Mark Scheme (Results)

January 2021

Pearson Edexcel International Advanced Subsidary / Advanced Level
In Biology (WBI13)
Paper 01 Practical Skills in Biology I

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Additional Guidance	Mark
1(a)	An answer that includes four of the following points. • one reference to safety (1) and three of the following points • use of cotton bud (1) • followed by use of stain/dye (1) • place cells (on slide) under coverslip (1) • use of high power of microscope (1)	e.g. bud into disinfectant/sterile/fresh bud/toothpick/wear gloves/ goggles/safe use of microscope/slides/careful use of bud/stain to prevent injury Accept toothpick/earbud/lollipop stick/glass rod/swab can piece together	(4)

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	A drawing showing the following features: • drawing showing correct shape of cell and nucleus and nucleus in correct position (1) • any two correct labels (1)	 Ignore other features drawn nucleus, cytoplasm, (plasma) membrane, nuclear membrane Ignore other labelled features unless specifically plant cell ones, then this mark negated	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	• reading of width using scale (1) • width calculated (1)	Example of calculation: 33/34/35 units So actual width is 33/34/35 x 3 = 99/102/105 (μm) so no marks for mp2 if other answers to mp1 unless 32 or 36, or 3.3, 3.4, 3.5 correct answer with no working gains both marks	(2)

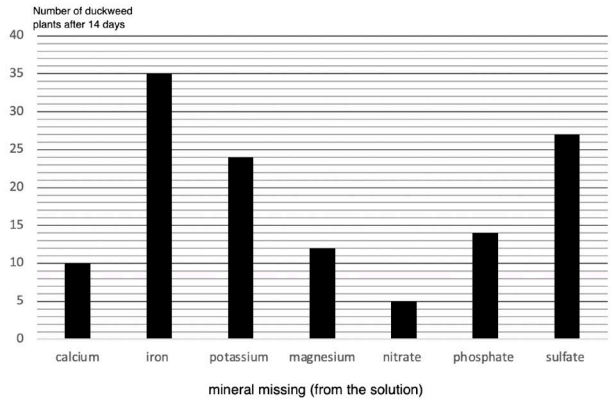
Question Number	Answer	Additional Guidance	Mark
1(c)(i)	• calculation of haemoglobin molecule volume	Example of calculation $4/3\pi r^3 = 1.3 \times 3.14 \times 2.5^3 = 65.45nm^3$ Other acceptable answers 65.5/63.81/63.8/65.42/65.4/63.78	(1)

Question Number	Answer	Additional Guidance	Mark
1(c)(ii)	A calculation showing the following steps: • volume of red blood cell ÷ volume of haemoglobin molecule (1) • conversion and standard form (1) OR • conversion of {red blood cell volume, from μm^3 to nm3 / Hb molecule radius, 2.5 nm to 0.0025 μm / Hb volume calculated from nm^3 to μm^3} (1) • division of rbc volume in {$nm^3 \div \mu m^3$} by calculated haemoglobin molecule volume in {$nm^3/ \mu m^3$} (1)	Example of calculation 80 ÷ (answer from 1ci) e.g.= 80 ÷ 65.45 = {1.222/1.22/1.2} $1.2/1.22 \times 10^9$ 80 μm3 to 8 x 1010 nm^3 / Hb molecule radius, 2.5 nm to 0.0025 μm e.g {80 000 000 000 / 8 x 1010} ÷ 65.44 = 1 222 493 887 = $1.2/1.22 \times 10^9$	(2)

Question Number	Answer	Additional Guidance	Mark
1(c)(iii)	A comparative description that includes any two of the following: • one difference described for plant cell and RBC (1) • another difference described for plant cell and RBC (1)	e.g. plant cell has nucleus, RBC does not allow one mark if both statements correct but not comparative plant cell: nucleus/nucleolus/vacuole/large(r) vacuole/chloroplasts/cell wall/regular shape/bigger/colour accept converse	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	An answer that includes the following points: • (one duckweed plant and) a solution with all minerals (1) • (one duckweed plant and) a solution with no minerals / (distilled) water (1)	accept complete solution/medium	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	A description that includes the following points: • temperature by use of {thermostatically controlled {chamber / room} / incubator} (1) • pH by use of buffer (1)		(2)

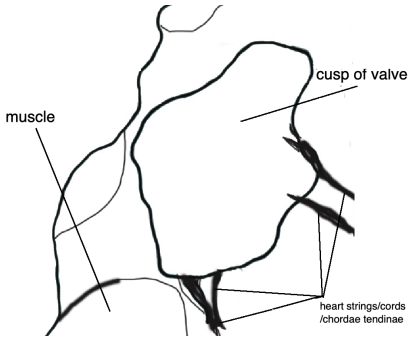
Question Number	Answer	Additional Guidance	Mark
2(b)(i)	A graph showing the following features: • A axes correct (x – mineral missing, y – no. of plants), y starting at zero and with no break in the axis (1) • L axes correctly labelled (1) • P correct plotting on a linear scale on y (1) • S bar chart (1)	 accept minerals in any order on x	(4)

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	An explanation that includes the following points: • fewer duckweed plants with no nitrate than with no phosphate / less growth with no nitrate than with no phosphate (1) • credit correct use of nitrate (1) • further detail of role of the nitrate containing substance stated in mp2 (1)	accept nitrate least growth piece together e.g amino acids/protein/chlorophyl/ATP/nucleic acids/chlorophyl/enzymes e.g. protein enzymes / energy / ATP / cell division / new plant/ photosynthesis/respiration/speed up reactions	(3)

Question Number	Answer	Additional Guidance	Mark
2(c)(i)	An answer that includes two of the following points: • difficult to distinguish one plant from another/plants overlap (1) • (plants / leaflets) are of different sizes / may grow by increasing in size (1) • leaf number varies from plant to plant (1)		(2)

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	An answer that includes the following points: • measure the {mass/area/root length} (1) • measurements of growth taken (at start) and after {stated/known/intervals of} time • description of method to improve accuracy of measurement of growth (1) • calculation of rate as {change divided by time / gradient of graph against time}	accept weight ecf eg. height 1 day minimum if stated e.g. pat dry before weighing, {2 or higher place / electronic} balance, use of calipers, graph paper, micrometer	(4)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• A – right atrium • B - aorta • C - pulmonary artery • D – coronary artery	Any two correct for one mark	(2)

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	A drawing showing the following features: • cusp and two sets of cords shown (1) • one feature correctly labelled (1) • another feature correctly labelled (1)	valve/muscle/cord/strings/tendon/ventricle/ papillary muscle  	(3)

Question Number	Answer	Additional Guidance	Mark
3(a)(iii)	An answer containing two of the following points: • ventricle / muscle /wall {pumps blood/empties ventricle} (1) • (atrioventricular) valve prevents {blood flowing from ventricle into atrium/backflow into atrium} (1) • cords prevent valve from {opening wrong or closing wrong way/going inside out/flipping} (1) • papillary muscle pulls on cords (1)	allow ecf from diagram, e.g. atrium pumps blood into ventricle	(2)

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	A calculation showing the following steps • correct measurements of lines M from the diagrams and subtraction (1) • calculation of percentage increase (1)	normal, 0.7/0.8, HC, 1.7/1.8 1.7 -0.7 = 1.0 cm/1.8-0.7 = 1.1/1.7-0.8 = 0.9/ 1.8-0.8 = 1.0 1.0 ÷ 0.7 = 140 1.1 ÷ 0.7 = 160 0.9 ÷ 0.8 = 110 1.0 ÷ 0.8 = 130 (%) ecf 0.6 or 0.9, 1.6 or 1.9 for 1 mark	(2)

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	An answer that includes the following points; Similarities • right ventricles {unaffected/same} (1) • atria {unaffected/same} (1) Differences • left ventricle {wall/muscle} thicker in the HC heart (1) • left ventricle (chamber) {smaller/shorter} in the HC heart (1)	 accept both hearts same size if neither mp1 nor 2 given accept R and/or L atria accept converse accept converse	 (4)

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(b)(iii)</td><td>A table showing the following features

• headings, thickness with units and categories (1)

• raw data correctly entered (1)

• spaces for SDs to be entered (1)</td><td>units must not be in cells of table

e.g. acceptable range shown in some cells, answer must include just one figure in this range
<table><tr><td>group</td><td>mean thickness of Artery A / µm</td><td>SD</td><td>mean thickness of Artery B / µm</td><td>SD</td></tr><tr><td>ECH</td><td>340-345</td><td></td><td>520</td><td></td></tr><tr><td>HC</td><td>455-460</td><td></td><td>585-590</td><td></td></tr><tr><td>control</td><td>460</td><td></td><td>600-610</td><td></td></tr></table></td><td>(3)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
3(b)(iv)	An answer that includes the following: • suitable manipulation of the data Plus three from the following points • ECH has an {effect / greater effect} on the arteries, HC {does not / has smaller effect} (1) • correct description of effect of ECH on artery A (1) • correct description of effect of ECH on artery B (1) • correct description of effect of HC on arteries A or B (1)	accept ECH has greatest / most effect e.g.ECH causes decrease (in thickness) in artery A e.g ECH has no effect on Artery B / decrease (in thickness) in artery B is not significant e.g HC does not affect artery A thickness / decrease (in thickness) in artery A is not significant HC does not affect artery B thickness / decrease (in thickness) in artery B is not significant	(4)

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