Pearson Edexcel

Mark Scheme (Results)

Summer 2024

Pearson Edexcel International Advanced Level In Biology (WBI16) Paper 01
Practical Skills in Biology II

Question Number	Answer	Additional Guidance	Mark
1(a)(i)	{cristae / inner (mitochondrial) membrane}	Accept stalked particles	(1) Grad

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	NAD / FAD	Accept cytochrome oxidase / cytochromes /NADH /FADH2 Ignore reference to oxidised and reduced Do not accept NADP or other incorrect molecule No mark if one correct and one incorrect answer given	(1) exp

Question Number	Answer	Additional Guidance	Mark
1(b)	A description that contains five of the following: • range of five suitable temperatures used (1) • use of thermostatic waterbath (1) • incubate yeast and indicator separately to reach same temperature (1) • suitable named indicator used (1) • record time taken for colour to change (1) • identification of one variable (1) • repeats and calculate { means/SD's } (to compare) (1)	**Accept** temperatures between 5 and 45°C (ignore additional temperatures outside the range) **Accept** waterbath set at a stated temperature **Accept** to equilibrate/acclimatise **Accept** TTC / DCPIP / methylene blue ignore stated colours **Accept:** pH {volume / conc/mass/strain/type} of yeast suspension/ volume/conc of TTC Ignore species **Accept** average	**Exp (5)**

Question Number	Answer	Additional Guidance	Mark
1(c)	An explanation that includes three of the following: • at high temperatures there is more kinetic energy (1) • as temperature increases { more collisions between enzyme and substrate/more ES (complexes) formed} (1) • at {high(er) temperatures /above optimum temperature} enzymes are denatured (1)	**Accept** reverse argument / KE **Accept** reverse argument **Accept** description of bonds being broken changing shape of active site Accept high temperatures change shape of active site so substrate no longer fits not denatured if low temperature	**Exp (3)**

(Total for Question 1 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)	A description that includes four of the following • touching woodlouse in standardised manner (1) • **method** of control of suitable variable (1) • repeat with different woodlice (1) **one of these methods** • repeated touches on (same) woodlouse (until no response seen) (1) • record the number of touches before no response seen (1) **OR** • measure time to curl/uncurl • (record time taken and) number/frequency of touches (to curl/uncurl to standard state)	**Accept** eg glass rod / cotton bud / same force **Accept** temperature – AC room humidity /moisture – AC room light intensity – same intensity bulb / same distance woodlouse variable eg age – same length/ mass species – use a key **Accept** repeat with different woodlice	**Exp (4)**

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	71 / 71.15/ 71.2	**Not** 71.1 / 71.0 / 71.20 Ignore minus sign	**Cleri (1)**

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	• axes correctly orientated with suitable axis labels and units and linear scale (1) • all points correctly plotted (1) • points (joined) with {labels/ key}(1)	eg. x axis: stimulus / sound y-axis: mean distance / cm (not MP3 if a bar graph)	**Exp (3)**

Question Number	Answer	Additional Guidance	Mark
2(b)(iii)	• suitable precaution (1)	eg. Sound should not be too loud/time for fish to rest after testing/ do not test same fish several times; suitable size tank ignore release to the wild / control of light intensity	**Exp (1)**
Question Number	Answer	Additional Guidance	Mark
2(b)(iv)	**Abiotic** • temperature • sound factor eg intensity / duration of sound / how far away the sound is • light {intensity/wavelength} • size of tank • pH **Biotic** • Age / sex of fish	**Accept** pitch /intensity/amplitude/frequency **Accept** gender/mass	**Exp (2)**

uestion Number	Answer	Additional Guidance	Mark
2(b)(v)	• variable with suitable control method **described** (1) • results are not valid / description of expected effect on the dependent variable (1)	**Accept:** Water temperature – use of thermostatic heater in tank Sound factors – sound of fixed duration eg 1s / from fixed distance eg 10m Light intensity – bulb of known wattage / at fixed distance Size of tank – same sized tank for each trial Age – fish hatched at same time Sex - select fish of known sex pH - buffer Description needs to be directional Accept other variables controlled and expected effect	**Exp (2)**

(Total for Question 2 = 13 marks)

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(a)</td><td>x 2.5</td><td></td><td>Cleri (1)</td></tr>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(b)(i) Clip with 3bii</td><td>• calculation of observed values (1)

• calculation of $\frac{(O-E)^2}{E}$ (1)

• calculation of chi-squared value (1)</td><td><table><tr><td></td><td>Observed value</td><td>Expected value</td></tr><tr><td>Smooth light</td><td>12</td><td>20</td></tr><tr><td>Rough light</td><td>15</td><td>20</td></tr><tr><td>Smooth dark</td><td>24</td><td>20</td></tr><tr><td>Rough dark</td><td>29</td><td>20</td></tr></table>
Accept MP1 one correct substitution into part of calculation
Accept MP2 for one value eg 3.20

Accept: 3.20 / 1.25 / 0.80 / 4.05 for MP1 and 2

9.3 /9.30 /9.300 correct answer only gains 3 marks

Accept ECF for MP2 and 3</td><td>Exp (3)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
3(b)(ii) Clip with 3bi	An answer including three of the following • calculated value (9.3) is **more** than a critical value stated/indicated from the table (1) • therefore reject the null hypothesis (1) • top shells show a preference (1) • Suitable comment on preference (1)	**Accept** any stated value againt any critical value with correct reasoning for all MP's e.g. top shells prefer dark to light / no preference for rough or smooth	**Exp (3)**

Question Number	Answer	Additional Guidance	Mark
3(b)(iii)	An answer which includes three of the following: • leave them for longer so that they have time to {move around / select their preferred habitat} (1) • put more than five molluscs into each area so that there is more data to analyse (1) • controlled temperature so they move {in the same way/at the same speed} (1) • cover the light side with a transparent covering eg glass so that {both sides are covered / you are not comparing covered and uncovered} (1) • use a round tray so that the molluscs do not collect in corners (1)		**Exp (3)**

(Total for question 3 = 9 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	A description that includes three of the following: • find a suitable pre-treatment for seeds (1) • find suitable conditions for {germination/growth/respiration} of seeds (1) • find a suitable time for seeds to (start) {germination/growth/respiring} (1) • find a suitable timescale to measure distance moved by bubble (1)	**Accept** soaking time / number of times to rinse seeds /other valid example **Accept** temperature / light wavelength/daylength **Accept** time to produce a measurable change of gas find a suitable {number / mass} of seeds to obtain a measurable rate/quantity of gas	**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) • suitable method for preparing seeds (1) • use of a carbon dioxide absorber (1) • seeds left to equilibrate/acclimatise (before data collection) (1) • description of data collection in a given time (1) • calculation of rate described (1) • identify one abiotic variable to be controlled and description of how it is controlled (1) • one biotic variable identified (1) • use both types of seed in the investigation (1)	**Accept** distance moved by bubble (in respirometer) in given time / volume of oxygen/gas **used** in given time **Accept** soaking / rinsing / surface sterilisation etc E.g soda lime /KOH/NaOH **Not** sodium hydrogen carbonate **Accept** distance moved by bubble in given time / volume of gas collected in syringe E.g distance / volume divided by time **Accept**: temperature / wavelength of light Ignore pH **Accept** age of seeds / mass of seeds / variety of seeds	**Exp (8)**

Question Number	Answer	Additional Guidance	Mark
4(c)	A description including the following • **raw** data table with headings and **units**, with means calculated from repeats (1) • suitable graph with labelled axes (1) • use of an appropriate statistical test (1)	**Accept** distance moved by bubble (in given time) **Accept additional columns** eg volume of oxygen used / rate of respiration **Accept** description of calculating mean **Do not accept** units in the body of the table **Accept** distance moved by bubble / volume of oxygen used / rate of respiration MP2 and 3 usually a bar graph and a stats test for **difference** OR a line graph of time intervals	**Exp (3)**

Question Number	Answer	Additional Guidance	Mark
4(d)	An answer that includes three of the following: • if mung beans germinate more quickly than peas the highest respiration rate may be at different times after soaking (1) • It is hard to control {age/viability}of seeds (1) • Seed may change from aerobic to anaerobic respiration (1) • errors in { reading position of bubble on scale/measuring volume of gas} (1) • germinating seeds produce heat so hard to control temperature (which affects rate of respiration) (1)	**Accept** older seeds may have a lower {germination rate / respiration rate} **Accept** if some seeds do not germinate this will affect the result / reduce the respiration rate **Accept** changing temperature will affect position of bubble on scale	**Exp (3)**

(Total for question 4 = 17 marks)