



General Certificate of Education

Human Biology 1406

HBIO1 The body and its diseases

Mark Scheme

2009 examination - January 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

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		A , right atrium; B , atrioventricular/tricuspid valve; C , left ventricle;	3	1 mark lost if right and left wrong way round/not identified
1	b	i	Produces electrical activity/impulses (in response to electrical activity from SAN)/passes on electrical activity from SAN/time delay/passes on impulses;	1	Q – loss of one mark for signal/message Reject – impulses to atria Accept – passes electrical impulses to bundle of His/ventricles
1	b	ii	Carry electrical activity/impulses from AVN; To ventricles; Causing contraction (of ventricles) from base/simultaneously;	2 max	Accept – signals/messages Accept ‘heart <u>muscle</u> ’ Accept – to/from apex of heart

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	a	i	Ribosome(s);	1	
2	a	ii	Plasma/cell (surface) membrane;	1	Accept – membrane unless disqualify with, e.g. nuclear membrane
2	b		<p>Two suitable comparisons, accepting bacterial cell has;;</p> <p>Examples, Bacterial cell has capsule/slime layer; Cell wall; (Bacterial) flagellum; Mesosome; Different size ribosomes; Circular DNA; Human cell has nucleus; Membrane-bound organelles; Two named examples of membrane-bound organelles;;</p>	2 max	Reject ref to thin and flat
2	c		Carry genetic information/genes;	1	Reject/ignore – to carry DNA - to carry genetic code Accept – genetic material with coded information – - information for protein synthesis Ignore – genetic material on its own

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	a		Polar/ionic; Hydrogen; S-S;	2 max	Accept – disulphide Reject - sulphide
3	b		Hydrolysis;	1	
3	c		<u>Distance moved by spot</u> distance moved by solvent ; 55 – 59mm and 71 – 73mm; Valine;	3	First point awarded even if numbers wrong – if clear

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	a		(Interaction of) enzyme (and substrate) changes shape; When enzyme interacts/fits with/into with substrate; Forming <u>active site</u> /giving (complementary) shape fit between <u>active site</u> and substrate;	2 max	No ref. to active site for first two marks Must be clear that interaction with substrate leads to shape change and fit Reject – Lock and key descriptions
4	b		As temperature increases, Greater <u>kinetic</u> energy; Molecules move faster; Greater chance/number of (effective) collisions; Greater chance/number of ES complex forming; Ref. to more likely to have (enough) activation energy;	3 max	Accept converse statements relating to cooling Q – penalise 1 mark for 'dead' or 'used up' enzymes

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	a		Lactose intolerance in babies/babies don't make/have lactase; Lactose (in milk) causes colic/crying/discomfort; Lactase breaks down lactose/milk sugar;	2 max	
5	b		To avoid prejudice/bias from <u>mother</u> (when recording crying);	1	Accept for mother – she/they/their Accept – to avoid mothers being concerned that their child has lactose intolerance. Q - Reject vague ref. to fair test/avoid bias with no ref. to mothers.
5	c		One variable; with explanation; Example, Type of milk used; So same concentration of lactose; Same age of children; Change in enzyme production with age; Same age of children; Change in milk consumption with age; Same volume of milk (per kg baby); So same dosage (of lactose);	2 max	Accept ref. to controlling other factors in diet Reject – time in the context of duration of investigation, given in stem Accept – e.g. time of feeding each day Accept temperature of milk, related to action of lactase enzyme
5	d		There is a decrease in crying; Could be other causes/symptoms of colic; Babies might cry for reasons besides colic/might have colic and not cry/can't be sure they have colic, they can't talk; Don't know number of babies in trial/need a larger study; So don't know how reliable mean is; Standard deviation not given/spread of data; So don't know whether difference is significant;	3 max	

				Babies still crying (for 1.43 hours); Recording by mothers might not be reliable; Longer running study to make sure effect (of lactase) lasts;		
--	--	--	--	--	--	--

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	a		<p>Faulty (CFTR) gene/protein; Can't transport/move/pass chloride ions out of cells/into mucus/chloride ions stay in cells; Water potential of mucus not low enough; Mucus doesn't take up water (by osmosis)/water moves into cells;</p>	3 max	<p>Accept – faulty CFTR</p> <p>Accept ref. to relative wp of cell</p>
6	b		<p>Children with CF have higher LCI (than healthy children)/use of figures (5 to 8 for healthy and 6 to 15 for CF); No (apparent) correlation with age; Some overlap between CF and healthy/greater variability in CF; Children with CF have (thick) mucus in airways; Children with CF lose elasticity of lungs; (Blockage by mucus) makes ventilation/breathing difficult; Some CF in healthy range because of (improved) treatment; Depends on the severity of CF/symptoms when you measured it;</p>	4 max	<p>Accept converse arguments</p> <p>Accept – smaller range in healthy</p> <p>Reject ref. to blocking lungs</p>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a		Enters cells; Divides; Produces endotoxin/ produces toxin when it dies; That kills cells/produces inflammation;	2 max	
7	b	i	Only <i>Salmonella</i> binds to <u>antibody</u> /other bacteria do not <u>bind</u> to antibody/ <u>this antibody is specific to antigen on Salmonella</u> ; (So) only <i>Salmonella</i> removed with beads;	1 max	Accept other words meaning 'bind'
7	b	ii	Counting colonies gives the number of bacteria/ one colony = 1 bacterium from solution; Each bacterium (divides to) give a colony;	2	
7	b	iii	Two examples of aseptic technique;; Examples, Wipe work surfaces with disinfectant (before and after use); Wash hands before/wear sterile gloves; Use sterile solution (to re-suspend bacteria); Flame (suitable example of) equipment (before/after inoculation);	2 max	Reject just – 'Use sterile technique/equipment' or similar Note – these are <i>examples</i> Ignore vague references to 'heating' equipment

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	a		<p>Rise in blood <u>glucose</u> (after eating a food)/a measure of the rate of absorption of <u>glucose</u>;</p> <p>A measure of how quickly carbohydrates from different foods appear as blood sugar;</p> <p>Compared to the rise with pure glucose/white bread;</p>	2	<p>Accept – ability to raise blood glucose</p> <p>Ignore – ‘affects’ blood glucose</p> <p>Ignore – just glucose ‘released’, since could be digestion</p>
8	b		<p>Fibre increases greatly/significantly (so more plant material);</p> <p>No great change in protein (so same meat);</p> <p>No great change in fat (so same meat);</p> <p>Ref. to SDs (in context of means) and spread of data;</p>	3	
8	c	i	<p>With LGI diet,</p> <p>Lower blood glucose overnight/peaks after mealtimes/greater or more fluctuations;</p> <p>Also lower in late afternoon/early evening/almost always lower;</p> <p>Mean LGI lower;</p>	2	
8	c	ii	<p>Higher <u>fibre</u> reduces absorption/intake/slows release/digestion of glucose;</p> <p>Less glucose in diet to be <u>absorbed</u>;</p>	1 max	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
9	a		Damage to <u>lining</u> of artery/endothelium; Fatty streaks/deposits; (Of) macrophages/ foam cells/ lymphocytes; Containing LDL/cholesterol; Layers of (smooth) muscle cells; Calcification/calcareous deposits (or described); (Fibrous) plaque/connective tissue with muscle cells/ dead white cells;	3 max	Q – reject ref. to epithelium Reject plaque in context of fat
9	b	i	Increase in BMI <u>and</u> WHR positive correlation/ increases with increase in protein; So (likely) increase in atheroma with obesity;	2	Note – stem relates BMI and WHR to obesity = implied Assume references to both unless stated otherwise – e.g. ‘they’ increase as protein increases
9	b	ii	WHR (no mark), Data points more closely clustered (about line of best fit); So stronger correlation; So fewer mistakes in identification/false positive/negatives (as indicator);	2	
9	b	iii	Uses mass which isn’t all due to fat;	1	

Question	Part	Sub Part	Marking Guidance	Mark	Comments
10	a		Antibiotics only kill bacteria; Antibiotics work against parts of cells; Example of part of cell affected (e.g. ribosome); Viruses are not cells/have no cell components/no metabolism;	2 max	Accept – antibiotics kill cells
10	b		Lymph vessels drain tissue fluid; Tissue fluid formed but not drained;	2	Q – fluid, not water
10	c		<ol style="list-style-type: none"> 1 Three different viruses (in vaccine); 2 With antigen (on each virus); 3 Different for each (virus); 4 Macrophage/phagocyte presents antigen; 5 Binds to/activates (receptor protein on) T-cells; 6 T-cells activate B-cell; 7 Antigen binds to antibody on B-cell; 8 (This) B-cell divides/ clonal selection; 9 Different clone/antibody against each virus; 10 Plasma cells/B cells secrete antibody; 11 Memory cells formed (B and/or T); 12 Vaccine provokes (primary immune) response; 13 Memory cells give rapid response in future (preventing development of disease/giving immunity); 	7 max	Q – reject viral cells Q – distinction between antibody and antigen
10	d		Fall in vaccination rate (with MMR)/ parents don't get the vaccination (for their children); (More) children not immune to measles/not protected; Child with measles (more) likely to be in contact with non-vaccinated child; Loss of herd immunity/described;	3 max	Q – distinction between vaccination and immunity
10	e		Yes, Harm claim based on few children, so unreliable; Finnish study many children, so more reliable; Over long time, so more reliable; Finnish also found no lasting gut conditions/very few children affected (31);	4 max	Penalise failure to refer to reliability once. If reliability mentioned once, then assume for other points Reliability could be described

		<p>Diseases cause harm, harm by vaccine unproven/small; (Large scale) outbreak of measles would (probably) produce fatalities/harm to a large number of children; No, Because research only covers gut disorders; Vaccine could have other harmful effects not studied here;</p>	Accept figures
10	f	<p>Very high percentage/millions vaccinated against MMR; So high chance that any child with an illness has received MMR; So positive correlation likely;</p>	2 max