



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

**Biology**

**BIOL2**

**(Specification 2410)**

**Unit 2: The Variety of Living Organisms**

**Final**

***Mark Scheme***

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| Question | Marking Guidelines   | Mark  | Comments   |
|----------|--|-------|--|
| 1(a)     | 1. Granum/grana/thylakoid;<br>2. Stroma;   | 2     | 1. Ignore references to membranes, stacks or discs.<br>Allow phonetic spellings.   |
| 1(b)     | 1. Absorbs/traps/uses light;<br>2. For photosynthesis;<br>3. Produces carbohydrates/sugars/lipids/protein; | 2 max | 1. Light dependent reaction = marking point 1.<br>3. Accept any named product of photosynthesis for marking point 3.<br>Reference to light dependent and light independent reactions = two marks |
| 1(c)     | Correct answer in range of 2.53 – 2.66;;<br>Any length divided by 30000 = 1 mark;                          | 2     |  |

| Question | Marking Guidelines  | Mark | Comments   |
|----------|---|------|--|
| 2(a)(i)  | Anaphase  | 1    |  |
| 2(a)(ii) | <ol style="list-style-type: none"> <li>1. Sister/identical chromatids/ identical chromosomes;</li> <li>2. To (opposite) poles/ends/sides;</li> </ol>  | 2    | <ol style="list-style-type: none"> <li>1. Reject: Homologous chromosomes separate.</li> <li>1. Allow any reference to chromatids/ chromosomes being identical e.g. same DNA</li> </ol>         |
| 2(b)(i)  | <ol style="list-style-type: none"> <li>1. 8.4/cells with twice DNA content = replicated DNA / late interphase / prophase / metaphase / anaphase;</li> <li>2. 4.2 = DNA not replicated / (early) interphase / telophase / cell just divided / finished mitosis;</li> </ol> | 2    | <ol style="list-style-type: none"> <li>1. Any reference to interphase must suggest towards end of interphase.</li> <li>1. 'Chromosomes replicate' is not enough for DNA replicates.</li> </ol> |
| 2(b)(ii) | 2.1;  | 1    |  |

| Question | Marking Guidelines   | Mark  | Comments   |
|----------|--|-------|--|
| 3(a)(i)  | <i>Synodontis batensoda</i> / <i>S. batensoda</i> ;  | 1     | Ignore spellings   |
| 3(a)(ii) | <i>Mochokus niloticus</i> ;  | 1     | Ignore spellings   |
| 3(b)     | 5;   | 1     |  |
| 3(c)(i)  | Fertile offspring produced;  | 1     | Allow suitable description of offspring being fertile.                                 |
| 3(c)(ii) | <ol style="list-style-type: none"> <li>1. Attracts/recognises same species;</li> <li>2. Attracts/recognises mate/opposite sex;</li> <li>3. Indication of sexual maturity/ fertility / synchronises mating;</li> <li>4. Stimulates release of gametes;</li> <li>5. Form pair bond;</li> </ol> | 2 max | <p>Attracts mate of the same species = two marks.</p> <p>3. Allow 'ready to mate'.</p> |

| Question | Marking Guidelines   | Mark  | Comments  |
|----------|--|-------|---|
| 4(a)(i)  | 4;   | 1     |   |
| 4(a)(ii) | <ol style="list-style-type: none"> <li>1. Change in amino acid/(sequence of) amino acids/primary structure;</li> <li>2. Change in hydrogen/ionic/disulphide bonds;</li> <li>3. Alters tertiary structure/active site (of enzyme);</li> <li>4. Substrate not complementary/cannot bind (to enzyme/active site) / no enzyme-substrate complexes form;</li> </ol> | 3 max | <ol style="list-style-type: none"> <li>1. Reject = different amino acids are 'formed'</li> <br/> <li>3. Alters 3D structure on its own is not enough for this marking point.</li> </ol> |
| 4(b)     | <ol style="list-style-type: none"> <li>1. Lack of skin pigment / pale/light skin / albino;</li> <li>2. Lack of coordination / muscles action affected;</li> </ol>  | 2 max |   |
| 4(c)     | Founder effect / colonies split off / migration / interbreeding;   | 1     | Allow description of interbreeding e.g. reproduction between individuals from different populations   |

| Question | Marking Guidelines   | Mark  | Comments  |
|----------|--|-------|---|
| 5(a)(i)  | (Human cells) don't have a cell wall;  | 1     | Accept "they" refers to human cells.  |
| 5(a)(ii) | (Affects) protein synthesis;   | 1     | Allow description e.g. 'amino acids not joined together / translation.<br>Reject: affects transcription.  |
| 5(b)     | <ol style="list-style-type: none"> <li>1. Mutation present/occurs;</li> <li>2. Resistance gene/allele;</li> <li>3. Resistant bacteria (survive and) reproduce;</li> <li>4. Vertical (gene) transmission / Horizontal (gene) transmission / conjugation;</li> </ol> | 3 max | Ignore antibiotic causes mutation.<br><ol style="list-style-type: none"> <li>1. Reference to immunity disqualifies first credited marking point.</li> <li>2. Must clearly state marking point 2. Do not award by implication e.g. resistance passed on by vertical gene transmission = one mark (marking point 4)</li> </ol> Reference to mitosis negates marking point 3 <u>or</u> 4 (not both marks). |
| 5(c)     | <ol style="list-style-type: none"> <li>1. <u>Horizontal</u> (gene) transmission;</li> <li>2. Via conjugation/pilus;</li> <li>3. Plasmid/Gene/DNA replicated/copied;</li> <li>4. <u>Plasmid</u> transferred (to <i>S.aureus</i>);</li> </ol>                        | 3 max | Ignore reference to mitosis   |

| Question | Marking Guidelines   | Mark  | Comments  |
|----------|--|-------|---|
| 6(a)     | <ol style="list-style-type: none"> <li>1. Amino acid sequences / primary structure;</li> <li>2. Closer the (amino acid) sequence the closer the relationship;</li> <li>3. (Protein structure) related to (DNA) base/triplet sequence;</li> </ol>   | 2 max | <p>More closely related (species) have more similarities in amino acid sequence/primary structure = two marks;</p> <p>Amino acid sequence is related to (DNA) base/triplet sequence = two marks;</p>                      |
| 6(b)     | <ol style="list-style-type: none"> <li>1. Reference to base triplets/triplet code / more bases than amino acids / longer base sequence than amino acid sequence;</li> <li>2. Introns / non-coding DNA;</li> <li>3. Degeneracy of code / more than one code for each amino acid;</li> </ol> | 2 max | <p>Different (base) triplets code for same amino acids = 2 marks;</p> <p>Degeneracy of triplet code = 2 marks</p> <p>Ignore reference to codon.</p> <p>3. Allow 'more than one base sequence can code for a protein';</p> |
| 6(c)     | <ol style="list-style-type: none"> <li>1. Most closely related to chimpanzee;</li> <li>2. Least closely related to trout;</li> </ol>   | 2     |   |



| Question | Marking Guidelines  | Mark | Comments  |
|----------|---|------|---|
| 7(a)(i)  | Produces a more reliable mean/average / makes sure sample was representative / reduce effect of extreme values / identify anomalies;  | 1    | Ignore references to chance                                     |
| 7(a)(ii) | Removes bias;   | 1    |   |
| 7(b)     | Two marks for correct answer of 5.8;;<br>One mark for incorrect answer that clearly shows denominator as 216;   | 2    |   |
| 7(c)     | <ol style="list-style-type: none"> <li>1. Increase in variety of plants/shrubs/grass;</li> <li>2. More habitats/niches;</li> <li>3. Greater variety of food sources / more food sources;</li> </ol> | 3    | 3. Answers only referring to 'more food' should not be credited |

| Question  | Marking Guidelines   | Mark  | Comments  |
|-----------|--|-------|---|
| 8(a)      | <ol style="list-style-type: none"> <li>1. Active transport by endodermis;</li> <li>2. ions/salts into xylem;</li> <li>3. Lowers water potential (in xylem);</li> <li>4. (Water enters) by osmosis;</li> </ol>                | 3 max | <ol style="list-style-type: none"> <li>4. Allow mark point 4 in any context of water movement in the root e.g. into root hair.</li> </ol> |
| 8(b)(i)   | <ol style="list-style-type: none"> <li>1. Increases then decreases;</li> <li>2. Peak/maximum at 13.00/14.00 (hours)/ 7.8 – 8.0;</li> </ol>   | 2     | Allow peak/maximum at any time between 13.00 – 14.00 or 7.8 – 8.0;  |
| 8(b)(ii)  | <ol style="list-style-type: none"> <li>1. Maximum/overall rate is higher (in branches);</li> <li>2. Reaches maximum/peak earlier (in the day) (in branches);</li> <li>3. Starts higher / ends lower (in branches)</li> </ol> | 2     | Allow converse for all marking points.  |
| 8(b)(iii) | <ol style="list-style-type: none"> <li>1. Movement starts/peaks earlier in branches/higher up;</li> <li>2. Creates tension/'negative pressure'/'pull';</li> </ol>  | 2     |   |

| Question | Marking Guidelines  | Mark  | Comments   |
|----------|---|-------|--|
| 9(a)     | <ol style="list-style-type: none"> <li>1. Haemoglobin carries oxygen / has a high affinity for oxygen / oxyhaemoglobin;</li> <li>2. In red blood cells;</li> <li>3. Loading/uptake/association in lungs;</li> <li>4. at <u>high p.O<sub>2</sub></u>;</li> <li>5. Unloads/ dissociates / releases to respiring cells/tissues;</li> <li>6. <u>at low p.O<sub>2</sub></u>;</li> <li>7. Unloading linked to higher carbon dioxide (concentration);</li> </ol> | 6 max | <p>7. Ignore reference to incorrect pH in relation to effect of higher carbon dioxide concentrations for marking point 7.</p>  |
| 9(b)     | <ol style="list-style-type: none"> <li>1. Allows comparison;</li> <li>2. (Different temperature) affects enzymes;</li> <li>3. (Different temperature) affects respiration/metabolism;</li> <li>4. (Different temperature) affects amount of dissolved oxygen;</li> </ol>  | 2 max | <p>Do not credit ‘temperature affects results’ on its own;</p> <p>2. Allow reference to denaturation of enzymes.</p>   |
| 9(c)     | <ol style="list-style-type: none"> <li>1. Increases then levels out / stops increasing / fluctuates slightly;</li> <li>2. At 5 (cm<sup>3</sup> dm<sup>-3</sup>) / 320 (cm<sup>3</sup> g<sup>-1</sup>h<sup>-1</sup>);</li> </ol>   | 2     | <p>Allow description of ‘fluctuates slightly’ in terms of candidate quoting figures after 320.</p>   |
| 9(d)     | <ol style="list-style-type: none"> <li>1. <i>Chronimus longistylus</i> has higher uptake at low (oxygen) concentrations;</li> <li>2. (Higher uptake) up to 2 cm<sup>3</sup> dm<sup>-3</sup>;</li> </ol>   | 2     | <p><i>Chronimus longistylus</i> has higher uptake to (oxygen concentration of) 2 / lower uptake after 2;; (= 2 marks)</p> <p>2. Award mark if candidate uses figures from table e.g. higher at concentration 1 (220) <u>or</u> concentration 2 (285).</p> <p>Higher uptake at concentration 1 <u>or</u> 2 = 2 marks.</p> |
| 9(e)(i)  | <p>More (than in African) lost via gills in Australian lungfish / less (than African) lost via lungs in Australian lungfish;</p>  | 1     |  |

|          |  |   |  |
|----------|--|---|--|
| 9(e)(ii) | <ol style="list-style-type: none"><li>1. More/most exchange is via lungs (in African lungfish);</li><li>2. Gills will not function/function less efficiently (in air);</li></ol> | 2 | <ol style="list-style-type: none"><li>1. Allow converse for first point.</li><li>2. Allow water is required for gills to function.</li></ol> |
|----------|--|---|--|

| Question  | Marking Guidelines   | Mark  | Comments   |
|-----------|--|-------|--|
| 10(a)(i)  | <ol style="list-style-type: none"> <li>1. Sex;</li> <li>2. Lifestyle;</li> <li>3. Body mass;</li> <li>4. Health;</li> <li>5. Ethnicity;</li> <li>6. Genetic factors / family history;</li> </ol>   | 2 max | <p>Stress, smoking, diet etc are examples of lifestyle.</p> <p>3. Allow weight for mark point 3.<br/>Reject: height.</p>                                       |
| 10(a)(ii) | <ol style="list-style-type: none"> <li>1. Large sample/number / 410 000;</li> <li>2. Long time period / 8.5/many years;</li> <li>3. Different countries / more than one country;</li> </ol>  | 2     | Reject: random   |
| 10(b)     | <p>Correct answer of 209/209.1 = 2 marks;;</p> <p>Incorrect answer but multiplies by 8.5 = 1 mark;</p>   | 2     | Answer of 210 = one mark   |
| 10(c)     | Age affects risk of cancer;  | 1     | Must relate to cancer not just to illness  |
| 10(d)     | <ol style="list-style-type: none"> <li>1. Correlation does not mean causal relationship;</li> <li>2. Tea/coffee contains other substances;</li> <li>3. Contain different amounts of caffeine;</li> <li>4. Estimated intake (of tea/coffee);</li> <li>5. No control group;</li> <li>6. Only one type of cancer studied;</li> <li>7. Further studies required / only one investigation/study/group;</li> </ol> | 4 max | <ol style="list-style-type: none"> <li>1. Reject casual for point 1.</li> </ol> <p>Reference to 'due to other factors' on its own is not enough for a mark</p> |
| 10(e)(i)  | <ol style="list-style-type: none"> <li>1. Treated the same;</li> <li>2. No caffeine;</li> </ol>  | 2     | <ol style="list-style-type: none"> <li>2. Accept decaffeinated</li> <li>2. Reject 'placebo.</li> </ol>   |

|            |   |       |  |
|------------|---|-------|--|
| 10(e)(ii)  | <ol style="list-style-type: none"> <li>1. Absorb different amounts;</li> <li>2. Broken down by enzymes/digested;</li> <li>3. Different blood volumes;</li> <li>4. Differences in metabolism;</li> <li>5. Caffeine from a different source;</li> </ol> | 1 max | Reject: Different body masses                              |
| 10(e)(iii) | <ol style="list-style-type: none"> <li>1. Less oxygen/glucose to (cancer) cells;</li> <li>2. Less carcinogens;</li> <li>3. Reduces spread of cancer (cells);</li> </ol>   | 1 max | 'Reduces cell division' on its own should not be credited. |