Pearson Edexcel

Mark Scheme (Results)

January 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)	A description that includes six of the following points: • use of any two of root, stem, leaves, flowers (1) • {same / standardised} extraction method used (1) • preparation of {agar (plate) / broth} with bacteria (1) • description of aseptic technique (1) • preparation of discs soaked in extract / addition of extract to broth (1) • incubate for stated time and stated temperature (1) • measure the diameter/area of {zone of inhibition / turbidity} (1)	e.g. same volume of solvent/grinding time/mass/concentration allow description allow culture medium for agar e.g. flaming/sterilising loop/forceps/petri dish autoclaving/sterilise work surface/near a Bunsen flame allow wells allow one stated time and temperature in the range 24-72hrs and 20-30°C	**(6)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	• bacteriostatic prevents increase in bacterial{numbers/ population} (1) • bacteriocidal kills bacteria (1)	Allow inhibits/slows/stops growth/numbers remain constant	(2)

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	• (prescribe) <u>only</u> for bacterial infections / do not use for viral infections/do not use for minor infections/finish the course (1) • to reduce creating bacterial resistance (1)	allow creates selection pressure	(2)

Question Number	Answer	Additional Guidance	Mark
2(a)	• correct answer (1) • correct units (1)	20.0 μm hour^{-1} Allow /h /hr /hour per hour (allow any of these to $^{-1}$ instead of the solidus)	(2)

Question Number	Answer	Additional Guidance	Mark
2(b)	• higher temperatures {increase enzyme activity / results in more ES complexes} (1) • increase respiration/metabolic rate so increased growth (1) • Very high temperatures denature enzymes stopping growth (1)	ORA allow more cell wall made/molecules released Ignore increase in cell numbers	**(2)**

Question Number	Answer	Additional Guidance	Mark
2©	An answer that includes two of the following points: Abiotic • (concentration of) minerals in growth medium (1) • pH (1) • light (intensity) (1) • humidity (1)	Ignore nutrients/oxygen/carbon dioxide Allow boron/sucrose concentration	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(c)(ii)	• suitable method of control of identified variable (1)	Candidates can express this in a variety of ways.	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(c)(iii)	• results are not valid / description of expected effect on the dependent variable (1)	Candidates can express this in a variety of ways. The answer must be directional	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(d)	• store pollen for different time intervals (before use) (1) • keep a relevant named variable/condition the same (1)	allow same species/source allow **all** variables the same	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)	• There is no (significant) difference between the **surface area** of toepads before and after the **hurricane**	Candidates can express this in different ways A and B must be qualified	**(1)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(b)</td><td>• suitable table format with correct column headings and units (1)

• all data correctly entered (1)

• means correctly calculated (1)</td><td>Example table

<table>
<tr><td colspan="2">area of toepad /mm^2</td></tr>
<tr><td>sample A</td><td>Sample B</td></tr>
<tr><td>0.9</td><td>0.8</td></tr>
<tr><td>1.3</td><td>1.3</td></tr>
<tr><td>1.1</td><td>1.5</td></tr>
<tr><td>1.2</td><td>1.8</td></tr>
<tr><td>1.3</td><td>1.3</td></tr>
<tr><td>1.5</td><td>1.5</td></tr>
<tr><td>1.6</td><td>1.6</td></tr>
<tr><td>0.8</td><td>1.9</td></tr>
<tr><td>0.7</td><td>1.8</td></tr>
<tr><td>Mean 1.16</td><td>Mean 1.50</td></tr>
</table>

Or 1.2 and 1.5
A third column negates MP1</td><td>(3)</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(c)</td><td>• bar graph with linear scale starting at zero and axes labelled (1)

• means plotted correctly (1)

• range bars plotted correctly (1)</td><td>ALLOW ECF from 3bi

mean (surface) area (of toepads) /mm^2
A B</td><td>(3)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
3(d)(i)	• correct numerator (1) • correct substitution of given $(S_A)^2$ and $(S_B)^2$ divided by 9/denominator (1) • correct answer (1)	ECF for any mean values allow use of 1.16 – 1.50 numerator = 0.1527 If $(S_A)^2$ and $(S_B)^2$ squared again then use denominator 0.0497 only MP1 and 3 t = 1.96 Correct answer gains 3 marks Ignore minus sign t = 2.225/2.23 if 1.16 mean used	**(3)**

Question Number	Answer	Additional Guidance	Mark
3(d)(ii)	• the calculated value of *t* (1.96) is less **than** the critical value of **2.12** (1) • therefore accept the null hypothesis there is no difference between the surface area (of toepads) before and after the hurricane (1)	*Ignore negative t values so do not award MP1* Allow ECF from 3di if t value more than 2.12 allow converse statements/ref to 16 D of Fonly Allow sample A and sample B	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(e)	An answer that includes two of the following points: • repeat after each hurricane (1) • measure hind limb toepads (1) • repeat in other {locations/areas} (1) • other species (of lizard) (1)	ignore repeat the expt	**(2)**

(Total for question 3 = 14 marks)

Question Number	Answer	Additional Guidance	Mark
4(a)	A description that includes the following points: • suitable way of germinating seeds/checking they are viable (1) • find a suitable temperature for {respiration/germination/seeds to grow} (1) • find a suitable mass of seeds to give a measurable volume of gas(1) • find suitable method for absorbing carbon dioxide (1) • find a suitable method to measure (change of) gas volume (1)	Do no allow oxygen <u>produced</u>	**(2)**

Question Number	Answer	Additional Guidance	Mark
4(b)	An answer that includes the following points: • clear statement of the **dependent variable** e.g. distance moved in unit time volume of oxygen in unit time (1) • some description of apparatus used (1) • control mass of seeds (1) • (record) time for a measured distance of the meniscus or volume of gas (1) • time to acclimatise (1)	Do not piece together the dependent variable Allow volume of gas using syringe allow respirometer/labelled diagram/manometer allow KOH/NaOH	**(9)**

	• repeat with and without soda lime (1) • one variable that needs to be controlled (1) • description of how this variable is controlled (1) • repeat the method with the other seed type (1) • formula for calculating RQ (1)	allow disinfection with bleach to prevent contamination Ignore pH/light/ Allow AC with suitable stated temperature/incubator allow $CO_2 \div O_2$ Or distance with soda lime – distance without ÷distance without soda lime	

Question Number	Answer	Additional Guidance	Mark
4(c)	• table with headings for raw results and appropriate units means calculated from repeats (1) • bar graph format with labelled axes (1) • use of an appropriate statistical test (1)	t test/Mann-Whitney U test/Wilcoxon test	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(d)	• difficult to measure distances or (collect small) volumes of gas (1) • difficult to prevent contamination of watermelon seeds (1) • difficulty of controlling temperature (1)	allow apparatus contaminated ignore temperature in a list of variables	**(2)**

Total for question 4 = 16

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