Pearson Edexcel

Mark Scheme (Results)

January 2024

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

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