Version 1.0

General Certificate of Education (A-level)
January 2013

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 students' 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 students' 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 students' 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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<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>1(a)</td><td>
<table>
<tr><td>Statement</td><td>Starch</td><td>Cellulose</td><td>Glycogen</td></tr>
<tr><td>Found in plant cells</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>Contains glycosidic bonds</td><td>✓</td><td>✓</td><td>✓</td></tr>
<tr><td>Contains β-glucose</td><td></td><td>✓</td><td></td></tr>
</table>
</td><td>3</td><td>One mark for each correct row</td></tr>
<tr><td>1(b)</td><td>Hydrolysis;</td><td>1</td><td>Accept: if phonetically correct

Do not accept: ‘hydration’</td></tr>
<tr><td>1(c)</td><td>1. Coiled / helical / spiral;
2. (So) compact / tightly packed / can fit (lots) into a small space;
3. Insoluble;
4. (So) no osmotic effect / does not leave cell / does not affect <u>water potential</u>;
5. Large molecule / long chain;
6. (So) does not leave cell / contains large number of glucose units;
7. Branched chains;
8. (So) easy to remove glucose;</td><td>2 max</td><td>Feature = one mark
Explanation = one mark

Note: these are independent marking points

These must be related for <u>both</u> marks but can be in reverse order

4. Accept: prevents osmosis

4. and 6. Accept: can’t cross membranes</td></tr>
<tr><td>1(d)</td><td>Two marks for correct answer of 479-521;;

One mark for incorrect answers in which candidate clearly divides measured length by actual length;</td><td>2</td><td>Accept: measured and actual lengths in different but correct units for 1 mark

The actual range is 23-25 mm, If they just divide this by 48 they gain 1 mark

Just writing the formula is insufficient, numbers must be used</td></tr>
</table>

Question	Marking Guidance	Mark	Comments
2(a)(i)	Made of (different) tissues / more than one tissue;	1	
2(a)(ii)	1. (Muscle) contracts; 2. (Arteriole) narrows/constricts/reduces size of lumen/vessel / vasoconstriction;	2	Assume that 'they' or 'it' = muscle Ignore: references to pressure **Q** Correct context for muscle contracts, vessel constricts
2(b)(i)	Short diffusion distance/pathway;	1	Accept: thin diffusion pathway
2(b)(ii)	(More) time for exchange/diffusion (of substances);	1	Accept: example of more time for specific substance to be exchanged
2(c)	1. Water potential (in capillary) not as low/is higher/less negative / water potential gradient is reduced; 2. Less/no water removed (into capillary); 3. By osmosis (into capillary);	3	Accept: 'blood or plasma' instead of 'capillary' 2. Accept converse: water remains in the tissue 2. **Q** Marking points 2. and 3. must be in the context of movement into the capillary Neutral: reference to more tissue fluid being formed as in the question stem Neutral: reference to lymphatic drainage

<table>
<tr><th>Question</th><th>Marking Guidance</th><th>Mark</th><th>Comments</th></tr>
<tr><td>3(a)</td><td>
<table>
<tr><td>Kingdom</td><td>Animalia</td></tr>
<tr><td>Phylum</td><td>Chordata</td></tr>
<tr><td>Class</td><td>Mammalia</td></tr>
<tr><td>Order</td><td>Carnivora</td></tr>
<tr><td>Family</td><td>Felidae</td></tr>
<tr><td>Genus</td><td>Panthera</td></tr>
<tr><td>Species</td><td>pardus</td></tr>
</table>
</td><td>2</td><td>One mark for each correct column
Do not award mark for last column if ‘<u>P</u>ardus’ is <u>clearly</u> stated
Accept: Panthera pardus in final box</td></tr>
<tr><td>3(b)</td><td>(For the leopard and cheetah)
1. More <u>hydrogen</u> bonds (form);
2. Similar DNA sequence(s) / similar base sequence(s) / more complementary bases / more base pairs;</td><td>2</td><td>Accept converse argument for leopard and puma
Neutral: similar DNA
2. Idea of ‘more’ must be clear</td></tr>
<tr><td>3(c)(i)</td><td>1. Drop in population / many killed / only single female left;
2. Idea of reduced/low genetic variation/diversity / reduction in (variety of) alleles / smaller gene pool;</td><td>2</td><td></td></tr>
<tr><td>3(c)(ii)</td><td>1. Mutation affecting sperm cell or production (in small population);
2. Errors during <u>meiosis;</u>
3. Inbreeding / closely related cheetahs breed;
4. High chance of inheriting allele / high frequency of allele (in the population);</td><td>2 max</td><td>4. Accept: high frequency of homozygous/two recessive alleles</td></tr>
</table>

Question	Marking Guidance	Mark	Comments
4(a)	Variation / differences within the same/a species;	1	
4(b)(i)	1. Identical twins show genetic influence / differences between them show environmental influence; 2. Non-identical twins (also) show an environmental/non-genetic influence;	2	Neutral: allows a comparison It must be clear which set of twins is being referred to Do not credit repetition of bullet points in stem
4(b)(ii)	Genes play a greater role / environment plays a lesser role;	1	Must be comparative Neutral: genes are involved Neutral: involves genes and the environment
4(b)(iii)	Any suitable suggestion for a maximum of two marks e.g.: 1. Age; 2. Sex (non-identical twins); 3. Family/medical history (of mental illness); 4. No use of recreational drugs; 5. Ethnic origins;	2 max	Neutral: 'environment' as in question stem Neutral: unqualified ideas such as health / lifestyle

Question	Marking Guidance	Mark	Comments
5(a)	Open/use tap / add water from reservoir;	1	
5(b)	1. Seal joints / ensure airtight / ensure watertight; 2. Cut shoot under water; 3. Cut shoot at a slant; 4. Dry off leaves; 5. Insert into apparatus under water; 6. Ensure no air bubbles are present; 7. Shut tap; 8. Note where bubble is at start / move bubble to the start position;	2 max	Answer must refer to precautions when setting up the apparatus Ignore: references to keeping other factors constant
5(c)	1. Water used for support/turgidity; 2. Water used in photosynthesis; 3. Water produced in respiration; 4. Apparatus not sealed/'leaks';	2 max	Accept: water used in (the cell's) hydrolysis or condensation (reactions) for one mark. Allow a named example of these reactions
5(d)	As number of leaves are reduced (no mark), 1. Less surface area; 2. Fewer stomata; 3. Less evaporation/transpiration; 4. Less cohesion/tension/pulling (force);	3 max	Accept: converse arguments

Question	Marking Guidance	Mark	Comments
6(a)	1. Cell wall not formed / production inhibited; 2. Lower <u>water potential</u> in bacterium; 3. <u>Water enters</u> and causes lysis/expansion/pressure;	2 max	1. **Q** Accept: weakened cell wall, but do not accept 'cell wall is broken down' 2. Accept: converse 2. Must be clear that the lower water potential is in the bacterium
6(b)	Human cells lack enzyme (**B**)/have a different enzyme/produce different fatty acids/use different substrates;	1	Neutral: 'human cells do not have cell walls' as out of context
6(c)	1. Change in base sequence (of DNA/gene); 2. Change in amino acid sequence / primary structure (of enzyme); 3. Change in hydrogen/ionic/ disulphide bonds; 4. Change in the tertiary structure/active site (of enzyme); 5. Substrate not complementary/cannot bind (to enzyme / active site) / no enzyme-substrate complexes form;	3 max	2. Accept: different amino acids coded for 2. Reject: different amino acids produced 4. Neutral: alters 3D structure /3D shape
6(d)	1. Resistance gene/allele; 2. On plasmid; 3. (Spread by) horizontal transmission; 4. (Involves) conjugation/pilus;	3 max	1. **Q** Reject: if in the context of immunity Neutral: vertical transmission 3. Reject: if any reference to bacteria dividing by mitosis 4. **Q** Ignore: conjunction

Question	Marking Guidance	Mark	Comments
7(a)(i)	(We should maintain biodiversity to) Prevent extinction /loss of populations/ reduction in populations /loss of habitats / save organisms for future generations (idea of);	1	Neutral: references to 'playing God' / animal rights
7(a)(ii)	A suitable example of how some species may be important financially e.g. 1. medical / pharmaceutical uses; 2. commercial products / example given; 3. tourism; 4. agriculture; 5. saving local forest communities;	1 max	
7(b)	1. Fewer plant species / decrease in plant diversity; 2. Fewer habitats/nesting sites; 3. Fewer niches; 4. Fewer food sources/varieties; 5. Less protection from predators/ hunters/environment;	2 max	Accept: converse arguments for islands with a high percentage of forest remaining 1. Neutral: fewer plants 2. Neutral: fewer homes 4. Neutral: less food
7(c)	1. Number of (individuals/birds of) each species; 2. Total number of individuals/birds of all species;	2	1. Neutral: number of species 2. Accept: 'total number of birds' as given context for 'all species' in the investigation
7(d)	1. (Larger birds have) a low(er) SA:VOL; 2. (So) less heat loss / more heat retained;	2	Neutral: reference to fat / feathers MP2 is independent of MP1

Question	Marking Guidance	Mark	Comments
8(a)	1. Strands separate / H-bonds break; 2. DNA helicase (involved); 3. Both strands/each strand act(s) as (a) template(s); 4. (Free) nucleotides attach; 5. Complementary/specific base pairing / AT and GC; 6. DNA polymerase joins nucleotides (on new strand); 7. H-bonds reform; 8. Semi-conservative replication / new DNA molecules contain one old strand and one new strand;	6 max	1. **Q** Neutral: strands split 1. Accept: strands unzip 4. Neutral: bases attach 4. Accept: nucleotides attracted 6. Reject: if wrong function of DNA polymerase 8. Reject: if wrong context e.g. new DNA molecules contain half of each original strand
8(b)(i)	18;	1	Do not accept 17.5
8(b)(ii)	10;	1	
8(b)(iii)	1. Horizontal until 18 minutes; 2. (Then) decreases as straight line to 0 μm at 28 minutes;	2	Allow +/- one small box 2. Allow lines that start from the wrong place, ending at 0 at 28 minutes
8(c)(i)	Two marks for correct answer of 19.68 or 19.7;; One mark for incorrect answers in which candidate clearly multiplies by 0.82;	2	Accept 19hrs 41mins Allow one mark for incorrect answers that clearly show 82% of 24 (hours)
8(c)(ii)	1. No visible chromosomes/chromatids; 2. Visible nucleus;	1 max	
8(c)(iii)	**D** (no mark) 1. Lower % (of cells) in interphase / higher % (of cells) in mitosis/named stage of mitosis; 2. (So) more cells dividing / cells are dividing quicker;	2	1. Accept: 'less' or 'more' instead of '%' 1. Do not accept: higher % (of cells) in each/all stage(s) 2. Accept: uncontrolled cell division 2. Do not award if Tissue **C** is chosen

Question	Marking Guidance	Mark	Comments
9(a)	1. Random; 2. Method e.g. number generator / number out of a hat; ***OR*** 3. Matched / all the same; 4. For e.g. age / sex;	2 max	Random number generator = 2 marks Same age = 2 marks
9(b)	1. (Differences) are real/significant/not due to chance; 2. (As) bars/SDs do not overlap;	2	It = the difference 2. Accept: 'standard errors do not overlap' as told 'standard deviation' in the question stem
9(c)	1. No/slight (placebo) effect; 2. Group **2** and **3** results are similar/the same/ SDs/bars overlap;	2	2. Accept: other descriptions of Groups **2** and **3** 2. Accept: that Groups **2** and **3** are not significantly different
9(d)	1. (Allows) anomalies to be identified/ ignored/ effect of anomalies to be reduced / effect of variation in data to be minimised / concordant results; 2. (Makes) average/mean (more) reliable;	2	Accept: 'outliers' instead of anomalies 1. Reject: idea of not recording anomalies / preventing anomalies from occurring 1. Accept: 'cancels out anomalies' as bottom line response 2. **Q** Neutral: makes the average/mean more accurate 2. Ignore: 'more reliable' alone
9(e)(i)	1. Unethical/unfair not to treat patients; 2. Dangerous / could cause an asthma attack;	1 max	

9(e)(ii)	1. Ensures normal treatment does not affect results / improvements are only due to the spray; 2. (As) normal treatment is short-lived/ effective for less than 24 hours/ (24h) is long enough for normal treatment to wear off;	2	
9(f)(i)	1. (Improvement scores) are qualitative / subjective/rely on own judgement/ different patients may assess symptoms differently; 2. Some patients may lie/exaggerate/want to please doctors;	2	Accept: converse arguments for measuring FEV_1 e.g. quantitative/objective patients cannot lie 1. Neutral: empirical evidence
9(f)(ii)	1. Not blind / patients knew they were not receiving treatment/ patients did not receive treatment; 2. (So) more likely to underestimate/give lower scores / did not expect to improve / less improvement;	2	