Mark Scheme (Results)

June 2023

Pearson Edexcel International Advanced Level
In Biology (WBI13) Paper 01
Practical Skills in Biology I

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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.

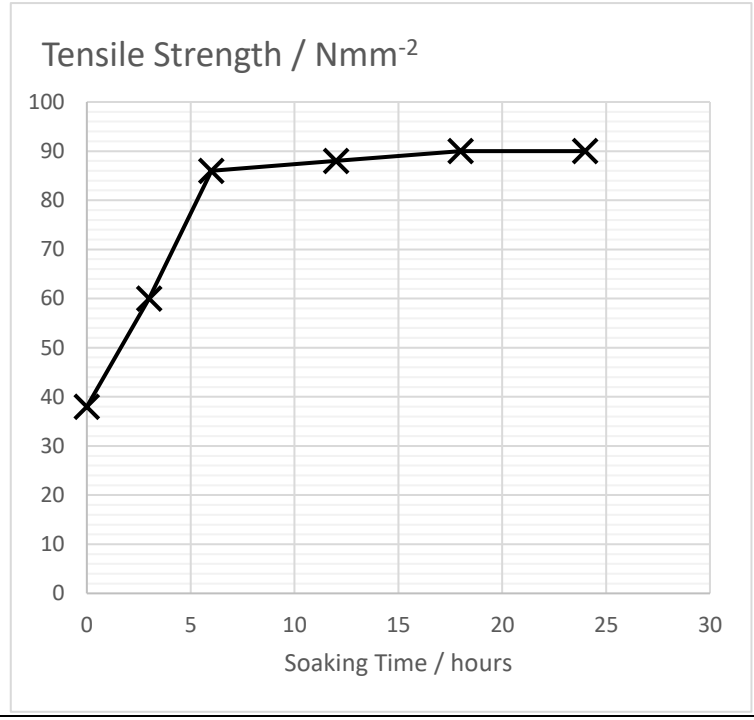
Question Number	Answer	Additional Guidance	Mark
1ai	An answer that includes the following • sclerenchyma (1) • xylem (vessel) (1)	IGNORE phloem, companion cells, cambium, parenchyma	grad 2

Question Number	Answer	Additional Guidance	Mark
1aii	An answer that includes the following: • (increased) {strength / support / hardness / rigidity} (1) • makes cell (wall) impermeable / reduces permeability or description e.g., stops / reduces water entering or leaving (1)	IGNORE flexible ACCEPT stops anything going in or out / makes (cell wall) waterproof	expert 2

Question Number	Answer	Additional Guidance	Mark
1bi	• (soaking) time (1)		grad 1

Question Number	Answer	Additional Guidance	Mark
1bii	An answer that includes the following points: • cut {thin / transverse} section (of fibre) / lay (fibre on slide) on microscope (1) • measure using (eyepiece) graticule (1) • which has been calibrated (with stage micrometer) (1)	ACCEPT description of calibration	expert 3

Question Number	Answer	Additional Guidance	Mark
1biii	An answer that includes the following points • fibre {diameter / radius} is needed to calculate (cross sectional) area (1) • (cross sectional) area is needed to calculate tensile strength / strength of fibre (1) • diameter will affect {tensile strength / strength of fibres} (1)	ACCEPT diameter is needed to calculate tensile strength for 1 mark	expert 2

Question Number	Answer	Additional Guidance	Mark
1ci	A graph with the following features • A axes correct (x - soaking time, y- tensile strength) (1) • L all labels correct (x- soaking time / hours, y- tensile strength / Nmm^{-2}) (1) • P plots correct on a linear scale on both axes (1) • S points joined with straight lines (1)	They lose mp S if they extrapolate beyond 24 hours. They can split the y-axis as long as they show it clearly, or they can start at numbers above zero Neither axis has to start at zero, just make sure it is linear 	expert 4

Question Number	Answer	Additional Guidance	Mark
1cii	An description that includes three of the following points • soaking time increases (tensile) strength (1) • relationship is (nearly) linear {up to 6 hours / from 6 to 18 hours} (1) • {large / significant / rapid} increase up to 6 hours / more than doubles up to 6 hours (1) • slow increase (after 6) / no increase after 18 hours / levels off (1)	DO NOT piece together, must be a clear statement ACCEPT manipulation to show size of increase	expert 3

Question Number	Answer	Additional Guidance	Mark
2a	An answer that includes the following: • A divide to form the male (gamete / nuclei) (1) • B produces (digestive) enzymes / digests the style / makes pathway (for male gamete / to ovum) /grows towards ovum (1)	ACCEPT ovary, ovule, female gamete, egg	expert 2

Question Number	Answer	Additional Guidance	Mark
2b	An answer that includes the following points: • credit suitable methods used (to observe germination of pollen grains) (1) • sucrose solution added (1) • suitable time quoted before germination rate assessed (1) • control of one relevant abiotic variable (1) • control of one relevant biotic variable (1) • view through microscope / count germinated & non-germinated / count germinated & total (and work out percent) (1) • reference to relevant health and safety issue (1)	e.g. hanging drop, agar plates, filter paper, cavity slide ACCEPT boron / sugar. > or = 15 minutes < or = 5 days temperature, pH, light, sucrose concentration, fixed time species, a cultivar, variety of plant, type species of bee e.g. pollen allergy, bee stings	Expert 5

Question Number	Answer	Additional Guidance	Mark
2ci	An answer that includes the following points: • the optimum is at higher temperature for bee than hand collected pollen / described / both optima quoted (30C and 36C) (1) • the percentage germination is higher in hand (than bee collected pollen at all temperatures) (1) • range in percentage germination in hand greater than in bee collected / fall from optimum {higher / steeper} in hand than bee collected/ temperature has greater effect on hand collected (1) • enzymes denature (above the optimum / above 30C and 36C in both) (1) • there are no {error bars / SDs / SEs} (1)	ACCEPT both temperatures at which % germinations starts to go down quoted ACCEPT reverse arguments ACCEPT ranges quoted (-3 or -4 and -16) from 22 to 19/18 56 to 40/41 etc. or peak to lowest ACCEPT there is no measure of variability	Expert 4

Question Number	Answer	Additional Guidance	Mark
2cii	An answer that includes the following points: • repeat the experiment at 30C (1) • {all conditions / named condition} should be kept constant (1) • (mean and) SD (calculated) / error bars (1) • look for overlap in SDs / perform t-test (1)	 IGNORE the number of repeats IGNORE temperature ACCEPT named relevant other test of difference	 Expert 4

Question Number	Answer	Additional Guidance	Mark
2di	A calculation with the following steps:	Correct answer gets 3 marks with no working Ecf at mp 2 and 3	
	• lengths correctly read from graph (1)	1000 and 750	
	• subtraction followed by correct division using data above and multiplication by 100(1)	1000 – 750 = 250 then 250 ÷ 750 = 0.3333 OR 1000 – 750 = 250 250 ÷ 1000 = 0.25 OR 250 ÷ 875 = 0.2857	
	• quoted to correct sig figs. and as a percentage (1)	3.3 (%) 25.0 (%) 28.6 (%) Accept 25, 33 or 29 for 2 marks	Expert 3

Question Number	Answer	Additional Guidance	Mark
2dii	• pollen damaged (in bee sample) / description (1)	ACCEPT reverse argument. Allow secrete something which affects pollen negatively/ collect less ripe pollen / bees selective / bee pollen from a different species	expert 1

Question Number	Answer	Additional Guidance	Mark
3ai	An explanation that includes the following: • prevents escape / spreading of (bacteria / *E .coli*) (1) • prevents {contamination of the agar or cultures with (other types of) bacteria) / cross contamination /effect on the results} (1)	accept ref validity If no other marks awarded ACCEPT prevents contamination	Expert 2

Question Number	Answer	Additional Guidance	Mark
3aii	An answer that includes four of the following points: • description of how a bacterial culture is made (1) • description of addition of extract (1) • control of feature of independent variable described (1) • incubate {at suitable quoted temperature / for suitable quoted time / same length of time} (1) • statement of what is measured related to method above if awarded (1)	e.g. paper disc / cut well e.g. disc size / wells same size / {volume / age} / of extract temp. <30 but > 10, time 1 day to 7 days zone of inhibition clear area / turbidity	expert 4

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3b</td><td>A table with the following features:

• suitable table drawn (1)

• all headings correct with units (1)

• all data correctly entered (1)</td><td>Must all be quoted to one decimal place.

<table><tr><td colspan="4">Inhibition of growth / au</td></tr><tr><td colspan="2">Roselle</td><td colspan="2">Clove</td></tr><tr><td>Ethanol</td><td>Water</td><td>Ethanol</td><td>Water</td></tr><tr><td>21.1 / 21.0</td><td>15.6 / 15.5</td><td>17.4 / 17.5</td><td>13.0/ 13.1 / 13.2</td></tr></table>Units in cells loses mp 2</td><td>expert 3</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3ci</td><td>1.2:1 / 1.23:1 / 0.83:1</td><td>ACCEPT the other way round in any case</td><td>Grad 1</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3cii</td><td>An answer that includes the following points:

• Ethanol extract {is more effective / better than / gives higher inhibition of growth than / has higher antimicrobial properties} (extract made with water) (1)

• Roselle (extract) {is more effective / better / gives higher inhibition of growth than / has higher</td><td>ACCEPT reverse argument</td><td>expert 2</td></tr>
</table>

	antimicrobial properties} } (than the clove extract) (1)		

Question Number	Answer	Additional Guidance	Mark
3d	An answer that includes two of the following points: • {enzymes / protein} needed for growth / relevant processes described (1) • pH is no longer optimal (for growth) (1) • because {enzymes / proteins} are denatured (by pH change) (1) • lower pH affects (hydrogen / ionic) bonding / R groups (in proteins / enzymes) (1)		expert 2

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