Version 1.0

**AQA**

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

**Biology**                  **BIOL2**

**(Specification 2410)**

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

# Final

# *Mark Scheme*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events, which all examiners participate in and is the scheme, which was used by them in this examination. The standardisation process ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Mark Scheme – General Certificate of Education (A-level) Biology – Unit 2: The Variety of Living Organisms – June 2012

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

| Question | Marking Guidelines | Marks | Comments |
|---|---|---|---|
| 2(a) | 2 of the following pairs:<br><br>1. Larger leaves;<br>2. Photosynthesis;<br><br>**OR**<br><br>3. Larger/bigger/thicker root;<br>4. Storage;<br><br>**OR**<br><br>5. Stem shorter / absent;<br>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<br><br>Accept converse descriptions of leaves, root and stem: longer root, taller stem, smaller leaves<br><br>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;<br><br>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<br><br>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<br><br>Reject OH/HO <u>molecule</u><br><br>Ignore alcohol |
| 3(b)(i) | **Starch**<br><br>1. (1,4 and) 1,6 bonds/contains 1,6 bonds /branching<br><br>2. All glucoses/ monomers same way up<br><br>3. Helix/coiled/compact<br><br>4. Alpha glucose<br><br>5. No (micro/macro) fibrils/fibres | **Cellulose**<br><br>1. 1,4 bonds / no 1,6 bonds / unbranched / straight;<br><br>2. Alternate glucoses/monomers upside down;<br><br>3. Straight;<br><br>4. Beta glucose;<br><br>5. Micro/macro fibrils/fibres; | 2 max | 1 mark per pair of contrasts, both starch and cellulose required<br><br>Accept other comparable differences eg hydrogen bonds **within** starch but **between** cellulose molecules |
| 3(b)(ii) | 1. H-bonds / micro/macro fibrils /fibres;<br><br>2. Strength / rigidity / inelasticity; | | 2 | Reject strong hydrogen bonds<br><br>'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;<br><br>2. Replace cells / repair tissue / organs /body;<br><br>3. Genetically identical cells;<br><br>4. Asexual reproduction /cloning; | 2 max | Ignore growth of cells<br><br>Ignore repair cells<br><br>Reject bacteria<br><br>3. 'Produces 2 genetically identical cells' does not reach MP1 as well as MP3<br><br>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<br><br>Neutral: Large sample |
| 4(b)(ii) | 1. A = metaphase;<br><br>2. Chromosome / chromatids lie on equator;<br><br>3. B = anaphase;<br><br>4. Chromatids /chromosomes separating / moving apart / moving to poles; | 4 | <br><br>2. Reject homologous chromosomes<br><br>Allow centre/middle<br><br>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;<br>2. D = <u>deoxy</u>ribose;<br>3. E = phosphate; | 3 | 2. Ignore sugar<br><br>3. Ignore phosphorus, Ignore molecule |
| 5(a)(iii) | <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> | 2 | Spelling must be correct to gain MP1<br><br>First mark = names correct<br><br>Second mark = % correct, with <u>adenine as 34%</u> |
| 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<br><br>Ignore unqualified reference to mutation<br><br>Accept reference to introns and exons if given together<br><br>Ignore 'junk' DNA/multiple repeats |

| Question | Marking Guidelines | Marks | Comments |
|----------|-------------------|-------|----------|
| 6(a)(i) | Kingdom / phylum / class; | 1 | Accept Animalia /animal kingdom / Chordata / Chordates / Aves<br><br>Allow phonetic spelling |
| 6(a)(ii) | Family; | 1 | |
| 6(b)(i) | 1. Shows the spread of the data / how data varies;<br><br>2. Overlap = no difference / due to chance / not significant;<br><br>3. Low SD means results more reliable / repeatable; | 2 max | 1. Reject range.<br>Accept varies from the mean<br>2. Allow converse<br><br>3. Ignore accurate/valid/ |
| 6(b)(ii) | 1. Different colour/different feathers/different throat;<br><br>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;<br><br>2. Amino acid sequence is the result of DNA/alleles//base sequence; | 2 | Accept more closely related = more similar sequence<br><br>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;;<br><br>2. Answer incorrect but shows clear understanding of $\Sigma$; | 2 | 1. Ignore more than 3dp<br><br>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)<br><br>1. Fewer <u>species</u> / Beech aphid/Large white butterfly/7-spot ladybird absent /only three <u>species</u> / <u>species</u> diversity lower;<br><br>2. Mostly one species / mostly bird-cherry aphid;<br><br>3. Fewer plant species; | 2 max | Assume wheat field if site unspecified<br><br>1. Allow species richness in context of few species<br><br><br><br>3. Allow one type of food source if clearly plant |
| 7(c) | For:<br><br>1. Data support the claim / evidence supports claim;<br><br>Against:<br><br>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 <u>plants</u>;<br><br>2. Another habitat / more habitats / places to live / niches;<br><br>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 |

Mark Scheme – General Certificate of Education (A-level) Biology – Unit 2: The Variety of Living Organisms – June 2012

| Question | Marking Guidelines | Marks | Comments |
|---|---|---|---|
| 8(a)(i) | 1. Stomata open; <br><br> 2. Transpiration highest around mid-day; <br><br> 3. Middle of day warm<u>er</u> / light<u>er</u>; <br><br> 4. (Increased) tension / water potential gradient; <br><br> 5. Cohesion (between water molecules); | 3 max | Allow converse <br><br><br> 3. Allow 'Sun is at it's hottest' <br><br> Ignore 'pull, suck' <br><br> 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 <br><br> Incorrect function of artery disqualifies mark |
| 8(b)(ii) | 1. (Aorta wall) stretches; <br> 2. Because ventricle/heart contracts / systole / pressure increases; <br><br> 3. (Aorta wall) recoils; <br> 4. Because ventricle relaxes / heart relaxes /diastole / pressure falls; <br><br> 5. Maintain smooth flow / pressure; | 3 max | 1. Allow expand <br> 2. Reject if MP1 wrong <br><br> 3. Allow spring back <br><br> Reject any reference to contract / relax in MP1 and 3 <br><br> 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 <br><br> 1. High blood / hydrostatic pressure / pressure filtration; <br><br> 2. Forces water / fluid out; <br><br> 3. Large proteins remain in capillary; <br><br> Return <br><br> 4. Low water potential in capillary / blood; <br> 5. Due to (plasma) proteins; <br><br> 6. <u>Water</u> enters capillary / blood; <br><br> 7. (By) <u>osmosis</u>; <br><br> 8. Correct reference to lymph; | 6 max | <br><br><br><br> 2. Reject plasma, ignore tissue <br><br><br><br><br><br><br><br><br><br><br> 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' <br><br> 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; <br> 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 <br><br> 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); <br> 2. Trial did not use people; <br> 3. Very little / no effect after 50 ($\mu g\,cm^{-3}$); <br> 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 <br><br> 2. Allow references to not being as effective in humans |
| 9(c) | 1. Mutation; <br> 2. Horizontal transmission / conjugation; | 2 | Ignore reference to vertical transmission <br><br> 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; | 4 max | 1. Reject reference to antibodies. Reject <u>all</u> bacteria killed Allow credit for use of figures to show effect |
| --- | --- | --- | --- |
| | 2. (Survivors have) resistant gene/allele; | | |
| | 3. (Resistant bacteria) reproduce/multiply; | | 3. Reject 'immune bacteria' |
| | 4. Valid reference to data at 2 months; | | 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 |
| | 5. (Infection) no difference at 3 months; | | 4 and 5 must refer to time |
| | | | 4 and 5 allow credit for use of figures |