Version 1.0

General Certificate of Education (A-level)
January 2012

Biology BIOL2

(Specification 2410)

Unit 2: The Variety of Living Organisms

Final

Mark Scheme

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 events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process 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 standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised 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 from: aqa.org.uk

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.

Question	Marking Guidelines	Mark	Comments
1(a)	1. Granum/grana/thylakoid; 2. Stroma;	2	1. Ignore references to membranes, stacks or discs. Allow phonetic spellings.
1(b)	1. Absorbs/traps/uses light; 2. For photosynthesis; 3. Produces carbohydrates/sugars/ lipids/protein;	2 max	1. Light dependent reaction = marking point 1. 3. Accept any named product of photosynthesis for marking point 3. Reference to light dependent and light independent reactions = two marks
1(c)	Correct answer in range of 2.53 – 2.66;; Any length divided by 30000 = 1 mark;	2	

Question	Marking Guidelines	Mark	Comments
2(a)(i)	Anaphase	1	
2(a)(ii)	1. Sister/identical chromatids/ identical chromosomes; 2. To (opposite) poles/ends/sides;	2	1. Reject: Homologous chromosomes separate. 1. Allow any reference to chromatids/ chromosomes being identical e.g. same DNA
2(b)(i)	1. 8.4/cells with twice DNA content = replicated DNA / late interphase / prophase / metaphase / anaphase; 2. 4.2 = DNA not replicated / (early) interphase / telophase / cell just divided / finished mitosis;	2	1. Any reference to interphase must suggest towards end of interphase. 1. 'Chromosomes replicate' is not enough for DNA replicates.
2(b)(ii)	2.1;	1	

Question	Marking Guidelines	Mark	Comments
3(a)(i)	*Synodontis batensoda* / *S. batensoda;*	1	Ignore spellings
3(a)(ii)	*Mochokus niloticus*;	1	Ignore spellings
3(b)	5;	1	
3(c)(i)	Fertile offspring produced;	1	Allow suitable description of offspring being fertile.
3(c)(ii)	1. Attracts/recognises same species; 2. Attracts/recognises mate/opposite sex; 3. Indication of sexual maturity/ fertility / synchronises mating; 4. Stimulates release of gametes; 5. Form pair bond;	2 max	Attracts mate of the same species = two marks. 3. Allow 'ready to mate'.

Question	Marking Guidelines	Mark	Comments
4(a)(i)	4;	1	
4(a)(ii)	1. Change in amino acid/(sequence of) amino acids/primary structure; 2. Change in hydrogen/ionic/ disulphide bonds; 3. Alters tertiary structure/active site (of enzyme); 4. Substrate not complementary/cannot bind (to enzyme/active site) / no enzyme-substrate complexes form;	3 max	1. Reject = different amino acids are 'formed' 3. Alters 3D structure on its own is not enough for this marking point.
4(b)	1. Lack of skin pigment / pale/light skin / albino; 2. Lack of coordination / muscles action affected;	2 max	
4(c)	Founder effect / colonies split off / migration / interbreeding;	1	Allow description of interbreeding e.g. reproduction between individuals from different populations

Question	Marking Guidelines	Mark	Comments
5(a)(i)	(Human cells) don't have a cell wall;	1	Accept "they" refers to human cells.
5(a)(ii)	(Affects) protein synthesis;	1	Allow description e.g. 'amino acids not joined together / translation. Reject: affects transcription.
5(b)	1. Mutation present/occurs; 2. Resistance gene/allele; 3. Resistant bacteria (survive and) reproduce; 4. Vertical (gene) transmission / Horizontal (gene) transmission / conjugation;	3 max	Ignore antibiotic causes mutation. 1. Reference to immunity disqualifies first credited marking point. 2. Must clearly state marking point 2. Do not award by implication e.g. resistance passed on by vertical gene transmission = one mark (marking point 4) Reference to mitosis negates marking point 3 or 4 (not both marks).
5(c)	1. Horizontal (gene) transmission; 2. Via conjugation/pilus; 3. Plasmid/Gene/DNA replicated/copied; 4. Plasmid transferred (to *S.aureus)*;	3 max	Ignore reference to mitosis

Question	Marking Guidelines	Mark	Comments
6(a)	1. Amino acid sequences / primary structure; 2. Closer the (amino acid) sequence the closer the relationship; 3. (Protein structure) related to (DNA) base/triplet sequence;	2 max	More closely related (species) have more similarities in amino acid sequence/primary structure = two marks; Amino acid sequence is related to (DNA) base/triplet sequence = two marks;
6(b)	1. Reference to base triplets/triplet code / more bases than amino acids / longer base sequence than amino acid sequence; 2. Introns / non-coding DNA; 3. Degeneracy of code / more than one code for each amino acid;	2 max	Different (base) triplets code for same amino acids = 2 marks; Degeneracy of triplet code = 2 marks Ignore reference to codon. 3. Allow 'more than one base sequence can code for a protein';
6(c)	1. Most closely related to chimpanzee; 2. Least closely related to trout;	2	

Question	Marking Guidelines	Mark	Comments
7(a)(i)	Produces a more reliable mean/average / makes sure sample was representative / reduce effect of extreme values / identify anomalies;	1	Ignore references to chance
7(a)(ii)	Removes bias;	1	
7(b)	Two marks for correct answer of 5.8;; One mark for incorrect answer that clearly shows denominator as 216;	2	
7(c)	1. Increase in variety of plants/shrubs/grass; 2. More habitats/niches; 3. Greater variety of food sources / more food sources;	3	3. Answers only referring to 'more food' should not be credited

Question	Marking Guidelines	Mark	Comments
8(a)	1. Active transport by endodermis; 2. ions/salts into xylem; 3. Lowers water potential (in xylem); 4. (Water enters) by osmosis;	3 max	4. Allow mark point 4 in any context of water movement in the root e.g. into root hair.
8(b)(i)	1. Increases then decreases; 2. Peak/maximum at 13.00/14.00 (hours)/ 7.8 – 8.0;	2	Allow peak/maximum at any time between 13.00 – 14.00 or 7.8 – 8.0;
8(b)(ii)	1. Maximum/overall rate is higher (in branches); 2. Reaches maximum/peak earlier (in the day) (in branches); 3. Starts higher / ends lower (in branches)	2	Allow converse for all marking points.
8(b)(iii)	1. Movement starts/peaks earlier in branches/higher up; 2. Creates tension/'negative pressure'/'pull';	2	

Question	Marking Guidelines	Mark	Comments
9(a)	1. Haemoglobin carries oxygen / has a high affinity for oxygen / oxyhaemoglobin; 2. In red blood cells; 3. Loading/uptake/association in lungs; 4. at <u>high p.O_2</u>; 5. Unloads/ dissociates / releases to respiring cells/tissues; 6. <u>at low p.O_2</u>; 7. Unloading linked to higher carbon dioxide (concentration);	6 max	7. Ignore reference to incorrect pH in relation to effect of higher carbon dioxide concentrations for marking point 7.
9(b)	1. Allows comparison; 2. (Different temperature) affects enzymes; 3. (Different temperature) affects respiration/metabolism; 4. (Different temperature) affects amount of dissolved oxygen;	2 max	Do not credit 'temperature affects results' on its own; 2. Allow reference to denaturation of enzymes.
9(c)	1. Increases then levels out / stops increasing / fluctuates slightly; 2. At 5 (cm^3 dm^{-3}) / 320 (cm^3 $g^{-1}h^{-1}$);	2	Allow description of 'fluctuates slightly' in terms of candidate quoting figures after 320.
9(d)	1. *Chronimus longistylus* has high<u>er</u> uptake at low (oxygen) concentrations; 2. (Higher uptake) up to 2 cm^3 dm^{-3};	2	*Chronimus longistylus* has higher uptake to (oxygen concentration of) 2 / lower uptake after 2;; (= 2 marks) 2. Award mark if candidate uses figures from table e.g. higher at concentration 1 (220) <u>or</u> concentration 2 (285). Higher uptake at concentration 1 <u>or</u> 2 = 2 marks.
9(e)(i)	More (than in African) lost via gills in Australian lungfish / less (than African) lost via lungs in Australian lungfish;	1	

9(e)(ii)	1. More/most exchange is via lungs (in African lungfish); 2. Gills will not function/function less efficiently (in air);	2	1. Allow converse for first point. 2. Allow water is required for gills to function.

Question	Marking Guidelines	Mark	Comments
10(a)(i)	1. Sex; 2. Lifestyle; 3. Body mass; 4. Health; 5. Ethnicity; 6. Genetic factors / family history;	2 max	Stress, smoking, diet etc are examples of lifestyle. 3. Allow weight for mark point 3. Reject: height.
10(a)(ii)	1. Large sample/number / 410 000; 2. Long time period / 8.5/many years; 3. Different countries / more than one country;	2	Reject: random
10(b)	Correct answer of 209/209.1 = 2 marks;; Incorrect answer but multiplies by 8.5 = 1 mark;	2	Answer of 210 = one mark
10(c)	Age affects risk of cancer;	1	Must relate to cancer not just to illness
10(d)	1. Correlation does not mean causal relationship; 2. Tea/coffee contains other substances; 3. Contain different amounts of caffeine; 4. Estimated intake (of tea/coffee); 5. No control group; 6. Only one type of cancer studied; 7. Further studies required / only one investigation/study/group;	4 max	1. Reject casual for point 1. Reference to ‘due to other factors’ on its own is not enough for a mark
10(e)(i)	1. Treated the same; 2. No caffeine;	2	2. Accept decaffeinated 2. Reject ‘placebo.

10(e)(ii)	1. Absorb different amounts; 2. Broken down by enzymes/digested; 3. Different blood volumes; 4. Differences in metabolism; 5. Caffeine from a different source;	1 max	Reject: Different body masses

10(e)(iii)	1. Less oxygen/glucose to (cancer) cells; 2. Less carcinogens; 3. Reduces spread of cancer (cells);	1 max	'Reduces cell division' on its own should not be credited.