



**General Certificate of Education (A-level)
June 2012**

Biology

BIOL2

(Specification 2410)

Unit 2: The Variety of Living Organisms

Final

Mark Scheme

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Question	Marking Guidelines	Marks	Comments
1(a)(i)	Diffusion;	1	Ignore references to structures, membrane components etc Allow simple diffusion Reject facilitated diffusion
1(a)(ii)	1. (Thin / flat body) so short distance for diffusion / short diffusion pathway; 2. (Thin / flat body so) large surface area to volume ratio;	2	Ignore references to membrane, wall, body surface 'It' refers to flatworm's body
1(b)(i)	A group of <u>tissues</u> ;	1	Ignore references to function Group = more than one
1(b)(ii)	1. (Carbon dioxide enters) via stomata; 2. (Stomata opened by) guard cells; 3. Diffuses through air spaces; 4. Down diffusion gradient;	3 max	1. Reject <u>stroma</u> 3. Allow concentration gradient. Reject along gradient unless direction made clear

Question	Marking Guidelines	Marks	Comments
2(a)	2 of the following pairs: 1. Larger leaves; 2. Photosynthesis; OR 3. Larger/bigger/thicker root; 4. Storage; OR 5. Stem shorter / absent; 6. Less energy used in stem growth / more energy for producing sugar;	4 max	Mark for explanation must be paired with correct change in structure Accept converse descriptions of leaves, root and stem: longer root, taller stem, smaller leaves Accept converse correct explanation
2(b)	Beet ready quicker / less time required / allows land to be used again / harvested earlier;	1	Allow more crops/many harvests. Ignore references to yield / profit
2(c)	1. (Diversity) reduced / fewer different alleles / less variation / smaller gene pool; 2. As <u>alleles</u> have been chosen / rejected;	2	

Question	Marking Guidelines		Marks	Comments
3(a)(i)	β/ <u>Beta</u> glucose;		1	Accept b / B Reject any reference to alpha/α
3(a)(ii)	Glycosidic;		1	Reject references to α(1-4) glycosidic bond, but allow beta 1-4, or unspecified reference to 1-4 (1,4)
3(a)(iii)	OH / hydroxyl / HO;		1	Reject hydroxide Reject OH/HO <u>molecule</u> Ignore alcohol
3(b)(i)	<p>Starch</p> <ol style="list-style-type: none"> (1,4 and) 1,6 bonds/contains 1,6 bonds /branching All glucoses/ monomers same way up Helix/coiled/compact Alpha glucose No (micro/macro) fibrils/fibres 	<p>Cellulose</p> <ol style="list-style-type: none"> 1,4 bonds / no 1,6 bonds / unbranched / straight; Alternate glucoses/monomers upside down; Straight; Beta glucose; Micro/macro fibrils/fibres; 	2 max	1 mark per pair of contrasts, both starch and cellulose required Accept other comparable differences eg hydrogen bonds within starch but between cellulose molecules
3(b)(ii)	<ol style="list-style-type: none"> H-bonds / micro/macro fibrils /fibres; Strength / rigidity / inelasticity; 		2	Reject strong hydrogen bonds 'Strong hydrogen bonds' = 0 but 'Strong hydrogen bonds give strength (to the molecule)' = 1

Question	Marking Guidelines	Marks	Comments
4(a)	<ol style="list-style-type: none"> 1. Growth / increase in cell number; 2. Replace cells / repair tissue / organs /body; 3. Genetically identical cells; 4. Asexual reproduction /cloning; 	2 max	<p>Ignore growth of cells</p> <p>Ignore repair cells</p> <p>Reject bacteria</p> <p>3. 'Produces 2 genetically identical cells' does not reach MP1 as well as MP3</p> <p>4. Allow example or description</p>
4(b)(i)	(Ensures) representative (sample);	1	<p>Accept find some cells in mitosis/not in interphase. Accept 'more reliable' only if linked to percentage (of cells). 'Improves reliability' on its own does not gain this mark</p> <p>Neutral: Large sample</p>
4(b)(ii)	<ol style="list-style-type: none"> 1. A = metaphase; 2. Chromosome / chromatids lie on equator; 3. B = anaphase; 4. Chromatids /chromosomes separating / moving apart / moving to poles; 	4	<ol style="list-style-type: none"> 2. Reject homologous chromosomes Allow centre/middle 4. Reject homologous chromosomes
4(c)	2 hours / 120 minutes;;	2	Allow 1 mark if working shows candidate understood that mitosis would take 10%

Question	Marking Guidelines	Marks	Comments										
5(a)(i)	Repeating units / nucleotides / monomer /molecules;	1	Allow more than one, but reject two										
5(a)(ii)	1. C = hydrogen bonds; 2. D = <u>deoxy</u> ribose; 3. E = phosphate;	3	2. Ignore sugar 3. Ignore phosphorus, ignore molecule										
5(a)(iii)	<table border="1"> <thead> <tr> <th>Name of base</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Thymine</td> <td>34</td> </tr> <tr> <td>Cytosine / Guanine</td> <td>16</td> </tr> <tr> <td>Adenine</td> <td>34</td> </tr> <tr> <td>Cytosine / Guanine</td> <td>16</td> </tr> </tbody> </table>	Name of base	Percentage	Thymine	34	Cytosine / Guanine	16	Adenine	34	Cytosine / Guanine	16	2	Spelling must be correct to gain MP1 First mark = names correct Second mark = % correct, with <u>adenine as 34%</u>
Name of base	Percentage												
Thymine	34												
Cytosine / Guanine	16												
Adenine	34												
Cytosine / Guanine	16												
5(b)(i)	153;	1											
5(b)(ii)	Some regions of the gene are non-coding / <u>introns</u> / start/stop code/triplet / there are two DNA strands;	1	Allow <u>addition</u> mutation Ignore unqualified reference to mutation Accept reference to introns and exons if given together Ignore 'junk' DNA/multiple repeats										

Question	Marking Guidelines	Marks	Comments
6(a)(i)	Kingdom / phylum / class;	1	Accept Animalia /animal kingdom / Chordata / Chordates / Aves Allow phonetic spelling
6(a)(ii)	Family;	1	
6(b)(i)	<ol style="list-style-type: none"> Shows the spread of the data / how data varies; Overlap = no difference / due to chance / not significant; Low SD means results more reliable / repeatable; 	2 max	<ol style="list-style-type: none"> Reject range. Accept varies from the mean Allow converse Ignore accurate/valid/
6(b)(ii)	<ol style="list-style-type: none"> Different colour/different feathers/different throat; Birds don't mate/pair bond with/recognise other species; 	2	<ol style="list-style-type: none"> Reference to courtship alone is not sufficient
6(c)	<ol style="list-style-type: none"> Different species would have different amino acid sequences; Amino acid sequence is the result of DNA/alleles//base sequence; 	2	Accept more closely related = more similar sequence References to incorrect statements about coding negates second mark

Question	Marking Guidelines	Marks	Comments
7(a)	Removes bias;	1	
7(b)(i)	<ol style="list-style-type: none"> 1.28 / 1.29 / 1.285 / 1.3;; Answer incorrect but shows clear understanding of Σ; 	2	<ol style="list-style-type: none"> Ignore more than 3dp $\Sigma = 318250$. Allow mark if denominator written out. Incorrect denominator but evidence of understanding gains mark
7(b)(ii)	<p>Diversity index would be lower (NO MARK)</p> <ol style="list-style-type: none"> Fewer <u>species</u> / Beech aphid/Large white butterfly/7-spot ladybird absent /only three <u>species</u> / <u>species</u> diversity lower; Mostly one species / mostly bird-cherry aphid; Fewer plant species; 	2 max	<p>Assume wheat field if site unspecified</p> <ol style="list-style-type: none"> Allow species richness in context of few species Allow one type of food source if clearly plant
7(c)	<p>For:</p> <ol style="list-style-type: none"> Data support the claim / evidence supports claim; <p>Against:</p> <ol style="list-style-type: none"> Only wheat field / only comparing with wood / one type of habitat /only insects considered; 	2 max	<ol style="list-style-type: none"> Ignore reference to correlation/causation
7(d)	<ol style="list-style-type: none"> Greater variety of <u>plants</u>; Another habitat / more habitats / places to live / niches; Another food source / more food types; 	2 max	<ol style="list-style-type: none"> Answers referring to 'more food' should not be credited. Allow reference to either animal or plant as foods

Question	Marking Guidelines	Marks	Comments
8(a)(i)	<ol style="list-style-type: none"> 1. Stomata open; 2. Transpiration highest around mid-day; 3. Middle of day warmer / lighter; 4. (Increased) tension / water potential gradient; 5. Cohesion (between water molecules); 	3 max	<p>Allow converse</p> <p>3. Allow 'Sun is at it's hottest'</p> <p>Ignore 'pull, suck'</p> <p>Reject increased cohesion in the context of cohesion tension</p>
8(a)(ii)	(Inside xylem) lower than atmospheric pressure / (water is under) tension;	1	Accept cohesion tension. Ignore vacuum
8(b)(i)	High pressure / smoothes out blood flow / artery wall contains more collagen / muscle / elastic (fibres) / connective tissue;	1	<p>Accept converse for pulmonary vein</p> <p>Incorrect function of artery disqualifies mark</p>
8(b)(ii)	<ol style="list-style-type: none"> 1. (Aorta wall) stretches; 2. Because ventricle/heart contracts / systole / pressure increases; 3. (Aorta wall) recoils; 4. Because ventricle relaxes / heart relaxes / diastole / pressure falls; 5. Maintain smooth flow / pressure; 	3 max	<ol style="list-style-type: none"> 1. Allow expand 2. Reject if MP1 wrong 3. Allow spring back <p>Reject any reference to contract / relax in MP1 and 3</p> <ol style="list-style-type: none"> 4. Reject if MP3 wrong
8(b)(iii)	Aorta 1.2 / largest SD;	1	Allow pulmonary vein provided candidate relates standard deviation to mean
8(c)	<p>Formation</p> <ol style="list-style-type: none"> 1. High blood / hydrostatic pressure / pressure filtration; 2. Forces water / fluid out; 3. Large proteins remain in capillary; <p>Return</p> <ol style="list-style-type: none"> 4. Low water potential in capillary / blood; 5. Due to (plasma) proteins; 6. <u>Water</u> enters capillary / blood; 7. (By) <u>osmosis</u>; 8. Correct reference to lymph; 	6 max	<ol style="list-style-type: none"> 2. Reject plasma, ignore tissue 7. Osmosis must be in correct context

Question	Marking Guidelines	Marks	Comments
9(a)(i)	Fastest rate of growth/division / enzymes don't denature / optimum temperature for enzymes / at or close to body temperature;	1	Do not accept optimum temperature if not qualified
9(a)(ii)	Same amount / number of bacteria / only one variable in the investigation;	1	Reject 'same volume of bacteria' Allow doesn't change concentration of antibiotic
9(a)(iii)	To show that only the antibiotic has an effect (on the bacteria);	1	Allow 'to see the effect without the antibiotic', 'reference point'
9(b)(i)	<ol style="list-style-type: none"> Falls steeply then levels out / less steep; Fall is less steep after 5-10 $\mu\text{g cm}^{-3}$ / levels out at / after 50 $\mu\text{g cm}^{-3}$; 	2	Principles = trend, value Allow values from y axis (48-58) / levels off 38 / 39
9(b)(ii)	<ol style="list-style-type: none"> 50 ($\mu\text{g cm}^{-3}$) reduced bacterial growth more (than lower concentrations); Trial did not use people; Very little / no effect after 50 ($\mu\text{g cm}^{-3}$); Other concentrations not tested; 	3	<ol style="list-style-type: none"> 'Allow 50 ($\mu\text{g cm}^{-3}$) kills the most bacteria' NB '50 is most effective' is in stem so do not credit Allow references to not being as effective in humans
9(c)	<ol style="list-style-type: none"> Mutation; Horizontal transmission / conjugation; 	2	Ignore reference to vertical transmission Allow description. Reject 'conjunction'
9(d)	Age affects immune system / heart / teeth;	1	Ignore any other variable

<p>9(e)</p>	<ol style="list-style-type: none"> 1. Antibiotic reduces number of bacteria; 2. (Survivors have) resistant gene/allele; 3. (Resistant bacteria) reproduce/multiply; 4. Valid reference to data at 2 months; 5. (Infection) no difference at 3 months; 	<p>4 max</p>	<ol style="list-style-type: none"> 1. Reject reference to antibodies. Reject <u>all</u> bacteria killed Allow credit for use of figures to show effect 3. Reject 'immune bacteria' 4. Valid reference includes either: difference insignificant (between the two groups) or higher percentage of patients who had infected heart valves had teeth extracted/lower percentage of patients who did not have infected heart valves had teeth extracted <p>4 and 5 must refer to time 4 and 5 allow credit for use of figures</p>
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