Version 1.0: 11/01/10



General Certificate of Education

Biology 1411

BIOL2 The variety of living organisms

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.

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.

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

Question	Part	Marking Guidance	Mark	Comments
1	(a)	Differentiation/specialisation	1	
1	(b)(i)	(cellulose) Cell wall;	1	
1	(b)(ii)	Two marks for correct answer 2350– 2500;; One mark for a measured length divided by real length;	 2	Accept measured and real lengths in different units for one mark.
1	(b)(iii)	Chloroplasts absorb light; Large vacuole pushes chloroplasts to edge (of cell); Thin/permeable (cell) wall to absorb carbon dioxide;	 1 max	**Q** Do not accept chlorophyll as alternative to chloroplasts

Question	Part	Marking Guidance	Mark	Comments
2	(a)(i)	Phylum, Class, Order, Genus; Mantophasma (M)/(Mantophasma) zephyra;	 2	
2	(a)(ii)	Groups within (larger) groups; No overlap;	 2	
2	(b)	Comparison of/look for similar features/structures/appearance;	1	

Question	Part	Marking Guidance	Mark	Comments
3	(a)(i)	Deoxyribose;	1	pentose / 5C sugar = neutral
3	(a)(ii)	Phosphate/Phosphoric acid;	1	phosphorus/P = neutral
3	(b)	Hydrogen (bonds);	1	
3	(c)	381/384/387;	1	
3	(d)	(Gln) Met Met Arg Arg Arg Asn;	1	
3	(e)	Change in (sequence of) amino acids/primary structure; Change in hydrogen/ionic/disulfide bonds; Alters tertiary structure/active site (of enzyme); Substrate cannot bind / no enzyme-substrate complexes form;	3 max	**Q** Reject = different amino acids are formed

Question	Part	Marking Guidance	Mark	Comments
4	(a)	Increase in/more carbon dioxide; Curve moves to the right/depressed;	2	**Q** Any reference to haemoglobin increasing affinity for oxygen disqualifies second mark point.
4	(b)(i)	More haemoglobin; So can load/pick up more oxygen (in the lungs);	2	**Q** Second mark point must relate to idea of loading oxygen. Answers referring only to transport of oxygen should not be credited this mark.
4	(b)(ii)	(Haemoglobin) has lower affinity for oxygen / more oxygen released; In/to the cells/ tissues;	2	

Question	Part	Marking Guidance	Mark	Comments
5	(a)	Single layer of cells / few layers of cells; So that light that can pass through / cells absorb light;	2	
5	(b)	Method of determining area of field of view/area seen using microscope; Count number of stomata in field of view; Repeats and calculation of mean;	3	
5	(c)	Water <u>vapour</u> accumulates / increased humidity/ reduced air movement (around stomata); Water potential/diffusion gradient reduced;	2	

Question	Part	Marking Guidance	Mark	Comments
6	(a)	(Blood) plasma;	1	
6	(b)	More/larger proteins / less urea/carbon dioxide / more glucose/amino acids/fatty acids/oxygen/ high(hydrostatic) pressure;	1	**Q** Reference to blood cells/water potential = neutral **Q** No Protein should not be credited
6	(c)(i)	Contracts;	1	**Q** Do not accept pumping of heart/heart beating
6	(c)(ii)	Loss of fluid/volume; Friction/resistance (of capillary wall);	1 max	**Q** Reference to a narrow lumen is not sufficient to gain a mark unless friction or resistance is mentioned.
6	(d)	Water potential (in capillary) not as low/is higher/less negative / water potential gradient is reduced; More tissue fluid formed (at arteriole end); Less/no water absorbed (into blood capillary); by osmosis; (into blood capillary);	3 max	**Q** The last two marking points must be in context of movement into the blood capillary

Question	Part	Marking Guidance	Mark	Comments
7	(a)(i)	Two marks for correct answer of 4.3; One mark for incorrect answer that clearly shows understanding of ∑n(n-1) /188 as denominator;	2	**Q** An answer of 4 scores 1 mark
7	(a)(ii)	Measures number of individuals (of each species) and number of species; Some species only present in small numbers;	2	**Q** First marking point can only be awarded if there is a reference to species.
7	(b)(i)	Reduced as one crop/species grown / other species removed; Use of herbicides/weeding/ploughing; Wheat (better) competitor for named factor e.g. light/nutrients;	2 max	
7	(b)(ii)	(Reduced) as less variety of food sources; (Reduced) as fewer habitats/niches; (Reduced) by pesticides/chemicals;	2 max	**Q** Answers only referring to 'less food' should not be credited

Question	Part	Marking Guidance	Mark	Comments
8	(a)	Filaments/lamellae provide large surface area; Thin/flattened epithelium/ one/two cell layers so short diffusion pathway (between water and blood); Countercurrent/blood flow maintains concentration/diffusion gradient;	2 max	**Q** Do not credit thin cell walls/membranes
8	(b)(i)	Large/wide range of values (so can fit on graph);	1	
8	(b)(ii)	Decrease in uptake with increase in mass / negative correlation;	1	
8	(b)(iii)	Enables comparison; As animals differ in size/mass;	2	
8	(b)(iv)	Smaller animals have larger surface area to volume ratio; Lose more heat per gram of tissue; Respire more/faster (relative to body mass); Oxygen used in respiration;	3 max	Allow converse for larger animals. Allow appropriately named animal as an alternative to smaller or larger animals.

Question	Part	Marking Guidance	Mark	Comments
9	(a)	Given only saline; Otherwise treated exactly the same way;	2	
9	(b)	Ethical consideration, e.g., leads to death/suffering of mice; Large number to improve reliability / reduce sampling error; Number of mice related to cost/space available/animal husbandry;	2 max	
9	(c)	Vary in shape / do not grow uniformly;	1	**Q** Allow descriptions of variation in shape.
9	(d)	7.44 and 1.74;; 7.42 and 1.72;; (Ratio) 4.28 : 1;; (Ratio) 4.31 : 1;; (Percentage decrease) 76.6%;; (Percentage decrease) 76.8%;;	2 max	Any of the answers shown gain two marks. An answer of 23.4% or 23.2% Percentage decrease gains one mark. Correct method of calculating rate/ratio/percentage increase with an incorrect answer gains one mark.
9	(e)	Reference to Mitosis; As chromosomes cannot attach (to spindle)/ chromatids cannot separate (on spindle); Cell division/cell cycle slows down;	3	**Q** Do not penalise confusion between chromosomes and chromatids in second marking point **Q** Mitosis slows down = 2 marks **Q** Mitosis stopped = 1mark **Q** Mitosis must be spelt correctly
9	(f)(i)	(Degree of) spread/variation from the mean;	1	

9	(f)(ii)	Both chemicals (on their own) slow down growth/are effective; Taxol is more effective than OGF; Combined treatment (seems) most effective; SD overlap for OGF with taxol and taxol (on its own) so not conclusive/could be chance/both treatments could be equally effective;	4	**Q** Ignore all references to significance

Question	Part	Marking Guidance	Mark	Comments
10	(a)	Recognition of same species; Stimulates release of gametes; Recognition of mate/opposite gender; Indication of sexual maturity/fertility;	2 max	
10	(b)(i)	Internal fertilisation / fertilisation occurs in pouch/limited area;	1	**Q** The term fertilisation is not required in the answer but must be implied.
10	(b)(ii)	Protection from predators (developing in pouch);	1	
10	(c)(i)	Less stress caused to seahorse / quicker/more accurate method / body is curved / head is linear;	1	**Q** Do not accept “easier” unless qualified.
10	(c)(ii)	Head length proportional to body length/or described;	1	
10	(d)	Positive correlation between head/body lengths of male and female/ female and male with similar head/body lengths pair together;	1	
10	(e)	Use line of best fit; And extrapolate/extend line as required;	2	

10	(f)	(Compare) DNA; Sequence of bases/nucleotides; DNA hybridisation; Separate DNA strands / break hydrogen bonds; Mix DNA/strands (of different species); Temperature/heat required to separate (hybrid) strands indicates relationship; Compare same/named protein; Sequence of amino acids /primary structure; <u>Immunological evidence</u> – not a mark Inject (seahorse) protein/serum into animal; (Obtain) antibodies/serum; Add protein/serum/plasma from other (seahorse) species; Amount of precipitate indicates relationship;	6 max	**Q** The marks awarded for reference to DNA and sequence of bases/nucleotides must be in a different context to DNA hybridisation.