Pearson Edexcel

Mark Scheme (Results)

January 2019

Pearson Edexcel International Advanced Level

Advanced Level in Biology (WBI06) Paper 01

Practical Biology and Investigative Skills

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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:

  i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear
  ii) select and use a form and style of writing appropriate to purpose and to complex subject matter
  iii) organise information clearly and coherently, using specialist vocabulary when appropriate

Question Number	Answer	Additional Guidance	Mark
1(a)	1. (dependent) variable to be measured stated ; 2. idea of one growth medium with and one without (added) zinc (sulfate) ; 3. use of {seeds / seedlings} ; 4. method for measuring the dependent variable ; 5. { same / stated } time for measurements to be taken ; 6. repeats **and** calculate a mean ;	**1. ACCEPT** distance between leaves / internode length / number of yellow stripes **IGNORE** 'mass' **2. ACCEPT** a range of concentrations that includes 0 5. at least 5 days	**(5)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	<u>Abiotic</u> 1. pH of { soil / growth medium } ; 2. { water / mineral } availability ; 3. temperature ; 4. light intensity / eq ; 5. humidity ; <u>Biotic</u> 6. { variety / source / genotype } of Zea ; 7. disease / pathogens / eq; 8. consumers / pests ; 9. competition qualified ;	If one abiotic and one biotic factor given in a section the no mark given 2. IGNORE 'nutrients' 4. IGNORE 'light' unqualified 6. IGNORE 'species' age and mass 8. ACCEPT predators 9. e.g. competition for light, competition for minerals, competition for space	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	1. variable with suitable control method described ; 2. results are **not valid** / description of possible directional effect on the dependent variable ;	1. 'water bath' must be qualified, e.g. stated temperature or thermostatically controlled	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)	1. chlorophyll is needed for { photosynthesis / light-dependent reaction / absorption of light / eq } ; 2. less GALP produced (in the light-independent reaction) ; 3. less { carbohydrate / glucose } for { respiration / cell wall synthesis / growth / eq } ; 4. fewer { amino acids / proteins / enzymes } available for growth ;	2. ACCEPT equivalents for GALP, e.g. TP, triose phosphate	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. there will be **no significant** { relationship / correlation } / eq ; 2. between the re-emergence time and the number of touches / eq ;	1. IGNORE 'difference' Note: 'the relationship between the re-emergence time and the number of touches is not significant' gains MP1 and MP2	**(2)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>2(b)</td><td>1. suitable table format ;

2. correct column headings with units ;

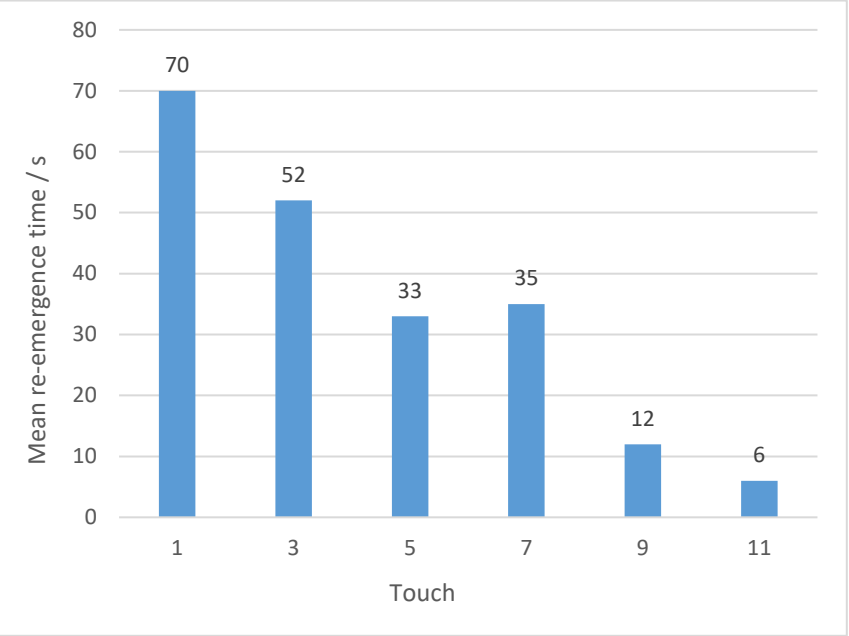
3. all raw data and means correct ;</td><td>All mean values must be either whole numbers or one decimal place.

2.units in the body of the table negates MP2

3. calculated means for each snail negates MP3

Example of table:

<table>
<tr><td rowspan="2">Touch</td><td colspan="3">re-emergence time / s</td><td rowspan="2">Mean (re-emergence time / s)</td></tr>
<tr><td>Snail A</td><td>Snail B</td><td>Snail C</td></tr>
<tr><td>1</td><td>74</td><td>74</td><td>62</td><td>70 / 70.0</td></tr>
<tr><td>3</td><td>55</td><td>55</td><td>47</td><td>52 / 52.3</td></tr>
<tr><td>5</td><td>34</td><td>34</td><td>30</td><td>33 / 32.7</td></tr>
<tr><td>7</td><td>38</td><td>38</td><td>30</td><td>35 / 35.3</td></tr>
<tr><td>9</td><td>10</td><td>10</td><td>16</td><td>12 / 12.0</td></tr>
<tr><td>11</td><td>5</td><td>4</td><td>10</td><td>6 / 6.3</td></tr>
</table></td><td>(3)</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
2(c)	1. axes correctly labelled and linear scale ; 2. means plotted correctly as bar graph ; 3. range bars plotted correctly ;	**Sample graph**  	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(d)	1. critical value identified as 0.427 ; 2. calculated value is greater than the critical value ; 3. therefore reject the null hypothesis ; 4. there is a significant {(-ve) relationship / correlation } between the re-emergence time and the number of touches ; 5. suitable comment on range bars ;	1. ACCEPT 0.427 circled on the table '-0.935 > 0.427' gains MP1 and 2 5. e.g. 'range bars are short', 'some range bars overlap'	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(e)	1. difficulty in {judging / timing} re-emergence ; 2. strength of touch may vary ; 3. small sample size / only three snails used ; 4. variability of snail ; 5. recovery time (after re-emergence) not defined ; 6. named environmental factor not controlled ;	4. e.g. previous condition, age, handling, mass IGNORE gender, species	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(a)	1. risk of growing { bacteria / fungi / pathogens } / eq ; 2. { growth regulators / plant tissue } may cause allergic reaction / eq ; 3. sharp instruments / eq ; 4. other sensible risk ;	 2. ACCEPT 'irritant' IGNORE 'harmful' or 'poisonous' 4. ACCEPT stated risk from carrying out aseptic technique, e.g. burning risk of hot agar, use of Bunsen burner, hot water in water bath	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	1. practise the method to see if it works ; 2. find suitable concentrations of growth regulator / eq ; 3. identify suitable {part / plant} to use ; 4. find suitable growth conditions (for plant tissue) ; 5. find the time taken for measurable growth to occur / eq ; 6. select an appropriate dependent variable ;	IGNORE rate of growth unqualified 4. ACCEPT 'find suitable temperature' 6. e.g. 'see whether change in mass is suitable'	**(3)**

Question Number	Answer	Additional Guidance	Mark
*3(c)	**QWC - Spelling of technical terms must be correct and answer must be organised in a logical sequence** 1. dependent variable clearly identified ; 2. at least 5 concentrations of growth regulator / eq ; 3. description of plant tissue culture ; 4. comment on the need for aseptic conditions ; 5. stated time period for growth measurements ; 6 and 7. variables that could alter growth ;; 8 and 9. description of how these variables are controlled ;; 10. repeats at each concentration ; 11. control source of plant material ;	QWC-emphasis is for clarity of expression 1. e.g. 'the dependent variable is the mass of the callus', 'the dependent variable is the height of the plant tissue' **BUT not rate of growth** 3. e.g. use of agar, removing explant 4. ACCEPT a suitable example 5. e.g. 'measure every day for 5 days', 'measure after two weeks' 6. ACCEPT volume IGNORE stated temperature values 11. Allow use of original plant tissue or clones	**8+2 QWC (10)**

Level	Mark		Descriptor
Level 1	**0**		The account is very disorganised and is very difficult to follow. Scientific vocabulary is very limited with many spelling and grammatical errors.
Level 2	**1**		There is some disorganisation in the account which is not always in the correct sequence. Some relevant scientific vocabulary is used. The account is not always in continuous prose and there are grammatical errors and some important spelling mistakes.
Level 3	**2**		The account is well organised with no undue repetition and a correct sequence. There is good use of scientific vocabulary in the context of the investigation described. The account is written in continuous prose which is grammatically sound with no major spelling errors.

Question Number	Answer	Additional Guidance	Mark
3(d)	1. table with suitable headings and units ; 2. means calculated from repeats ; 3. { scatter / line } graph format with labelled axes ; 4. use of an appropriate statistical test ;	IGNORE rate of growth as a table heading 4. ACCEPT e.g. Pearson's correlation coefficient, PMCC, Spearman's rank, correlation test	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(e)	1. difficult to control { all variables / named variable } affecting growth ; 2. idea of difficulty of measuring growth ; 3. possible contamination with { bacteria / fungi / mould } / eq ; 4. more than one growth regulator may be involved ;	2. IGNORE measuring growth rate, unqualified and measurement errors	**(3)**

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