Pearson Edexcel

Mark Scheme (Results)

October 2022

Pearson Edexcel International Advanced Subsidiary In Biology (WBI16)
Paper 1: Practical Biology and Investigative Skill

Question Number	Answer	Additional Guidance	Mark
1(a)	A description that contains five of the following: • pondweed set up with suitable apparatus to measure volume of gas (1) • use of at least five appropriate (stated) temperatures (1) • time for pondweed to acclimatise • sodium hydrogen carbonate added (in excess) (1) • volume of gas collected in {same/stated} time (1) • identification and control of one variable (1) • method of calculating rate (1)	**Accept** name of apparatus eg photosynthometer**/** diagram of apparatus to measure volume eg funnel +tube +(gas)syringe (connected together) Within range 5 - 50˚C **Accept** correct formula/bicarbonate/potassium hydrogen carbonate **Accept** minutes/hours/ per unit time **Accept:** pH – buffer mass or length of pondweed – measure light intensity – bulb at set distance – heatshield – wavelength with lamps/filter **Accept** number of bubbles divided by time	**Exp (5)**

Question Number	Answer	Additional Guidance	Mark
1(b)	An explanation that includes three of the following: • water (split to) form oxygen (1) • by photolysis (1) • electrons removed from water (1) • two oxygen (atoms) combine to form {one oxygen **molecule/O_2**} (1)	Ignore light dependent reaction unqualified Accept equation for MP1 and 3 $H_2O \rightarrow 2H^+ + 2e^- + ½ O_2$ to produce hydroxides/OH^- hydroxides react to form water and oxygen	**Exp (3)**

(Total for Question 1 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)(i)	• (add) {0.004 g/4mg} in 20 cm^3 of water	**Accept** equivalent correct answers e.g. 4mg in 0.02dm^3 Or 200mg in1dm^3 and then remove 20cm^3	**Exp (1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	0.93	Accept 0.933/0.9 Ignore 0.93333/0.93·	**(1)** **Exp**

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)	56.99	ECF from part ii Allow 55.55 to 57.127/57.13 Max 3 decimal places	**Exp (1)**
Question Number	Answer	Additional Guidance	Mark
2(a)(iv)	An explanation including two of the following: • facilitated diffusion (down a concentration gradient) (1) • (concentration) gradient reduces over time (1)	Accept description e.g. channel proteins Accept description of gradient and time refs using 1 - 2 hrs and 4 - 5hrs	**Exp (2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	Abiotic • temperature • pH Biotic • age / sex of toad • {part of body providing skin sample/thickness of skin}	Ignore other abiotic factors **Accept** gender **Accept** disease If biotic and abiotic factor stated on the same line they negate each other	**Exp (2)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	An answer that includes two of the following: • variable with suitable control method described (1) • results are not valid / description of expected effect on the dependent variable (1)	**Accept** AC / incubator/thermostatically controlled waterbath **Accept** stated directional answer	**Exp (2)**

(Total for Question 2 = 9 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• suitable risk identified (1) • suitable control identified (1)	Any reasonable risk identified eg toxic effects, allergy, irritant **ignore** infection/labcoat/PPE Any corresponding control identified eg use of gloves/mask	**Exp (2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	• there is no (significant) correlation between the (mean) percentage of germination (after 4 days) and the concentration of arsenic ions		**Exp (1)**

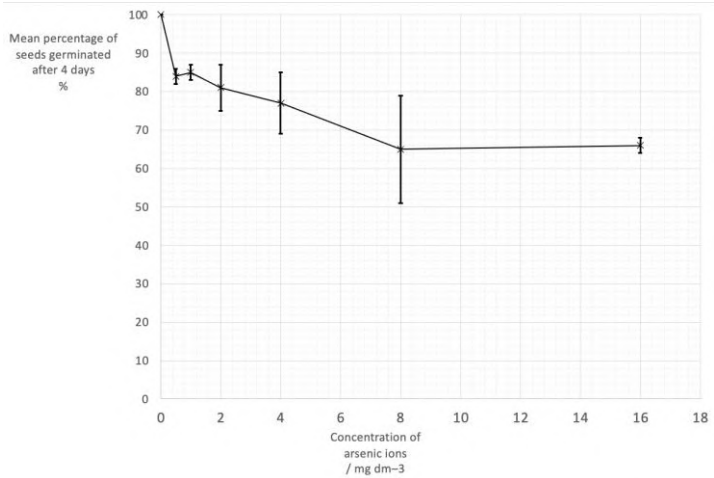
<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr>
<td>3(a)(iii)</td>
<td>An answer that includes three of the following:

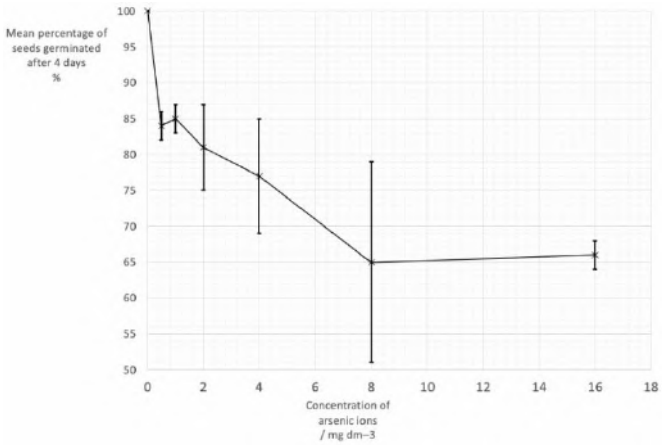
• axes labelled including units (1)

• data plotted correctly on a linear scale in scatter graph format (1)

• error bars correctly plotted (1)

<table>
<tr><th>concentration /mg dm^{-3}</th><th>mean %</th><th>error bar</th></tr>
<tr><td>0.0</td><td>100</td><td></td></tr>
<tr><td>0.5</td><td>84 ± 2</td><td>82 - 86</td></tr>
<tr><td>1.0</td><td>85± 2</td><td>83 - 87</td></tr>
<tr><td>2.0</td><td>81± 6</td><td>75 - 87</td></tr>
<tr><td>4.0</td><td>77 ± 8</td><td>69 - 85</td></tr>
<tr><td>8.0</td><td>65 ±14</td><td>51 - 79</td></tr>
<tr><td>16.0</td><td>66 ± 2</td><td>64 - 68</td></tr>
</table>
</td>
<td>Accept y axis mean % germination and x axis concentration of arsenic ions/ mg dm^{-3}
Accept broken scale with symbol or scale not starting at zero Ignore line if drawn

Example graph
 
</td>
<td>Exp (3)</td>
</tr>
</table>

		Example graph y axis not at zero  	

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	• calculation of intermediate step (1) • calculation of r_s (1)	**Accept** $\sum d^2 = 24$ **and** n=7 **OR** $\frac{6\sum d^2}{n(n^2-1)} = \frac{24}{336}$ 13/14 r_s = 0.929 / 0.93 / 0.9/0.9286 must be correct rounding correct answer with no working gains full marks	**Exp (2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	An answer that includes three of the following: • calculated value (0.93) is greater than the critical value, **0.786** therefore reject the null hypothesis (1) • there is a (significant) correlation between the percentage germination and the concentration of arsenic ions (1) • comment on variability of data (1)	**Accept** 0.93 > 0.786, so reject the null hypothesis **Accept** critical value identified in table only **Accept** a correct statement using the critical value from p = 0.01 **Accept** converse wording for MP1 And 2 if they claim the calculated value is less than.... Eg error/range bars **overlap**	**Exp (3)**

Question Number	Answer	Additional Guidance	Mark
3(c) (i)	An answer that includes two of the following: • differences in {alleles/DNA} (may alter the response to arsenic ions) (1) • some varieties may be unable to <u>absorb</u> arsenic ions (during germination/in 4 days) (1) • reference to mutation/natural selection (1)	Ignore genes **Accept** comment on membrane permeability **Accept** details of one form of mutation	**Exp (2)**

Question Number	Answer	Additional Guidance	Mark
3(c)(ii)	An answer that includes three of the following: • germinate seeds with no arsenic (1) • (grown in) different concentrations of arsenic ions (1) • control of a stated condition (1) • measure {height/mass} of plants after {stated/same length of time} (1)	Ignore soil Eg temperature, volume of water, light , pH accept other suitable parameter eg 7-100 days	**Exp (3)**

(Total for question 3 = 16 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	An answer that includes three of the following: • find the time for animal to start feeding (1) • find a suitable conditions for the animal to feed (1) • find a suitable method to for applying a touch/ suitable force (1) • find a suitable method of determining/measuring the extent of fan withdrawal (1)	Find/determine / identify eq Do not award method statements **Accept** find time interval between touches **Accept** measuring extension	**Exp (3)**

Question Number	Answer	Additional Guidance	Mark
4(b)	An answer that includes eight of the following: • clear statement of the dependent variable (1) • allow animal to acclimatise • method of touching the animal (1) • stated time intervals between touches or stated number of touches in a set time (1) • supply of organic particle to stimulate feeding activity (1) • identify one variable to be controlled and description of how it is controlled (1) • identify second variable to be controlled and description of how it is controlled (1 • repeat with another animal (1)	**Accept** record the length /extent of the withdrawal E.g. use of glass rod/cotton bud / touch with the same force MP6 and 7 e.g. temperature with thermostat in tank/waterbath **Accept** same age/sex	**Exp (8)**
Question Number	Answer	Additional Guidance	Mark

4(c)	• raw data table with headings and units, with means calculated from repeats (1) • scatter/line graph with labelled axes (1) • use of an appropriate (statistical) correlation test (1)	**Accept** any headers with appropriate units **Do not accept** description of calculating mean **Do not accept** units in the body of the table Accept bar graph and t test if comparing just two treatments	**Exp (3)**

Question Number	Answer	Additional Guidance	Mark
4(d)	An answer that includes three of the following: • difficulty in determining extent of withdrawal (1) • difficult to determine same pressure/force of touch (1) • difficult to ensure each organism in the {same age /not already habituated} (1) • difficult to control concentration of organic particles (1)	**Accept** noise/vibration/water currents/light to shade	**Exp (3)**

(Total for question 4 = 17 marks)