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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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Question	Marking Guidance	Mark	Comments																
1(a)	<table border="1"> <thead> <tr> <th>Statement</th> <th>Starch</th> <th>Cellulose</th> <th>Glycogen</th> </tr> </thead> <tbody> <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> </tbody> </table>	Statement	Starch	Cellulose	Glycogen	Found in plant cells	✓	✓		Contains glycosidic bonds	✓	✓	✓	Contains β-glucose		✓		3	One mark for each correct row
Statement	Starch	Cellulose	Glycogen																
Found in plant cells	✓	✓																	
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1(b)	Hydrolysis;	1	Accept: if phonetically correct Do not accept: 'hydration'																
1(c)	<ol style="list-style-type: none"> 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; 	2 max	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																
1(d)	Two marks for correct answer of 479-521;; One mark for incorrect answers in which candidate clearly divides measured length by actual length;	2	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																

Question	Marking Guidance	Mark	Comments
2(a)(i)	Made of (different) tissues / more than one tissue;	1	
2(a)(ii)	<ol style="list-style-type: none"> (Muscle) contracts; (Arteriole) narrows/constricts/reduces size of lumen/vessel / vasoconstriction; 	2	<p>Assume that 'they' or 'it' = muscle</p> <p>Ignore: references to pressure</p> <p>Q Correct context for muscle contracts, vessel constricts</p>
2(b)(i)	Short <u>diffusion</u> distance/pathway;	1	Accept: thin diffusion pathway
2(b)(ii)	(More) <u>time</u> for exchange/diffusion (of substances);	1	Accept: example of more <u>time</u> for specific substance to be exchanged
2(c)	<ol style="list-style-type: none"> <u>Water potential</u> (in capillary) not as low/is higher/less negative / water potential gradient is reduced; Less/no <u>water</u> removed (into capillary); By <u>osmosis</u> (into capillary); 	3	<p>Accept: 'blood or plasma' instead of 'capillary'</p> <p>2. Accept converse: water remains in the tissue</p> <p>2. Q Marking points 2. and 3. must be in the context of movement into the capillary</p> <p>Neutral: reference to more tissue fluid being formed as in the question stem</p> <p>Neutral: reference to lymphatic drainage</p>

Question	Marking Guidance	Mark	Comments														
3(a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">Kingdom</td> <td style="width: 50%; text-align: center;">Animalia</td> </tr> <tr> <td style="text-align: center;">Phylum</td> <td style="text-align: center;">Chordata</td> </tr> <tr> <td style="text-align: center;">Class</td> <td style="text-align: center;">Mammalia</td> </tr> <tr> <td style="text-align: center;">Order</td> <td style="text-align: center;">Carnivora</td> </tr> <tr> <td style="text-align: center;">Family</td> <td style="text-align: center;">Felidae</td> </tr> <tr> <td style="text-align: center;">Genus</td> <td style="text-align: center;">Panthera</td> </tr> <tr> <td style="text-align: center;">Species</td> <td style="text-align: center;">pardus</td> </tr> </table>	Kingdom	Animalia	Phylum	Chordata	Class	Mammalia	Order	Carnivora	Family	Felidae	Genus	Panthera	Species	pardus	2	<p>One mark for each correct column</p> <p>Do not award mark for last column if 'Pardus' is <u>clearly</u> stated</p> <p>Accept: Panthera pardus in final box</p>
Kingdom	Animalia																
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Genus	Panthera																
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3(b)	<p>(For the leopard and cheetah)</p> <ol style="list-style-type: none"> 1. More <u>hydrogen</u> bonds (form); 2. Similar DNA sequence(s) / similar base sequence(s) / more complementary bases / more base pairs; 	2	<p>Accept converse argument for leopard and puma</p> <p>Neutral: similar DNA</p> <p>2. Idea of 'more' must be clear</p>														
3(c)(i)	<ol style="list-style-type: none"> 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; 	2															
3(c)(ii)	<ol style="list-style-type: none"> 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); 	2 max	<p>4. Accept: high frequency of homozygous/two recessive alleles</p>														

Question	Marking Guidance	Mark	Comments
4(a)	Variation / differences within the same/a species;	1	
4(b)(i)	<ol style="list-style-type: none"> 1. Identical twins show genetic influence / differences between them show environmental influence; 2. Non-identical twins (also) show an environmental/non-genetic influence; 	2	<p>Neutral: allows a comparison</p> <p>It must be clear which set of twins is being referred to</p> <p>Do not credit repetition of bullet points in stem</p>
4(b)(ii)	Genes play a <u>greater</u> role / environment plays a <u>lesser</u> role;	1	<p>Must be comparative</p> <p>Neutral: genes are involved</p> <p>Neutral: involves genes and the environment</p>
4(b)(iii)	<p>Any suitable suggestion for a maximum of two marks e.g.:</p> <ol style="list-style-type: none"> 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	<p>Neutral: 'environment' as in question stem</p> <p>Neutral: unqualified ideas such as health / lifestyle</p>

Question	Marking Guidance	Mark	Comments
5(a)	Open/use tap / add water from reservoir;	1	
5(b)	<ol style="list-style-type: none"> 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	<p>Answer must refer to precautions when setting up the apparatus</p> <p>Ignore: references to keeping other factors constant</p>
5(c)	<ol style="list-style-type: none"> 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)	<p>As number of leaves are reduced (no mark),</p> <ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 2. Accept: different amino acids coded for 2. Reject: different amino acids produced 4. Neutral: alters 3D structure /3D shape
6(d)	<ol style="list-style-type: none"> 1. Resistance gene/allele; 2. On plasmid; 3. (Spread by) horizontal transmission; 4. (Involves) conjugation/pilus; 	3 max	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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 <u>and</u> 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	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 1. Horizontal until 18 minutes; 2. (Then) decreases as straight line to 0 μm at 28 minutes; 	2	<ol style="list-style-type: none"> 1. Allow +/- one small box 2. Allow lines that start from the wrong place, ending at 0 at 28 minutes
8(c)(i)	<p>Two marks for correct answer of 19.68 or 19.7;;</p> <p>One mark for incorrect answers in which candidate clearly multiplies by 0.82;</p>	2	<p>Accept 19hrs 41mins</p> <p>Allow one mark for incorrect answers that clearly show 82% of 24 (hours)</p>
8(c)(ii)	<ol style="list-style-type: none"> 1. No visible chromosomes/chromatids; 2. Visible nucleus; 	1 max	
8(c)(iii)	<p>D (no mark)</p> <ol style="list-style-type: none"> 1. <u>Lower</u> % (of cells) in interphase / <u>higher</u> % (of cells) in mitosis/named stage of mitosis; 2. (So) more cells dividing / cells are dividing quicker; 	2	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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	<p>Accept: converse arguments for measuring FEV₁ e.g. quantitative/objective patients cannot lie</p> <p>1. Neutral: empirical evidence</p>
9(f)(ii)	<ol style="list-style-type: none"> 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	