



Mark Scheme (Final)

Summer 2023

Pearson Edexcel International Advanced
Subsidiary Level In Biology (WBI16)

Paper 01

Unit 6: 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.

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
1a	<ul style="list-style-type: none"> Anaphase (1) 	Ignore ref to early / late anaphase Accept phonetic spelling	1 grad

Question Number	Answer	Additional Guidance	Mark
1bi	A description that includes six of the following points: <ul style="list-style-type: none"> description of treatment of onion {plants/ roots} grown in caffeine solution (1) use caffeine solution and without caffeine OR stated concentrations/number of caffeine concentrations(1) use of root tip (1) use of a suitable named stain (1) method of preparing microscope slides (1) counting cells under microscope (1) description of how to calculate mitotic index (1) 	Accept a concentrations without a 0% Accept description of tip e.g. terminal 5mm Toluidine blue/orcein/methylene blue/nile blue Teasing apart/squashing/macerate/treat with acid accept formula	6 exp

Question Number	Answer	Additional Guidance	Mark
1bii	<p>A description that includes three of the following points:</p> <ul style="list-style-type: none"> • β glucose (1) • 1-4 glycosidic bonds (1) • every (other) glucose molecule inverted (1) • the molecule is a {straight chain/unbranched} (1) 	<p>Accept beta /b/B</p> <p>Accept from diagram</p> <p>Ignore cellulose molecules joining together</p>	<p>3 exp</p>

(Total for question 1 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
2a	<ul style="list-style-type: none"> • Appropriate suggestion linked to benefit 	<p>E.g. shelter for wind/sun (so) reduced water loss/transpiration</p> <p>Animals graze mimosa before cactus</p> <p>Shelter helps cactus seedlings establish</p> <p>Accept other valid suggestions</p>	<p>1 exp</p>

Question Number	Answer	Additional Guidance	Mark
2b	<ul style="list-style-type: none"> identify a suitable risk such as being infected/ bitten/allergic reaction/irritant/sunburn/spines/dehydration/ trip hazard (1) Appropriate description of how to reduce the risk (1) 		2 exp

Question Number	Answer	Additional Guidance	Mark
2c i	<ul style="list-style-type: none"> correct selection of data/ratio both ratios correct and divided correctly correct final odds ratio 	<p>Step 1 = $60 \div 16$ OR 3.75</p> <p>Step 2 = $4 \div 20$ OR 0.2</p> <p>Odds ratio = $3.75 \div 0.2$ OR 18.75</p> <p>19 (not 19.0)</p> <p>Correct answer gains 3 marks ECF for MP2 and answer to 2sig fig if data/ratio incorrect</p>	3 exp

Question Number	Answer	Additional Guidance	Mark
2cii	<ul style="list-style-type: none"> The cactus plants are found growing in association with the mimosa/ tree 	Ignore text lifted from the question without qualification	1 exp

Question Number	Answer	Additional Guidance	Mark
2di	<p>An answer that includes two of the following points:</p> <p>Abiotic</p> <ul style="list-style-type: none"> Temperature (1) pH (1) water content (1) mineral content/salinity (1) 	<p><i>Only mark the first response on each line</i></p> <p>Accept soil moisture</p> <p>Accept soil structure/compaction/depth/oxygen /carbon dioxide content</p>	2 exp

Question Number	Answer	Additional Guidance	Mark
2dii	<ul style="list-style-type: none"> results are not valid / description of expected effect on the dependent variable (1) 	Description of effect must be directional eg increase temperature increases enzyme activity	1 exp

(Total for question 2 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
3a	<ul style="list-style-type: none"> There is no (significant) difference between the number of pupae from the untreated (A) and treated culture (B) medium 	Ignore eggs hatched	1 exp

Question Number	Answer	Additional Guidance	Mark																								
3b	<ul style="list-style-type: none"> suitable table format with data correct column headings (1) means correctly calculated (1) 	<table border="1"> <thead> <tr> <th colspan="2">Number of pupae</th> </tr> <tr> <th>A/untreated</th> <th>B/treated</th> </tr> </thead> <tbody> <tr> <td>72</td> <td>45</td> </tr> <tr> <td>68</td> <td>56</td> </tr> <tr> <td>81</td> <td>39</td> </tr> <tr> <td>56</td> <td>40</td> </tr> <tr> <td>43</td> <td>29</td> </tr> <tr> <td>52</td> <td>38</td> </tr> <tr> <td>60</td> <td>35</td> </tr> <tr> <td>64</td> <td>46</td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td>Mean 62</td> <td>Mean 41</td> </tr> </tbody> </table>	Number of pupae		A/untreated	B/treated	72	45	68	56	81	39	56	40	43	29	52	38	60	35	64	46			Mean 62	Mean 41	2 exp
Number of pupae																											
A/untreated	B/treated																										
72	45																										
68	56																										
81	39																										
56	40																										
43	29																										
52	38																										
60	35																										
64	46																										
Mean 62	Mean 41																										

Question Number	Answer	Additional Guidance	Mark
3c	<ul style="list-style-type: none"> bar graph with linear scale and labels (1) means plotted correctly (1) range bars plotted correctly (1) 	<p>mean number of pupae/culture or treatment/ A B.</p> <p>y axis must start at zero ALLOW ECF for incorrect means from 3bi</p> <p>Range bars 81-43 56-29</p>	3 exp

Question Number	Answer	Additional Guidance	Mark
3di	<ul style="list-style-type: none"> correct substitution of given $(S_A)^2$ and $(S_B)^2$ (1) correct answer (1) 	<p>ECF allow use of incorrect means Correct square root reduces to 5.109</p> <p>$t = 4.11$ (4.1) Correct answer only gains 2 marks accept additional decimal places</p>	2 exp

Question Number	Answer	Additional Guidance	Mark
3d ii	<ul style="list-style-type: none"> the calculated value of t (4.11) is more than the critical value 2.14 (1) therefore reject the null hypothesis there is a difference between the treated and untreated groups (1) 	<p>Allow ECF from 3di if calculated value is less than stated critical value Accept critical value of 2.98</p>	2 exp

Question Number	Answer	Additional Guidance	Mark
3e	<p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> • use other masses of pyrethrum (1) • leave adults to lay eggs for more than 24 hours (1) • Leave eggs for more than 5 days (to see if more hatch/pupate) (1) 	<p>ignore repeat the expt/amount</p> <p>accept concentration/volume</p> <p>accept more time</p> <p>accept more time</p>	2 exp
Question Number	Answer	Additional Guidance	Mark
3f	<p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> • Pyrethrum/concentration/ mass may have no effect on the flies/flies resistant (1) • Pyrethrum may be washed/blown off fruits (1) • pyrethrum may not reach eggs (1) • fruit damaged by {being eaten/pests/weather} (1) 	<p>accept flies become resistant</p> <p>Fruit skin might prevent pyrethrum entering fruit</p>	2 exp

(Total for question 3 = 14 marks)

Question Number	Answer	Additional Guidance	Mark
4a	<p>A description that includes two of the following points:</p> <ul style="list-style-type: none"> • find a suitable mass/age of leaves/concentration of extract/method of extraction (1) • find a suitable temperature/pH/medium/time/species of bacteria (1) • find suitable method to measure {inhibition/antibacterial effect} (1) 	A method to provide quantitative results	Exp 2

Question Number	Answer	Additional Guidance	Mark
4b	<p>An answer that includes nine of the following points:</p> <ul style="list-style-type: none"> • clear statement of the dependent variable e.g. zone of inhibition (1) • description of method of preparation of extract (1) • method of preparing bacterial lawn/broth/pour plate (1) • method of applying extract (1) • detail of measuring dependent variable (1) • description of aseptic technique (1) • use of a control for comparison (1) • Incubate at stated temperature (1) • two variables that need to be controlled (1) • method of control of one named variable (1) • repeat the whole experiment to calculate (mean) and SD/error bars (1) 	<p>Ignore amount ALLOW different valid methods.</p> <p>Wells/discs/drop in broth/serial dilution/put on agar</p> <p>e.g. ruler/grid/different orientations</p> <p>ignore taping dishes</p> <p>But not more than 30°</p> <p>e.g. temperature/pH/incubation time/size of disc/medium/species of bacteria/source/mass of leaves</p> <p>accept to measure variability of data</p>	<p style="text-align: right;">9 exp</p>

Question Number	Answer	Additional Guidance	Mark
4c	<p>An answer that includes the following points:</p> <ul style="list-style-type: none"> • table for collecting raw data with headings and units with means calculated from repeats (1) • bar graph format with labelled axes (1) • use of an appropriate statistical test (1) 	<p>accept with several concentrations description of mean calculated in text or mean on one graph label</p> <p>accept line graph if several concentrations used</p> <p>Accept a (named) correlation test with line graph a test for difference if bar graph</p>	<p>3 exp</p>

Question Number	Answer	Additional Guidance	Mark
4d	<p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> • difficult to measure distances/diameters/ZOI with precision (1) • only tested against one species of bacteria (1) • contamination (1) • bacteria cultured in aerobic conditions and gut is anaerobic or not cultures at human body temperature (1) 	<p>Accept errors in use of colorimeter</p> <p>Accept the bacteria used might be resistant</p> <p>Accept conditions might not be aseptic Ignore ref to pathogens</p>	<p>2 exp</p>

(Total for question 4 = 16 marks)

