



**General Certificate of Education (A-level)
January 2011**

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" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; text-align: center;">✓</td> <td style="width: 25%; text-align: center;">✓</td> <td style="width: 25%; text-align: center;">✓</td> <td style="width: 25%;"></td> </tr> <tr> <td></td> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> </table> | ✓ | ✓ | ✓ | | | | | ✓ | | | ✓ | ✓ | 4 | <p>One mark for each correct column</p> <p>Mark ticks only and ignore crosses</p> |
| ✓ | ✓ | ✓ | | | | | | | | | | | | | |
| | | | ✓ | | | | | | | | | | | | |
| | | ✓ | ✓ | | | | | | | | | | | | |
| 1(b) | <ol style="list-style-type: none"> 1. Two marks for box round two hydrogens and one of the oxygens from OH groups on carbons 1 and 4;; 2. One mark from incorrect answer involving any two hydrogens and an oxygen from carbons 1 and 4; | 2 | <p>Do not award marks if all atoms concerned are on same carbon atom or are on carbon atoms other than 1 and 4 or where the answer does not have two hydrogen and one oxygen</p> | | | | | | | | | | | | |
| 1(c)(i) | <ol style="list-style-type: none"> 1. Holds chains/cellulose molecules together/forms cross links between chains/cellulose molecules/forms microfibrils; 2. Providing strength/rigidity (to cellulose/cell wall); 3. Hydrogen bonds strong in large numbers; | 2 max | <p>Principles here are first mark for where hydrogen bonds are formed and second for a consequence of this.</p> <p>Accept microfibrines</p> | | | | | | | | | | | | |
| 1(c)(ii) | Compact/occupies small space/tightly packed; | 1 | <p>Answer indicates depth required. Answers such as “good for storage”, “easily stored” or “small” are insufficient.</p> | | | | | | | | | | | | |

| Question | Marking Guidance | Mark | Comments |
|----------|---|-------|--|
| 2(a) | More than one polypeptide/chain; | 1 | Ignore references to haem/other groups |
| 2(b)(i) | 141; | 1 | |
| 2(b)(ii) | <ol style="list-style-type: none"> 1. Stop/start sequences; 2. Non coding DNA (in the gene)/introns/multiple repeats/junk DNA; 3. Two chains/a non-coding strand/complementary base pairs; 4. <u>Addition</u> of base by mutation; | 2 max | Do not credit "some bases repeated" |
| 2(c) | Different primary structure/amino acids/different number of polypeptide chains; | 1 | Question is about haemoglobin so do not credit differences in DNA |
| 2(d) | <ol style="list-style-type: none"> 1. Low partial pressure of oxygen; 2. In lungs; 3. (Llama) haemoglobin able to load more oxygen/(llama) haemoglobin saturated (at low/particular partial pressure of oxygen); 4. Higher affinity for oxygen; | 3 max | <p>The terms used in the graph (or near approximations) should be used in this answer.</p> <p>Ignore references to unloading</p> <p>The answer must relate to llamas</p> |

| Question | Marking Guidance | Mark | Comments |
|----------|---|-------|---|
| 3(a) | Kingdom, phylum and class;; | 2 | Lose 1 mark for each error (i.e. omission or incorrect response). Sequence not essential. |
| 3(b)(i) | Shows <u>evolutionary</u> relationship; | 1 | |
| 3(b)(ii) | 26; | 1 | |
| 3(c)(i) | <ol style="list-style-type: none"> 1. Base sequence will be similar/some bases in common; 2. These bases will bind together/hydrogen bonds/complementary pairs; | 2 | <p>Do not accept same here.</p> <p>Accept converse providing that it is clear that the converse argument is being made.</p> |
| 3(c)(ii) | <ol style="list-style-type: none"> 1. Relationship is closer/more complementary bases/more base pairs; 2. More hydrogen bonds; 3. More heat energy needed (to separate bonds); | 2 max | <p>Do not allow stronger hydrogen bonds.</p> <p>Not higher temperature as this is in question.</p> |

| Question | Marking Guidance | Mark | Comments |
|----------|---|------|--|
| 4(a)(i) | 22; | 1 | |
| 4(a)(ii) | 1. Odd number of chromosomes/33 chromosomes (in leaf cell); 2. Chromosomes cannot pair/cannot undergo meiosis/would result in half chromosomes/cannot form haploid cells; | 2 | |
| 4(b)(i) | Fast growth/ produces crop fast/produces large crop; | 1 | Do not insist on relative statement. Accept similar terms for fast. E.g. “better” growth Do not accept unqualified references to profit. |
| 4(b)(ii) | Leaves less likely to break/higher breaking strength; | 1 | |
| 4(c) | Low genetic diversity because they are produced by mitosis; Will all have the same DNA/genes/alleles/ will be <u>genetically</u> identical/will be clones; OR Low genetic diversity because they are not produced by meiosis; No crossing over/independent segregation/will not be <u>genetically</u> different; | 2 | Independent segregation is the specification term. Accept other such as random assortment. |

| Question | Marking Guidance | Mark | Comments |
|----------|---|-------|--|
| 5(a) | Number of a/each (species); | 1 | Accept answers expressed differently providing they convey this information. Ignore extra information if it does not contradict answer. |
| 5(b) | <ol style="list-style-type: none"> 1. Lower diversity of plants/ few species of plants/less variety of plants/few plant layers; 2. Few sources/types of food/feeding sites; 3. Few habitats/ niches; 4. Fewer (species of) herbivore so few (species of) carnivores; 5. Aspect of agriculture (killing insects); | 3 max | Must be a reference to species or kinds, not just fewer insects and fewer plants. Not less food. |
| 5(c)(i) | Cannot predict/ do not know intermediate values; | 1 | |
| 5(c)(ii) | To see what would happen/ compare <u>with</u> no management work/ to see if numbers fell anyway/ To show that it was not a factor; | 1 | Management as a term not required. Allow explanations. |
| 5(d) | <ol style="list-style-type: none"> 1. Total <u>number</u> of birds along ditch B/ditch with one side cleared greater than along ditch A/ditch with both sides cleared; 2. But only gives data for all birds/does not give data for species/data not about diversity; 3. Single ditch/single occasion/not repeated/no control; | 3 | Principles: Correct from evidence Total number not diversity Flaws in technique |

| Question | Marking Guidance | Mark | Comments |
|----------|---|-------|---|
| 6(a) | 1. <u>Horizontal</u> (gene) transmission; 2. (Gene passed by) <u>conjugation</u> /through <u>pilus</u> ; | 2 | Vertical negates horizontal |
| 6(b) | <p>Shape</p> 1. Different penicillin has different shape/structure/ enzyme/active site has specific shape/structure; <p>Binding</p> 2. <u>No</u> longer fits/binds to active site/not complementary to active site/does <u>not</u> form E-S complex; <p>Consequence</p> 3. (Different) penicillin not broken down; | 3 | Not different |
| 6(c)(i) | 1. Kills pathogenic/harmful bacteria/pathogens; 2. Disease less likely/improves health/animals healthier/reduces <u>spread</u> of infection; 3. Faster growth/more productive animals/more food converted to meat/greater survival/lower vet's bills/increased yield/less energy (for 'fighting infection'); | 2 max | Principles: Action of antibiotic Do not accept stops all disease Action on health Effect on production |
| 6(c)(ii) | 1. (Adding antibiotics) selects in favour of antibiotic resistance/resistant bacteria more likely to survive; 2. Increase in numbers/higher proportion of resistant bacteria; 3. May infect humans/may spread resistance to other species/ horizontal transfer; | 2 max | Penalise immune only on the first occasion it occurs in this part of the question. |

| Question | Marking Guidance | Mark | Comments |
|----------|---|------|--|
| 7(a)(i) | Cells are in interphase; | 1 | Accept G phase/ S phase. |
| 7(a)(ii) | Cells undergoing mitosis/in telophase/cytokinesis; | 1 | Accept all named stages but reject prophase, metaphase or anaphase on their own. |
| 7(b) | <ol style="list-style-type: none"> 1. 3 hours; 2. Time between beginnings/endings DNA replication/Increases/levelling outs of DNA concentration/for shape (of curve for replication) to be repeated; 3. (DNA) replication takes place once per cell cycle; | 3 | <p>Allow close approximation where candidate attempts to be more accurate.</p> <p>Principle What is shown on the graph</p> |

| Question | Marking Guidance | Mark | Comments |
|-----------|---|-------|---|
| 8(a)(i) | <ol style="list-style-type: none"> 1. Removes water vapour/moisture/saturated air; 2. Increases water potential gradient/more diffusion/more evaporation; | 2 | |
| 8(a)(ii) | <ol style="list-style-type: none"> 1. Increases kinetic energy; 2. Water molecules move faster; 3. Increases diffusion/evaporation; | 2 max | |
| 8(b)(i) | <p><u>Positive</u> correlation/as light intensity increases so does rate of water movement/follows same pattern/<u>directly</u> proportional;</p> | 1 | |
| 8(b)(ii) | <ol style="list-style-type: none"> 1. Stomata open; 2. Photosynthesis increases/transpiration increases; 3. More water pulled up; 4. Cohesion between water molecules/by cohesion tension; | 2 max | |
| 8(b)(iii) | <ol style="list-style-type: none"> 1. Water pulled up trunk/moves up at fast rate; 2. (Water column under) <u>tension</u>; 3. Sticking/adhesion (between water and) cells/walls/xylem; 4. Pulls xylem in; | 2 max | <p>Adhesion is not a specification requirement. Accept cohesion in this context</p> |

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| <p>8(c)</p> | <p>Elastic tissue</p> <p>1 Elastic tissue stretches under pressure/when heart beats;</p> <p>2 Recoils/springs back;</p> <p>3 Evens out pressure/flow;</p> <p>Muscle</p> <p>4 Muscle contracts;</p> <p>5 Reduces diameter of lumen/vasoconstriction/constricts vessel;</p> <p>6 Changes flow/pressure;</p> <p>Epithelium</p> <p>7 Epithelium smooth;</p> <p>8 Reduces friction/blood clots/less resistance;</p> | <p>6 max</p> | <p>Do not allow credit for expands/contracts/relaxes in this context.</p> <p>From a marking viewpoint ignore all specific references to arteries and arterioles. Consider all points as applying to both.</p> <p>3. Do accept controls</p> <p>4 – 6 Accept converse</p> |
|-------------|---|--------------|---|

| Question | Marking Guidance | Mark | Comments |
|----------|--|-------|--|
| 9(a) | (So results) can be compared/so measurement is the same each time/because eye is not perfectly round/uniform; | 1 | Accept eye opens to different amounts |
| 9(b)(i) | <ol style="list-style-type: none"> 1. Eye (diameter) is smaller and antennae longer; 2. Antennae detecting touch; 3. Data only refers to shrimps/data may not apply to all animals/only in one area; | 2 max | The principle here is that candidate has recognised that both features confirm suggestion. Exact wording does not matter. |
| 9(b)(ii) | <ol style="list-style-type: none"> 1. Standard deviation gives a measure of spread/variation; 2. More standard deviations overlap, the less likely it is that differences are real/significant/the more likely they are caused by chance; | 2 | <p>Do not accept range</p> <p>Accept converse.</p> <p>Although we are looking for the idea of significance, we cannot require this term.</p> |
| 9(c)(i) | <p>Qualitative statement about difference in size/ difference in variation/ overlap in size;</p> <p>Quantitative statement about difference in size/ difference in variation/ overlap in size;</p> <p>Supported by relevant two sets of figures from graph;;</p> | 2 | <p>Note simplistic answer involving a quantitative statement gains 1 mark.</p> <p>More specific answer involving quantitative information gains 2 marks.</p> |

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| 9(c)(ii) | (No) for same body length, antenna are longer/antenna are shorter/some with longer body have short antennae/some with shorter body length have longer antennae; OR (Yes) positive correlation in open/in cave; | 1 | Habitat not critical as a term. Must refer to idea of same habitat Accept description |
| 9(d) | More alleles of each gene/shrimps in open have all the alleles; | 1 | Candidates are required to use the information from the table. Must therefore refer to alleles. |
| 9(e) | <ol style="list-style-type: none"> 1. A small number of shrimps were /went into the cave; 2. All/high proportion of shrimps had allele L; 3. Cave population descended from these/these reproduce; | 3 | |
| 9(f)(i) | <ol style="list-style-type: none"> 1. Cross shrimps from two sites/watch courtship; 2. Breed young together/observe mating; 3. Allow 1 mark for any method of improving quality of results e.g. carry out reciprocal crosses/large number of crosses/isolate beforehand; | | Other valid equivalent suggestions should be accepted. |
| 9(f)(ii) | 1. If same species the shrimps would breed, producing fertile young/courtship species specific; | 3 | Accept any form of evidence – mating/laying eggs/giving birth to young. |