



Mark Scheme (Results)

Summer 2024

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

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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)(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 / FADH ₂ 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)

Question 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)

Question Number	Answer	Additional Guidance			Mark
3(a)	x 2.5				Cleri (1)
Question Number	Answer	Additional Guidance			Mark
3(b)(i) Clip with 3bii	- calculation of observed values (1) - calculation of $\frac{(O - E)^2}{E}$ (1) - calculation of chi-squared value (1)		Observed value	Expected value	Exp (3)
		Smooth light	12	20	
		Rough light	15	20	
		Smooth dark	24	20	
		Rough dark	29	20	
		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			

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 against 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)

