Mark Scheme (Results)

Summer 2019

Pearson Edexcel
International 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.

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
1(a)	25.3 ;	**ACCEPT** 25 / 25.31	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)(i)	1. dependent variable identified as yield ; 2. sampling {region / age} of plant stated ; 3. use of a correctly named stain ; 4. further detail of method ; 5. 6. further detail of method ; 7. count the number of cells in mitosis and find the total number of cells in each sample ; 8. method to measure grain yield (for each variety) ;	3. e.g. acetocarmine, Feulgen's, Schiff's, toluidine (blue), orcein, methylene blue, Tollen's reagent 4. e.g. heating, adding acid, squashing, teasing apart 5. **ACCEPT** formula for mitotic index 6. e.g. measure mass / count number of grains	**(5)**

Question Number	Answer	Additional Guidance	Mark
1(b)(ii)	1. pH of {soil / growth medium} ; 2. (soil) water availability ; 3. mineral availability ; 4. light {intensity / wavelength} eq ; 5. humidity ; 6. wind speed ; 7. carbon dioxide concentration / eq ;	**ACCEPT** any two for 1 mark 3. **ACCEPT** a named mineral nutrient	**(1)**

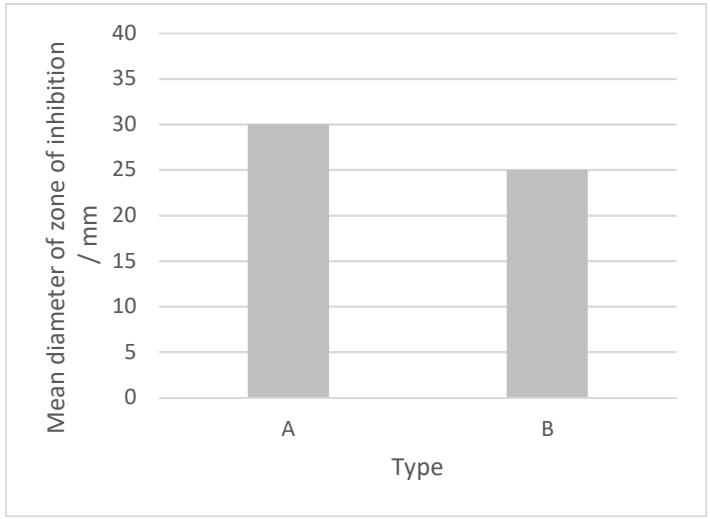
Question Number	Answer	Additional Guidance	Mark
1(b)(iii)	1. variable with suitable control method described ; 2. results are not valid / description of expected effect on the yield ;	3. **ACCEPT** a reference to either an increase or a decrease in yield	**(2)**

Question Number	Answer	Additional Guidance	Mark
1(c)	1. enzymes have a high optimum temperature ; 2. because they are not denatured ; 3. (so) these plants can carry out photosynthesis (at high temperatures) ; 4. idea that some varieties {release more growth hormones / more response to growth hormones} ; 5. idea that these plants have evolved (by natural selection) ;	1. **ACCEPT** 'enzymes work at a high temperature' 2. **ACCEPT** a description of denaturing or enzymes are thermostable 4. **ACCEPT** IAA	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(a)	1. there will be no significant difference ; 2. between the (mean) diameter of the zone of inhibition of the two (types of) bacteria ;	**Note**: 'the difference between the diameter of the zones of inhibition of the two bacteria is not significant' gains mark points 1 and 2	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(b)	1. suitable table format ; 2. correct column headings with units ; 3. all raw data and means correct ;	'mm' and 'diameter' should appear at least once for means, accept 30 and 25 Example table	**(3)**

Type	Diameter of zone of inhibition / mm	Mean diameter / mm
A	37 26 30 37 25 22 33 36 35 36 37 22 22 30 25	30.2
B	21 25 32 32 18 17 28 31 29 30 31 17 16 25 20	24.8

Question Number	Answer	Additional Guidance	Mark
2(c)	1. axes with linear scale, starting at zero, labelled correctly ; 2. means plotted correctly as a bar graph ; 3. range bars plotted correctly ;	Sample graph  For **A**, 22 to 37, for **B**, 16 to 32	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(d)	1. critical value identified as 2.05 ; 2. calculated value (2.44) is more than the critical value ; 3. therefore reject the null hypothesis ; 4. there is a significant difference between the diameters (of the zones of inhibition) ; 5. comment on the variability of the data ;	1. **ACCEPT** critical value identified on table 4. **ACCEPT** 'the diameter of A is significantly greater the diameter of B' 5. ACCEPT range bars overlap	**(4)**

Question Number	Answer	Additional Guidance	Mark
2(e)	1. idea that cultures were not evenly spread ; 2. idea that it is difficult to measure the diameter ; 3. the samples (of bacteria) were taken from one location ; 4. idea the bacterial samples were contaminated with other bacteria ; 5. concentration of antibiotic on disc may have been different / antibiotic discs not dried properly before placing on agar ; 6. wide variability of results / comment on {large / overlapping} range bars ;		**(4)**

Question Number	Answer	Additional Guidance	Mark
3(a)	two appropriate risks identified ; ;	e.g. idea that the {enzyme / casein} is an {irritant / allergen} risk associated with high temperature risk of broken glassware	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	1. practise the method to see if it works ; 2. find a suitable method for recording the end point / eq ; 3. find suitable {temperature / pH} for this reaction ; 4. find suitable {protease / enzyme / casein / substrate} concentrations ;	2. **ACCEPT** 'find method for measuring hydrolysis' or 'find time to take readings with colorimeter' Allow research for find for mp2,3,4	**(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** identified ; 2. at least 5 different concentrations of protease / eq ; 3. allow enzyme and substrate to equilibrate separately / eq ; 4. enzyme and substrate mixed at time zero / eq ; 5. method for determining end point ; 6. idea of finding rate of reaction ; 7 and 8. identifying two control variables that could alter the rate of reaction ;; 9 and 10. description of how these variables are controlled ;; 11. repeats at each concentration ;	QWC - emphasis is for clarity of expression 1. e.g. 'the dependent variable is the time taken for the solution to become colourless' **or** 'the dependent variable is the time to reach an end point' **or** the dependent variable is the absorbance after two minutes' 6. e.g. rate = 1 ÷ time to reach end point 7. and 8. e.g. temperature and pH 9. and 10. e.g. use a thermostatically controlled water bath and use a buffer **NOTE 8 marks maximum for the method plus 2 marks available for QWC**	**(10)**

Level	Mark	Descriptor
1	**0**	The account is very disorganized and is very difficult to follow. Scientific vocabulary is very limited with many spelling and grammatical errors.
2	**1**	There is some disorganization 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.
3	**2**	The account is well organized 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 headings ; 2. means calculated from repeats ; 3. {scatter / line} graph format with labelled axes ; 4. use of a correlation test ;	1. table to record raw data with units ignore concentration units if given 2. mean can be shown as a column heading 4. e.g. Spearman's rank or Pearson correlation test	**(4)**

Question Number	Answer	Additional Guidance	Mark
3(e)	1. difficult to control variables that affect the rate of reaction ; 2. credit a named variable ; 3. idea of difficulty of determining the end point ; 4. idea that only one **source** of {enzyme / substrate} has been used / eq ;	1.ACCEPT activity of enzyme or time for completion 2. e.g. temperature, substrate concentration, pH 3. problems with variability of colorimeter	**(3)**

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