



Mark Scheme (Results)

Summer 2021

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

Using the Mark Scheme

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

() means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer. ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Answer	Additional Guidance	Mark
1(a)	<p>A description that includes the following points:</p> <ul style="list-style-type: none"> dependent variable is the number (of eggs) hatched per unit time (1) use of five different concentrations of calcium ions (1) counting brine shrimps {hatched / swimming} at {same / stated} time intervals (1) suitable control of one variable (1) repeats (for each treatment) and calculate a mean (1) 	<p>Accept dependent variable is number (of eggs) hatched per stated time</p> <p>Accept use of zero calcium ions as one of the concentrations Ignore units if given</p> <p>If single count: minimum time one hour, maximum time 3 days</p> <p>eg. temperature / stated temp (up to 45°C) - thermostatically controlled waterbath pH - buffer light intensity - distance of bulb / wattage of bulb salinity - % or gml⁻¹</p>	(5) exp

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	<p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> pH (1) 		(2)

	<ul style="list-style-type: none">• temperature (1)• salinity (1)• light intensity (1)		exp
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Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	<p>An answer that includes the following points:</p> <ul style="list-style-type: none"> variable with suitable control method described (1) results are not valid / description of expected effect on the dependent variable (1) 	Description should be directional	(2) exp

Question Number	Answer	Additional Guidance	Mark
1(c)	<p>An explanation that includes three of the following points:</p> <ul style="list-style-type: none"> calcium ions allow substrate to bind to the active site of enzyme (1) activation energy lowered (at active site) (1) an increased rate of respiration (1) faster {anabolic / synthesis} reactions (leading to earlier hatching) (1) 	<p>Accept calcium ions increase binding of substrate to active site</p> <p>Accept calcium ions allow formation of enzyme- substrate complex</p> <p>Accept description of anabolic / synthesis reactions</p>	(3) exp

(Total for question 1 = 12 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)	<ul style="list-style-type: none"> there will be no difference between the biomass of Almo and Kanlow (switchgrass) 	Accept no difference in biomass between the two varieties of switchgrass	(1) exp

Question Number	Answer	Additional Guidance	Mark
2(b)(i)	<ul style="list-style-type: none"> the organic matter of living organisms in a given area 	Accept biological material for organic matter Accept organic matter per area per unit time eg per hectare per year	(1) exp

Question Number	Answer	Additional Guidance	Mark
2(b)(ii)	<ul style="list-style-type: none"> correct calculation of energy content (1) answer expressed to two significant figures in standard form (1) 	162 450 MJ 1.6 × 10 ⁵ MJ ALLOW consequential error for MP2 Correct answer with no working gets 2 marks	(2) exp

Question Number	Answer	Additional Guidance	Mark																											
2(b)(iii)	<ul style="list-style-type: none"> suitable table format, with data, correct column headings and units (1) medians correctly identified as 14.0 and 15.2 (1) 	<p>Do not accept units in the body of the table. eg.</p> <table border="1"> <thead> <tr> <th colspan="3">Biomass (of switchgrass) x10³ kg / hectare</th> </tr> <tr> <th>year</th> <th>Almo</th> <th>Kanlow</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20.1</td> <td>15.5</td> </tr> <tr> <td>2</td> <td>19.2</td> <td>22.2</td> </tr> <tr> <td>3</td> <td>14.2</td> <td>14.4</td> </tr> <tr> <td>4</td> <td>11.4</td> <td>11.4</td> </tr> <tr> <td>5</td> <td>11.8</td> <td>12.6</td> </tr> <tr> <td>6</td> <td>13.6</td> <td>15.2</td> </tr> <tr> <td>7</td> <td>14.0</td> <td>16.5</td> </tr> </tbody> </table>	Biomass (of switchgrass) x10 ³ kg / hectare			year	Almo	Kanlow	1	20.1	15.5	2	19.2	22.2	3	14.2	14.4	4	11.4	11.4	5	11.8	12.6	6	13.6	15.2	7	14.0	16.5	(2) exp
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7	14.0	16.5																												

Question Number	Answer	Additional Guidance	Mark
2(c)	<ul style="list-style-type: none"> bar graph with linear scale, correct axis labels with units (1) medians plotted correctly (1) range bars plotted correctly (1) 	<p>Scale must start at zero</p> <p>Allow ECF from 2biii</p>	(3) exp

Question Number	Answer	Additional Guidance	Mark
2(d)(i)	<ul style="list-style-type: none"> correct substitution of given R values in the equation (1) correct value of U_2 (1) 	<p>19.5</p> <p>Correct answer with no working gets 2 marks</p>	(2) exp

Question Number	Answer	Additional Guidance	Mark
2(d)(ii)	<p>An answer that includes three of the following points:</p> <ul style="list-style-type: none"> the calculated value of U (19.5) is more than the critical value which is 8 (at $p = 0.05$) (1) therefore accept the null hypothesis there is no difference between the yield of Almo and Kanlow varieties of switchgrass (1) comment on variability of data (1) 	<p>Allow ECF from (d)(i)</p> <p>Accept critical value circled in table</p> <p>eg range bars overlap</p>	(3) exp

Question Number	Answer	Additional Guidance	Mark
2(e)	<p>An answer that includes three of the following points:</p> <ul style="list-style-type: none"> • only one field was used so it may not be a representative sample (for biomass from these varieties) (1) • the plots for each variety may not have been randomly selected (1) • one named environmental condition may not be the same for each variety (1) • comment on the range of data over the seven-year period (1) 	<p>Do not accept small sample size</p> <p>Accept eg. all of the Almo plots may have been on one side of the field and all of the Kanlow plots on the other</p> <p>eg. shading, soil type, soil moisture, mineral content, slope of field</p> <p>eg. number of growing days / weather conditions might not be the same each year</p>	<p>(3) exp</p>

(Total for question 2 = 17 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)	A description that includes the following points: <ul style="list-style-type: none">• find a suitable method for touching the external gills (1)• find suitable conditions that allow the sea slugs to be active (1)• find a suitable method to decide when the gills have re-emerged (1)	Ignore stated methods – credit is for finding out Accept eg. temperature, light intensity	Exp (3)

Question Number	Answer	Additional Guidance	Mark
3(b)	<p>An answer that includes ten of the following points:</p> <ul style="list-style-type: none"> • clear statement of the dependent variable e.g. (time for) re-emergence of gills (1) • <u>description of method</u> to provide different number of touches (1) • <u>description of method</u> for ensuring same intensity of each touch stimulation (1) • <u>description of method</u> for determining complete re-emergence of gills (1) • the method of touching the gills must not cause pain / damage (1) • • the animals are given time to acclimatise {before stimulation begins / between touches} (1) • variables that need to be taken into account (2) • description of how these variables are controlled (2) • repeat whole experiment with different animals (1) 	<p>Accept description of frequency of touches eg every 5 minutes</p> <p>eg glass rod of same diameter same person using same glass rod to touch with the same force</p> <p>eg measure / sketch gills at start and refer to this</p> <p>clear statement required</p> <p>eg water temperature, pH, salinity, depth of water, light intensity, substrate eg source / age / sex / species of Aplysia</p> <p>Accept repeat with the same animal (after suitable interval)</p>	<p>(10) exp</p>

Question Number	Answer	Additional Guidance	Mark
3(c)	<ul style="list-style-type: none"> • table with headings and units (1) • means calculated from repeats (1) • line graph format with labelled axes (1) • use of an appropriate correlation statistical test (1) 	<p>Headings: time for re-emergence (accept minutes or seconds) and number of touches Accept description of table Accept statement or column in table Accept medians in place of mean</p> <p>Accept description of graph</p> <p>Accept named test eg Spearman Rank</p>	(4) exp

Question Number	Answer	Additional Guidance	Mark
3(d)	<ul style="list-style-type: none"> • difficult to standardise the touch affecting the withdrawal reflex (1) • possible errors in determining full re-emergence (1) • difficult to control {age of animal / surface area of gills} (1) • difficult to control other possible stimuli which may cause reflex (1) 	<p>eg. pressure / force</p> <p>accept sex of Aplysia</p> <p>eg. sound, shadows, vibrations, water currents</p>	(4) exp

(Total for question 3 = 21)