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General Certificate of Education (A-level)
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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)	**Starch** 1. (1,4 and) 1,6 bonds/contains 1,6 bonds /branching 2. All glucoses/ monomers same way up 3. Helix/coiled/compact 4. Alpha glucose 5. No (micro/macro) fibrils/fibres	**Cellulose** 1. 1,4 bonds / no 1,6 bonds / unbranched / straight; 2. Alternate glucoses/monomers upside down; 3. Straight; 4. Beta glucose; 5. 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)	1. H-bonds / micro/macro fibrils /fibres; 2. 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)	1. Growth / increase in cell number; 2. Replace cells / repair tissue / organs /body; 3. Genetically identical cells; 4. Asexual reproduction /cloning;	2 max	Ignore growth of cells Ignore repair cells Reject bacteria 3. 'Produces 2 genetically identical cells' does not reach MP1 as well as MP3 4. Allow example or description
4(b)(i)	(Ensures) representative (sample);	1	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 Neutral: Large sample
4(b)(ii)	1. A = metaphase; 2. Chromosome / chromatids lie on equator; 3. B = anaphase; 4. Chromatids /chromosomes separating / moving apart / moving to poles;	4	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%

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

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)	1. Shows the spread of the data / how data varies; 2. Overlap = no difference / due to chance / not significant; 3. Low SD means results more reliable / repeatable;	2 max	1. Reject range. Accept varies from the mean 2. Allow converse 3. Ignore accurate/valid/
6(b)(ii)	1. Different colour/different feathers/different throat; 2. Birds don't mate/pair bond with/recognise other species;	2	2. Reference to courtship alone is not sufficient
6(c)	1. Different species would have different amino acid sequences; 2. 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)	1. 1.28 / 1.29 / 1.285 / 1.3;; 2. Answer incorrect but shows clear understanding of Σ;	2	1. Ignore more than 3dp 2. $\sum$ = 318250. Allow mark if denominator written out. Incorrect denominator but evidence of understanding gains mark
7(b)(ii)	Diversity index would be lower (NO MARK) 1. Fewer species / Beech aphid/Large white butterfly/7-spot ladybird absent /only three species / species diversity lower; 2. Mostly one species / mostly bird-cherry aphid; 3. Fewer plant species;	2 max	Assume wheat field if site unspecified 1. Allow species richness in context of few species 3. Allow one type of food source if clearly plant
7(c)	For: 1. Data support the claim / evidence supports claim; Against: 2. Only wheat field / only comparing with wood / one type of habitat /only insects considered;	2 max	1. Ignore reference to correlation/causation
7(d)	1. Greater variety of plants; 2. Another habitat / more habitats / places to live / niches; 3. Another food source / more food types;	2 max	3. 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)	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	Allow converse 3. Allow 'Sun is at it's hottest' Ignore 'pull, suck' Reject increased cohesion in the context of cohesion tension
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	Accept converse for pulmonary vein Incorrect function of artery disqualifies mark
8(b)(ii)	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	1. Allow expand 2. Reject if MP1 wrong 3. Allow spring back Reject any reference to contract / relax in MP1 and 3 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)	Formation 1. High blood / hydrostatic pressure / pressure filtration; 2. Forces water / fluid out; 3. Large proteins remain in capillary; Return 4. Low water potential in capillary / blood; 5. Due to (plasma) proteins; 6. Water enters capillary / blood; 7. (By) osmosis; 8. Correct reference to lymph;	6 max	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)	1. Falls steeply then levels out / less steep; 2. Fall is less steep after 5-10 ($\mu g\,cm^{-3}$ / levels out at / after 50 $\mu g\,cm^{-3}$;	2	Principles = trend, value Allow values from y axis (48-58) / levels off 38 / 39
9(b)(ii)	1. 50 ($\mu g\,cm^{-3}$) reduced bacterial growth more (than lower concentrations); 2. Trial did not use people; 3. Very little / no effect after 50 ($\mu g\,cm^{-3}$); 4. Other concentrations not tested;	3	1. 'Allow 50 ($\mu g\,cm^{-3}$) kills the most bacteria' NB '50 is most effective' is in stem so do not credit 2. Allow references to not being as effective in humans
9(c)	1. Mutation; 2. 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

9(e)	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;	4 max	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 4 and 5 must refer to time 4 and 5 allow credit for use of figures