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General Certificate of Education (A-level)
January 2013

Biology BIOL2

(Specification 2410)

Unit 2: The Variety of Living Organisms

Final

Mark Scheme

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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	