Mark Scheme (Results)

January 2022

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

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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.

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Question Number	Answer	Additional Guidance	Mark
1a	A description that includes six of the following points: • dependent variable is mass needed to break fibres (1) • use fibres the same length and {diameter/cross sectional area} (1) • method of supporting fibre (1) • add known mass to fibre until it breaks (1) • suitable method of control of one variable {age of fibre / temperature/ humidity} (1) • method of calculation for tensile strength (1) • repeats and calculate a mean (1)	Accept thickness Accept between 2 (clamp stands) / with fibre hung from one (stand) Accept use of forcemeter – record force when it breaks Accept age of plant Accept AC room for temperature (not waterbath) AC room / humidifier / dehumidifier for humidity eg force divided by (cross sectional) area / mass converted to force then divided by (cs) area Accept repeats to calculate SD	**Exp 6**

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Question Number	Answer	Additional Guidance	Mark
1b	A description that includes three of the following points: • cellulose {is a polymer of / contains many /contains a large number of} B glucose (molecules) (1) • joined by 1-4 glycosidic bonds (1) • every other (glucose) molecule is inverted (1) • to give a straight (chain / molecule) (1)	Accept polysaccharide containing beta glucose molecules Accept reversed Accept linear / unbranched	**Exp 3**

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Question Number	Answer	Additional Guidance	Mark
1c	An answer that includes the following: • biofuels only release the carbon dioxide that was absorbed by {photosynthesis / plants} (1)	Accept they are (almost) carbon neutral Accept biofuels release carbon dioxide which plants would have released when they decompose / biofuels don't produce extra carbon dioxide	**Exp 1**

(Total for question 1 = 10 marks)

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Question Number	Answer	Additional Guidance	Mark
2a	An answer that includes the following: • snails have a simple nervous system, so they are thought not to feel (much) pain (1)	Accept snails are invertebrates so they do not feel (much) pain / snails are not sentient beings / do not need a licence to use snails	**Exp 1**

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Question Number	Answer	Additional Guidance	Mark
2b	An answer that includes the following: • correct use of r^3 (1) • correct multiplication by 2 (1) • correct answer to two significant figures (1)	Example calculation 1.5^3 / 3.375 / $\frac{3^3}{2}$ 28 (mm^3) Allow ecf if errors in first parts of calculation; 14 gets mp1 and 3; 230 gets mp2 and 3 Correct answer with no working gains full marks	**Exp 3**

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Question Number	Answer	Additional Guidance	Mark
2ci	Answer that includes two of the following: • (air / room / water) temperature (1) • humidity (1) • light intensity (1) • pH (of water) (1)		**Exp 2**

Question Number	Answer	Additional Guidance	Mark
2cii	Answer that includes the following: • variable with suitable control method described (1)	temperature : AC room / thermostatically controlled room ignore waterbath unless water temperature specified humidity : AC room / humidifier / dehumidifier light intensity : bulb {of known wattage / at known distance} pH : buffer	**Exp 1**

Question Number	Answer	Additional Guidance	Mark
2ciii	An answer that includes the following: • results are not valid / description of expected effect on the dependent variable (1)		**Exp 1**

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Question Number	Answer	Additional Guidance	Mark
2d	An answer that includes two of the following • presence of water, not volume, is important (1) • rate of water supply does not determine time to break down the membrane (1) • (rate of membrane breakdown is) limited by another factor (1)	Accept once the membrane is wet, adding more water makes no difference Accept time the water has been there is important, not the rate of supply Accept there is the same rate of diffusion of water through the membrane regardless of water supply. Accept changes to membrane structure takes time Accept enzymes may be involved in the breaking of the membrane. Accept something other than water is rate limiting Accept membrane thickness may vary, so takes longer to break down (if thicker).	**Exp 2**

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Question Number	Answer	Additional Guidance	Mark
3a	Answer that includes the following: • there is no (significant) difference between the (mean) number of mayfly nymphs in stream A and stream B	Accept in polluted and unpolluted streams	**Exp 1**

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

• suitable table format with data (1)

• correct column headings (1)

• means correctly calculated
ie 36.0 and 31.6 or 36 and 32 (1)</td><td>Example table

<table><tr><td></td><td colspan="2">Number of mayfly nymphs</td></tr><tr><td></td><td>stream A</td><td>stream B</td></tr><tr><td></td><td>27</td><td>25</td></tr><tr><td></td><td>37</td><td>16</td></tr><tr><td></td><td>24</td><td>34</td></tr><tr><td></td><td>45</td><td>12</td></tr><tr><td></td><td>34</td><td>35</td></tr><tr><td></td><td>38</td><td>26</td></tr><tr><td></td><td>49</td><td>43</td></tr><tr><td></td><td>61</td><td>51</td></tr><tr><td></td><td>40</td><td>26</td></tr><tr><td></td><td>20</td><td>24</td></tr><tr><td></td><td>28</td><td>36</td></tr><tr><td></td><td>38</td><td>26</td></tr><tr><td></td><td>42</td><td>49</td></tr><tr><td></td><td>25</td><td>52</td></tr><tr><td></td><td>32</td><td>19</td></tr><tr><td>mean</td><td>36.0 / 36</td><td>31.6 / 32</td></tr></table></td><td>Exp 3</td></tr>
</table>

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Question Number	Answer	Additional Guidance	Mark
3c	An answer that includes the following: • bar graph with linear scale and axes labelled with units (1) • means plotted correctly (1) • range bars plotted correctly (1)	 Must start at zero ie not broken axis Mean number of mayfly nymphs and (stream) A and B Accept ECF from 3b	**Exp 3**

Question Number	Answer	Additional Guidance	Mark
3di	An answer that includes the following: • correct calculation of numerator (1) • correct substitution of given $(S_A)^2$ and $(S_B)^2$ (1) • correct value of t (1)	Example calculation: 4.4 / 36.0 – 31.6 or 4.0 / 36 - 32 Ecf if wrong means used $\frac{116}{15} + \frac{160}{15}$ t = 1.026 / 1.03 or 0.933 / 0.93 Correct answer with no working gains full marks	**Exp 3**

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Question Number	Answer	Additional Guidance	Mark
3d ii	An answer that includes the following: • correct critical value stated / indicated in table (1) • calculated value is less than the critical value, therefore accept the null hypothesis (1) • there is no (significant) difference between the number of mayfly nymphs in streams A and B (1)	2.05	**Exp 3**

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Question Number	Answer	Additional Guidance	Mark
3e	An explanation that includes two of the following: • comment on the variability of data (1) • {samples should have been taken on more than one day / at more than one time of day / should have surveyed more than 2 streams} (1) • other named variables not monitored / measured (1)	Accept range bars overlap Accept number of species of mayfly nymphs should have been recorded Accept depth / flow rate / temperature / pH / light intensity / other pollutants	**Exp 2**

(Total for question 3 = 15 marks)

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Question Number	Answer	Additional Guidance	Mark
4a	A description that includes two of the following: • find a suitable {mass / concentration / number of cells} of yeast (that will produce carbon dioxide) (1) • find a suitable {method for measuring carbon dioxide / method to measure oxygen consumption / redox indicator} (1) • find a suitable range of temperatures (1)	Accept suitable {concentration / mass} of sugar Accept suitable concentration / mass of mineral ions eg TTC / DCPIP / methylene blue Accept find a suitable timescale to measure the {volume of gas produced / oxygen consumption}	**Exp 2**

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Question Number	Answer	Additional Guidance	Mark
4b	An answer that includes eight of the following: • clear statement of the dependent variable (1) • some description of apparatus used (1) • control of mass of yeast (1) • incubate for a set period of time and record {volume of carbon dioxide produced / movement of ink drop} (1) • five stated temperatures in a range of 5-55˚C (1) • two variables that need to be controlled (1) • description of how one of these variables is controlled (1) • repeats for each temperature or repeat the whole experiment (1) • method of calculating rate of respiration (1)	e.g. volume of carbon dioxide produced per unit time / volume of oxygen used per unit time / time for (named) redox indicator to change colour eg method of collecting (carbon dioxide) gas / respirometer with soda lime / tubes in a waterbath before mixing Accept {volume / concentration} of yeast (suspension) / number of yeast cells record time for {colour change of redox indicator / standard volume of (carbon dioxide) gas to be collected / ink drop to move standard distance} pH – buffer; {concentration / volume} of redox indicator; {mass / concentration} of glucose eg 10g sugar/ use of balance; {type / strain / species / age} of yeast; 1divided by time taken for colour change / distance divided by time / volume divided by time	**Exp 8**

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Question Number	Answer	Additional Guidance	Mark
4c	An answer that includes the following: • table for raw data with headings and units, and means calculated from repeats (1) • line graph format with labelled axes (1) • use of an appropriate correlation statistical test (1)		**Exp 3**

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Question Number	Answer	Additional Guidance	Mark
4d	An answer that includes two of the following: • difficult to measure (small) values of the dependent variable (1) • difficult to prevent contamination of yeast cultures / hard to maintain aseptic conditions (1) • difficulties related to experimental design (1)	Accept difficult to recognise end point Accept uneven distribution of yeast cells at start of investigation / unequal numbers in each tube Accept yeast may change from aerobic to anaerobic respiration during investigation; build-up of waste products may {affect enzymes / slow rate of respiration}; at higher temperatures, gases (CO_2 and oxygen) expand, so this would affect the volume recorded (esp in respirometer); carbon dioxide is water soluble, so the volume of gas recorded may not be accurate	**Exp 2**

(Total for question 4 = 15 marks)

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