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ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Biology 1411

BIOL1 Biology and disease

Mark Scheme

2010 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.

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Although specific marks are not awarded in questions 1-7, marks will take into account the quality of written communication. Credit will only be awarded where candidates have presented information clearly and coherently and have used the specialist vocabulary indicated in the mark scheme for this unit. Specific references to the quality of written communications are marked **Q** in this mark scheme.

SECTION A

Question	Part	Sub Part	Marking Guidance	Mark	Comments
1	(a)		Low(er) water potential in lumen / intestine / gut; Water enters lumen / leaves (body) cells / by osmosis;	2	Accept: hypertonic instead of low(er) water potential Neutral: water does not leave lumen by osmosis **Q** Water potential must be in the correct context
1	(b)	(i)	(Lactose +) Water; → (Glucose +) Galactose;	2	Accept: H_2O for water
1	(b)	(ii)	Hydrolysis;	1	Accept: if phonetically correct
1	(c)	(i)	(Add Biuret reagent to both solutions) – no mark; Lactase / enzyme will give purple / lilac / mauve; ***OR*** Lactose / reducing sugar will not give purple / lilac / mauve / will remain blue;	1	Neutral: positive / negative result Neutral: incorrect reference to the method
1	(c)	(ii)	Lactase / enzyme is a protein;	1	Accept: lactase / enzyme contains peptide bonds

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	(a)	(i)	Through alveolar <u>epithelium</u>; Through capillary <u>epithelium/endothelium</u>;	2	Accept: Through lining / wall of alveolus <u>and</u> capillary for 1 mark Accept: squamous epithelial cells for 'epithelium' Neutral: alveolar endothelium Neutral: references to diffusion **Q** Correct use of terminology;
2	(a)	(ii)	(Thicker alveolar wall) – no mark (So) Longer <u>diffusion</u> pathway / slower <u>diffusion</u>;	1	Neutral: less diffusion Neutral: references to surface area
2	(b)	(i)	(In alveolus) Brings in air containing a high(er) oxygen concentration; Removes air with a low(er) oxygen concentration;	2	Need the idea of air moving and oxygen concentration Neutral: reference to carbon dioxide concentration
2	(b)	(ii)	Circulation of blood / moving blood;	1	Neutral: blood Neutral: short diffusion pathway

2	(c)		Long time between decrease in mining and increase in cases; Graph shows fluctuations; Correlation does not prove causation / there may be other causes of miner's lung; Improved diagnosis methods; Do not know number of cases / baseline before 1990; Not all cases reported / not all individuals with miner's lung visit a doctor;	2 max	*Accept*: correct use of figures from graph for the first marking point: e.g. cases do not increase until after 2000 / 2001-2004 / 10 years later.

Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	(a)	(i)	Increases then plateaus / constant / steady / rate does not change; Correct reference. to 27/28 units; e.g. increases up to / plateaus at 27/28	2	Neutral: 'peaks' / 'reaches a maximum' / 'stops increasing' / 'no effect' instead of 'plateaus' Reject: rate decreases / reaction stops
3	(a)	(ii)	Substrate concentration / amount of substrate; As substrate concentration increases, rate increases / positive correlation (between rate and substrate concentration);	2	
3	(a)	(iii)	All <u>active sites</u> occupied / saturated / enzyme limiting (rate of reaction) / maximum number of E-S complexes;	1	Reject: enzymes used up Reject: substrate limits rate of reaction Neutral: substrate no longer limits the reaction Neutral: reference to temperature
3	(b)		Curve is lower and plateaus at a higher substrate concentration (it must also start at zero);	1	Accept: curve lower and joins existing curve at final point (with no plateau) Reject: if curve plateaus before original Reject: if curve plateaus lower than original
3	(c)	(i)	Methotrexate / drug is a similar shape / structure to substrate; Binds to / fits / is complementary to <u>active site</u>; Less substrate binds / less enzyme-substrate complexes formed;	2 max	**Q** Reject: same structure / shape **Q** Reject: reacts with active site Accept: substrate cannot bind / enzyme-substrate complex not formed

3	(c)	(ii)	Methotrexate / drug is only similar shape to specific substrate / only fits this <u>active site</u>; ***OR*** Methotrexate / drug is a different shape to other substrates / will not fit other <u>active sites</u>;	1	Assume that 'it' refers to the drug

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	(a)	(i)	Mitochondrion;	1	Neutral: cristae
4	(a)	(ii)	(Site of aerobic) respiration / ATP production / energy release; Active transport / transport against the concentration gradient;	2	**Q** Reject: anaerobic respiration **Q** Reject: energy produced Accept: energy produced in the form of ATP
4	(b)		89 – 91 gains 2 marks; Principle of: correct measured length gains 1 mark; magnification	2	Correct answer gains 2 marks outright 89-91 (mm) / 1000 or 8.9-9.1 (cm) / 1000 gains 1 mark
4	(c)		Suitable explanation given e.g. Reduced surface area; (So) less absorption; (Membrane-bound) enzymes less effective; (So) proteins / polypeptides not digested; Cell membranes damaged; (So) Fewer / less effective carrier / channel proteins; Carrier / channel proteins damaged; (So) less absorption;	2	Accept: converse arguments Neutral: structure **Z** incorrectly named Reduced surface area for absorption gains 2 marks Accept: references to diffusion and active transport for 'absorption' Reject: active transport if linked to channel proteins

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	(a)	(i)	1.08;	1	Must be to 3 significant figures, as in the table
5	(a)	(ii)	Allows comparison / shows proportional change; Idea that discs had different starting masses / weights;	2	*Neutral*: sizes / amounts *Neutral*: different masses
5	(a)	(iii)	(Allows) Anomalies to be identified / effect of anomalies to be reduced / effect of variation in data to be minimised; A <u>mean</u> to be calculated;	2	*Accept:* outliers instead of anomalies *Reject*: idea of not recording anomalies / preventing anomalies from occurring *Neutral:* average
5	(b)	(i)	Plot (sodium chloride) concentration against ratio / draw line of best fit; Find (sodium chloride concentration from the graph) where the ratio is 1 / there is no change in mass;	2	*Reject*: if wrong axes or type of graph
5	(b)	(ii)	Line / curve of best fit is more reliable / precise; Intercept / point where line crosses axis is more reliable / precise; ***OR*** Can plot SD values / error bars; (To show) variability about the mean / how spread out the results are;	2	*Neutral:* graph *Reject*: references to 'more accurate'

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	(a)		Virus / fungus / protozoan;	1	Neutral: named example
6	(b)		Produces toxins; Damages cells / tissues / example given e.g. cell lysis;	2	Neutral: infects / colonises / invades cells
6	(c)	(i)	(Antibodies) produced from a single clone of B cells / plasma cells; ***OR*** (Antibodies) produced from the same B cell / plasma cell;	1	Accept: hybridoma cell line instead of B cell / plasma cell Reject: idea that antibodies are cloned
6	(c)	(ii)	(Specific) primary structure / order of amino acids; (Specific) tertiary / 3D structure; (So) Only binds to / fits / complementary to one antigen;	3	Reject: 'active site' for either point 2. or 3. only once
6	(d)		(Rapid) treatment of carriers / infected cattle / disease; Can isolate / cull carriers / infected cattle; Infected (dairy) products not sold / consumed / tracked; Reduces spread of disease; No need to kill / prevents the death of non-infected animals;	3 max	Neutral: reference to rapid identification of infected cattle Neutral: ethical arguments

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	(a)		1. SAN initiates heartbeat / acts as a pacemaker / myogenic; 2. (SAN) sends wave of electrical activity / impulses (across atria) causing atrial contraction; 3. AVN delays (electrical activity / impulses); 4. (Allowing) atria to empty before ventricles contract / ventricles to fill before they contract; 5. (AVN) sends wave of electrical activity / impulses down Bundle of His / Purkyne fibres; 6. (Causing) ventricles to contract (from base up) / ventricular systole;	5 max	**Q** Must be in context Reject: signals / electronic / messages / nerve impulses once only Neutral: reference to non-conducting tissue delaying impulses instead of the AVN
7	(b)		1. Cholesterol / plaque / lipoprotein / LDL / fatty material / cells; 2. In artery wall / under lining / endothelium of artery / blood vessel; 3. Atheroma linked to blood clot / thrombosis; 4. (Blocks) coronary artery / artery supplying heart muscle / tissue / cells; 5. Reduces oxygen / glucose supply (to heart muscle / tissues / cells); 6. (Heart muscle / tissue / cells) unable to respire / dies;	5 max	Accept: LDL / triglyceride / cell debris; Reject: fatty acids / HDL; **Q** Do not accept references to veins or capillaries as equivalent to blood vessels **Q** Must be in the correct context If coronary artery is not mentioned or described, reference to heart muscle / tissue / cells is needed for 5.