

Mark Scheme (Results)

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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.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

    - ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is 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.

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.

Question Number	Answer	Additional Guidance	Mark
1a	• Zebra fish are {not caused pain/given a painful stimulus / returned to the source to prevent {ecological change / maintain population} ;	Accept no physical damage / stress / humane conditions / not harmed Ignore no licence needed / not against the law / they are social fish / has a simple nervous system or does not feel (much) pain unqualified ignore ethical comments	**(1)**

Question Number	Answer	Additional Guidance	Mark
1bi	• Correct expected value calculated (1) • Correct use of formula (1) • Correct answer (1)	No ECF 36 $\frac{44-36}{36} + \frac{28-36}{36}$ Other values can be awarded as long as two sums are being added 3.56 or 3.556 Correct answer with no working gains 3 marks 32/9 is MP 1 and 2 only	**(3)**

Question Number	Answer	Additional Guidance	Mark
1bii	• {prediction was correct / **null** hypothesis was accepted} as the value of chi squared is less than the critical value (1)	As we do not know their calculated value allow converse statements. Must state the calculated/chi squared value is more / less than the critical value/3.84 Accept there is no difference as the value of chi squared is less than the critical value/ore converse Ignore hypothesis unqualified	**(1)**

Question Number	Answer	Additional Guidance	Mark
1ci	An answer that makes reference to one of the following: *abiotic* • (water) temperature • light intensity • pH	Accept comment on water quality/oxygen concentration Accept wavelength of light	**(1)**

Question Number	Answer	Additional Guidance	Mark
1cii	• variable with suitable control method described (1) • {results are not valid / description of expected effect on the dependent variable} (1)	For temperature allow *thermostatic* water bath / tank heater / air conditioned room / AC / incubator Accept thermometer with a suitable method to adjust temperature Accept an increase or decrease but not just affected/changed Accept control and effect of a biotic variable	**(2)**

Question Number	Answer	Additional Guidance	Mark
1d	• so fish cannot {learn (from past experience) / become habituated}	Accept {fish could become habituated (if used more than once) (behavioural) stress / eq / might develop a preference / go to the same colour again } Ignore harm unqualified/ethical issues/explanations	**(1)**

Question Number	Answer	Additional Guidance	Mark
2a	A description that includes six of the following points: • dependent variable is the volume of juice needed to decolourise (DCPIP) (1) • (method of) making a juice extract of fruit (1) • (control of) {mass / concentration(s) / volume} of DCPIP **OR** {mass of fruit / volume of juice} (1) • DCPIP colour changes from blue to {colourless / juice colour / pink} (1) • (record the) volume of {juice / DCPIP} needed to {change colour / reach end point} (1) • Description of how to calculate concentration of Vit C (1) • repeats (for each treatment) and calculate a mean / standard deviation (1)	**Ignore** amount unqualified Accept volume of DCPIP that stays blue if added to a fixed volume of juice Accept crushing / pestle and mortar / eq Ignore pH / temperature / age of fruit Accept colourless juice stays blue (when DCPIP added) Accept titrate/ number of drops Accept {use of calibration curve / comparison with a standard concentration of vit C} Accept average	**(6)**

Question Number	Answer	Additional Guidance	Mark
2b	• correct subtraction (1) • correct answer (1)	example of calculation: 223.3 – 92.7 or <u>130.6</u> 141 OR 8.5 Answer must be to 3 sig figs Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
2c	A description that includes the following points: • (release of) thromboplastin (1) • prothrombin into thrombin (1) • fibrinogen into fibrin (1) • fibrin traps {red blood cells / platelets} (1)	MAX 3 marks if one correct statement is in the wrong order of events Ignore plasmin/plasminogen Accept (fibrin) mesh holds RBC's / eq	**(4)**

Question Number	Answer	Additional Guidance	Mark
3a	• There is no (significant) **difference** between the **diameter** of control stems and experimental stems	Accept no difference between the diameters of the two groups	**(1)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3b</td><td>

- suitable table format with data (1)
- correct column headings with units (1)
- means correctly calculated (1)

</td><td>
Example table
<table>
<tr><td colspan="2">Stem diameter / mm</td></tr>
<tr><td>Control stems</td><td>Bent stems</td></tr>
<tr><td>17.15</td><td>17.34</td></tr>
<tr><td>17.52</td><td>18.16</td></tr>
<tr><td>17.57</td><td>17.61</td></tr>
<tr><td>17.03</td><td>18.14</td></tr>
<tr><td>17.26</td><td>17.64</td></tr>
<tr><td>17.31</td><td>18.14</td></tr>
<tr><td>17.09</td><td>17.95</td></tr>
<tr><td>17.38</td><td>17.78</td></tr>
<tr><td>17.41</td><td>17.69</td></tr>
<tr><td>17.21</td><td>17.84</td></tr>
<tr><td>17.34</td><td>17.99</td></tr>
<tr><td>17.16</td><td>17.95</td></tr>
<tr><td>17.15</td><td>17.89</td></tr>
<tr><td>17.32</td><td>18.16</td></tr>
<tr><td>17.60</td><td>18.22</td></tr>
<tr><td>17.3(0)</td><td>17.9(0)</td></tr>
</table>
Not 17 18 as mean values

Means can be to two places or one but not mixed / Means do not have to be in the table
Ignore errors in table data eg 17.6 instead of 17.60
Not MP2 if units in the body of the table
</td><td>(3)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
3c	• bar graph with labels, units and linear scale (1) • means plotted correctly (1) • range bars plotted correctly (1)	mean diameter /mm and group / eq BAR GRAPH MUST START AT ZERO AND NO BROKEN SCALE Allow ECF from 3bi 17.34 -18.22 17.03 - 17.60 MP2 and 3 can be awarded for line graph	**(3)**

Question Number	Answer	Additional Guidance	Mark
3di	• correct substitution of given $(SA)^2$ and $(SB)^2$ (1) • correct answer (1)	Allow wrong means used for2 marks ie 0.03 and 0.06 7.75 Accept 7.746 / 7.7459 MP2 only for 34.6 / 34.64 / 34.641	**(2)**

Question Number	Answer	Additional Guidance	Mark
3d ii	• the calculated value of t (7.75) is **more than** the critical value 2.05 (at p=0.05) (1) • therefore reject the {**null** hypothesis/H_0}, there is a difference between the diameter of control and experimental stems (1)	Allow use of any quoted value as the calculated value (from3di so reverse statements Allow use of p=0.01 and critical value of 2.76 Allow reverse statement if calculated value is stated / shown as less than 2.05	**(2)**

Question Number	Answer	Additional Guidance	Mark
3e	An explanation that includes two of the following: • the {seeds/plants} may have been {different varieties / genetically different} (1) • plants may bend for other reasons eg phototropism / light direction (1) • the range bars **overlap**	Ignore IAA/auxins	**(2)**

Question Number	Answer	Additional Guidance	Mark
4a	A description that includes the three of the following: • find suitable ages of seedlings (1) • find a suitable temperature for respiration/growth (1) • find a suitable time for measuring a volume of gas (1) • find a suitable {mass / number} of seedlings (to give measurable results)(1) • find a suitable {pH / watering regime} for {respiration / growth} (1)	Ignore practice the method... Accept find a suitable time to give measurable results	**(3)**

Question Number	Answer	Additional Guidance	Mark
4b	An answer that includes eight of the following points: • MP1 clear statement of the dependent variable e.g. volume of gas / distance moved by meniscus (1) • MP2 appropriate description or diagram of apparatus used (1) • MP3 use seedlings of different ages (1) • MP4 record time for a measured distance of the meniscus/volume from gas syringe (1) • MP5 do with and without soda lime (1) • MP6 description of how to find the volume of oxygen used (1) • MP7 temperature needs to be controlled (1) • MP8 use of a thermostatic device to control temperature (1) • MP9 sterilise the (surface of) seeds (1) • MP 10 formula for calculating RQ (1)	Accept RQ Accept test tube with capillary tube / gas syringe the apparatus must be able to work Accept age in days or weeks only Accept record distance meniscus moved in a set time Accept distance x area / reading gas syringe / subtract one gas reading from another to give CO_2 produced Carbon dioxide released ÷oxygen consumed	**(8)**

Question Number	Answer	Additional Guidance	Mark
4c	• table to record data with headings. appropriate units and means calculated from repeats (1)	table should have space or columns for repeats. means can be stated somewhere else. Accept units as appropriate once, either in the table or graph RQ has no unit	
	• line/scatter graph format with labelled axes (1)	Accept bar graph if only two ages tested	
	• use of an appropriate (named) statistical test (1)	t test if only two ages otherwise a correlation test or named test Allow a stats test that relates to the data collected in the table	**(3)**

Question Number	Answer	Additional Guidance	Mark
4d	An answer that includes two of the following: • difficult to measure {distances / volumes of gas} (1) • (difficult to prevent) contamination of mung beans (1) • difficult to decide if seedings are germinating at the same rate (1) • seedlings may change from aerobic to anaerobic respiration (during investigation) (1)	Ignore amount Accept changes in {atmospheric pressure / temperature} change volume of gas Accept infected Accept seedlings may have a different starch / protein content	**(2)**

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