this);	2	<i>Accept makes in relation to Z but not X</i> <i>Ignore names of organelles if function correct</i>

---

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	a		Protein / molecule/glycoprotein; On surface of cell/microorganism; Stimulates immune response/production of antibodies;	2 max	
2	b		Zookeeper is not producing antibodies/passive immunity; No memory cells made;  OR Antivenom is an antigen/stimulates production of (anti-antivenom) antibodies; (Antivenom) destroyed by zookeeper's own antibodies;  OR Antibody destroys antigen/venom; Before immune response/no immune response;	2	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	a		Cotinine is an antigen; Antigen/cotinine binds to (specific) T-cell/activates T-cell; T-cell activates B-cells; Specific B cell becomes activated; (Specific) B cell divides/ clonal expansion; Forms (clone of) plasma cells; (Plasma) cell produces antibodies;	4 max	<i>Accept macrophage presents antigen for one mark</i> <i>Ignore references to memory cells and secondary immune response</i>
3	b		Antibodies are proteins with tertiary structure/specific shape/binding sites; Antibodies specific shape for cotinine; Only cotinine fits;	2	<i>Do not credit active site</i>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	a		Shape of enzyme/tertiary structure changes; Changes in hydrogen/ionic/weak bonds; Active site changes (shape); Substrate no longer fits/ES complex no longer formed/induced fit doesn't happen;	3 max	<i>Accept denaturation as alternative to first point</i>
4	b		Substrate concentration; Temperature; Enzyme concentration;	2 max	<i>Accept inhibitors</i> <i>Accept 'amount of' for concentration in points 1 and 3</i>  <i>Assume 'concentration' on its own is referring to enzyme (as word 'enzyme' is in stem)</i>
4	c		Water potential of bacterial cell is more negative than WP of plasma/outside; (Net movement of water) down a WP gradient into bacterial cell/water enters cell by osmosis; Cell wall not present to stop bursting/pressure increases inside cell/ cell wall loses structural strength;	3	<i>Accept converse argument about water loss</i> <i>Accept references to osmotic pressure and osmotic gradients, or concentrations and osmosis in the correct context</i>

---

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	a		Inactivity causes pooling of blood (in veins); No muscle contraction/pressure acting on veins; Less circulation/ reduced blood flow; Leads to blood clot formation;	2 max	<i>Pooling may be described</i>
5	b		(Venous) blood flows to right atrium/enters right side of heart; Leaves heart via pulmonary artery/goes to lungs; Capillary network in lungs gets blocked; Pieces of clot/thrombus do not reach arteries in heart/coronary arteries;	3 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	a	i	<p>Atrio-ventricular valve opens D</p> <p>Atrio-ventricular valve closes A;</p> <p>Semi-lunar valves open B</p> <p>Semi-lunar valves close C;</p>	2	<i>One mark for each correct pair of answers</i>
6	a	ii	$60/0.8 = 75$ ;;	2	<i>Allow one mark for 60/0.8</i>
6	a	iii	<p>Lower than pressure in left ventricle;</p> <p>Same pattern as left ventricle;</p>	2	
6	b		<p>Heart is myogenic;</p> <p>SAN initiates beat;</p> <p>SAN generates impulses(that cause contraction);</p>	2	<i>Do not allow messages, signals etc</i>



Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a		Hydrolysis;	1	<i>Accept breaking of peptide bonds</i>
7	b		Adding fluorine changes shape/different shape from other proteins; Do not fit active site (of protease); Induced fit not produced;	2 max	
7	c	i	Suitable example; e.g. Flaming spreader/ use lid of Petri dish as umbrella/ clean bench with disinfectant/ sterilise agar in autoclave;	1	<i>Ignore references to wearing gloves, unless suitably qualified and unqualified references to 'clean'</i>
7	c	ii	All the AMPs killed/inhibited the bacteria/AMPs with fluorine more effective than frog AMP; Not all fluorine AMPs are equally effective; Diameter/area of clear zone indicates effectiveness; Only used one kind of bacterium/need to repeat using other bacteria; Need to repeat the investigation/only one plate used; Credit suitable measurements or calculations;	3 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	a		A = envelope/membrane/phospholipid (bilayer); B = capsid / nucleocapsid / capsomere / protein;	2	
8	b	i	(HIV is) invading cells which make new viruses; Cells release viruses into blood;	2	
8	b	ii	Virus remains dormant/exists as provirus/exists as DNA in host DNA;	1	<i>Accept virus stays in cells</i>
8	c		HIV destroys T cells; More (free) viruses produced leads to fall in T-cells; (So fewer) T-cells activate B-cells/memory cells; Reduced/no antibody production; Immune system not working properly/inability to fight infection; Opportunistic infections;	4 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9	a	i	This condition might cause an abnormal heart rate/betablocker might be harmful;	1	
9	a	ii	So that nothing else affected heart rate/other medicines might alter heart rate; Might interfere with/change beta blocker activity; Removes a (possible) variable;	2	<i>Credit suitable suggestion about effect of other medicines, e.g. occupy receptors that betablockers fit into/bind to betablockers</i>
9	b		Reduces heart rate; Stays constant (throughout concert); Suitable use of figures; Suitable comparison with placebo;	2 max	
9	c		Three suitable reasons, eg Small sample size; Wide age range; Uneven/different numbers of males and females; Heart rates of 2 groups different before performance; Should have repeated the investigation/only one trial used; The musicians might not admit to taking other drugs;	3 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
10	a	i	Both contain fatty acids/carbon/hydrogen/oxygen/CHO;	1	
10	a	ii	Different shape from normal fat; Detail, e.g. does not contain glycerol/more fatty acids; Does not fit active site of enzyme/lipase; No E-S complex formed; No enzyme present to digest it;	4 max	
10	b	i	So that no bias was introduced/reporting of symptoms might be affected;	1	
10	b	ii	Selected at random; To avoid bias;  OR  Matched (to experimental group); So groups similar/named variable the same;  Same diet as group with Olestra; But eating normal fat/no Olestra; Other conditions the same/specific example;	3	<i>Accept description of how to achieve random or matched groupings</i>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
10	c		<p>(Yes)            For use with people who are morbidly obese;            Risks of side-effects out-weighed by health risks;            Reduces chance of obesity/diet high in fats leading to obesity;            Named consequence, e.g. CHD / diabetes;            Used in foods that are major cause of obesity;</p> <p>(No)            Side-effects unpleasant;            May affect taste of food;            Person does not change the kinds of food they eat;            Does not encourage eating fresh fruit and vegetables;            Person still eating a lot of 'junk'/processed food;            Doesn't necessarily affect total energy intake/could take in more carbohydrate;            Could affect uptake of fat-soluble vitamins;</p>	5 max	<i>Max 4 if candidate only addresses one side of the issue</i>
10	d		<ol style="list-style-type: none"> <li>1. Fatty diet can be a source of (more) cholesterol;</li> <li>2. Leads to higher blood cholesterol;</li> <li>3. Fatty deposits/atheroma;</li> <li>4. In wall of artery;</li> <li>5. Obstructs blood flow/creates turbulence;</li> <li>6. Blood clot forms/embolus;</li> <li>7. Travels in blood to place where artery narrowed;</li> <li>8. MI caused by blockage of coronary artery;</li> <li>9. Reduces blood/oxygen/glucose supply to heart <u>muscle</u>;</li> <li>10. Heart muscle (cells) die;</li> </ol>	6 max	<i>Accept for 1 mark a reference to higher concentration of LDLs</i>