Pearson Edexcel

Mark Scheme (Results)

November 2021

Pearson Edexcel GCE
In AS Biology (8BI0_01)
Paper 1: Core Cellular Biology and Microbiology

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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	Mark
1(a)	D	**(1) comp**

Question Number	Answer	Mark
1(b)	A	**(1) comp**

Question Number	Answer	Mark
1(c)		**(2) clerical**

Organelle	**Organelle found in**			
	both prokaryotic cells and animal cells	prokaryotic cells only	animal cells only	neither prokaryotic cells nor animal cells
P	X			
Q				X

Question Number	Answer	Mark
1(d)	C	**(1) comp**

Question Number	Answer	Additional Guidance	Mark
2(a)	An explanation that makes reference to three of the following: • magnesium ions needed for chlorophyll (1) • nitrate needed for {protein / amino acids} (1) • (leaves gradually become greener) because it takes a while for chlorophyll to be made (1) • (delay in plant growth) because plant needs to photosynthesise before plant can grow (1)	**ACCEPT** greener because chlorophyl is made **ACCEPT** photosynthesis / protein synthesis needed for growth	**(3)** **EXP**

Question Number	Answer	Additional Guidance	Mark
2(b)	• 10 cm^3 fertiliser + 90 cm^3 water		**(1)** **GRAD**

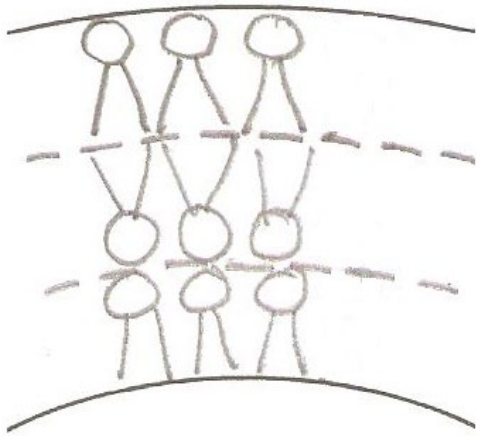
Question Number	Answer	Additional Guidance	Mark
2(c)	• 0.6 (cm day^{-1})	**ACCEPT** 0.595 Do not accept 0.59	**(1)** **CLER**

Question Number	Answer	Additional Guidance	Mark
3(a)	B		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
3(b)	D		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
3(c)	A		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
3(d)	• phospholipids are polar and triglycerides are non-polar		**(1) exp**

Question Number	Answer	Additional Guidance	Mark
3(e)(i)		All 3 layers drawn correctly = 2 marks 2 layers drawn correctly = 1 mark There should not be gaps between the layers	**(2)** **exp**

Question Number	Answer	Additional Guidance	Mark
3(e)(ii)	An explanation that makes reference to three of the following: • lipids are non-polar so cannot be carried in the solution (1) • non-polar phospholipid tails enclose the lipids (1) • phosphate heads are polar so can interact with the solution (1) • and with each other in two adjoining layers (1)		**(3)** **EXP**

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	An answer that makes reference to the following: • COOH and NH_2 group shown (1) • cysteine R group and H shown (1) • attached to central C (1)	**ACCEPT** charged groupings	**(3)** **EXP**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	• disulfide (bond / bridge)	**ACCEPT** disulphide	**(1) GRAD**

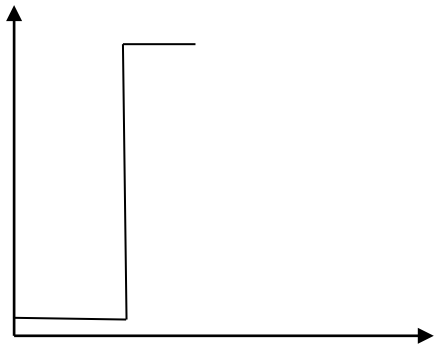
Question Number	Answer	Additional Guidance	Mark
4(b)(i)	<table><tr><td>AAC / AAT/ GAC/ GAT</td><td>TGT</td><td>TAC / TAT</td><td>AAC / AAT/ GAC/ GAT</td><td>GAA / GAG</td></tr></table>		**(1) GRAD**

Question Number	Indicative content
***4(b)(ii)**	**Indicative content:** • substitution mutation may result in no change of amino acid • TGT to TCC • so no effect on structure • substitution may change amino acid • e.g. TGT to TGG • inserting a try instead of Cys • no disulphide bond joining chain A and B together at that point • insertion / deletion will result in {frame shift mutation / change in amino acid sequence} • Cys no longer present in that position • no disulphide bond joining chain A and B together at that point • Cys may be inserted further down the chain so disulfide bond forming elsewhere • chain A will be shorter • change in bonding will affect {tertiary / quaternary} structure of insulin Level 1 : different types of mutation described but no link to insulin amino acids Level 2 : different types of mutation described with a link to insulin amino acids Level 3 : effects of mutations linked to possible changes in structure of insulin

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	B		**(1) comp**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	• (protein) capsid / protein coat		**(1) GRAD**

Question Number	Answer	Additional Guidance	Mark
5(a)(iii)	A description that makes reference to the following: • attach the virus to {receptors / attachment molecules} (1) • on the {epithelial cells / B lymphocytes} (1)		**(2) EXP**

Question Number	Answer	Additional Guidance	Mark
5(b)	An answer that makes reference to the following: • the delay before number of viruses increase (1) • the one step growth curve (1)	**ACCEPT** steep line / ignore steep downward line after peak due to cell bursting 	**(2)** **EXP**

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	An answer that makes reference to the following: • number of boys calculated (1) • number of girls calculated and given as a whole number (1)	47 % of 103 = 48.41 (103 - 48.41 =) 55 Correct answer with no working gains both marks	**(2)** **EXP**

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	An answer that makes reference to the following: • as age increases the proportion of children with non-typical symptoms get lower / decreases (1) • credit calculation to illustrate this (1)	 e.g. 50% in children aged 1 but 20% in children aged 15	**(2)** **EXP**

Question Number	Answer	Additional Guidance	Mark
5(c)(iii)	A description that makes reference to the following: • increase the sample size (1) • ensure there is data for all age groups (1) • investigate older teenagers (1)	 e.g. studying other towns **ACCEPT** increase age range	 **(3)** **EXP**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>6(a)</td><td>An answer that makes reference to the following:
<table><tr><th>Stage of cell cycle</th><th>Estimated length of time cell spends in this stage / hours</th></tr><tr><td>mitosis and cytokinesis</td><td>2</td></tr><tr><td>G_1 of interphase</td><td>10</td></tr><tr><td>S phase of interphase</td><td>8</td></tr><tr><td>G_2 of interphase</td><td>4</td></tr></table></td><td>All correct = 2 marks

G_2 and S / mitosis and G_1= 12 hours total = 1 mark</td><td>(2)
EXP</td></tr>
</table>

Question Number	Answer	Additional Guidance	Mark
6(b)	A description that makes reference to the following: • use a method similar to a root tip squash to stain the cells (1) • count the number of cells in mitosis (and cytokinesis) (1) • divide the number of cells in mitosis by the total number of cells counted (1) • and work out as a proportion of 24 hours (1)	**ACCEPT** description of technique that includes at least relevant two steps e.g. heating in acid and staining with acetic orcein	**(4)** **EXP**

Question Number	Answer	Additional Guidance	Mark
6(c)	An explanation that makes reference to five of the following: • DNA content will double by the end of {S phase / interphase} (1) • because DNA synthesis takes place (before mitosis) (1) • the chromosomes will now consist of pairs of chromatids joined together at the centromere (1) • During mitosis the chromatids separate and chromosomes now consist of one DNA molecule (by the end of mitosis (1) • DNA content will return to normal by the end of cytokinesis (1) • because chromatids are separated into (two new) daughter cells (1)	**ACCEPT** increase to 136 arbitrary units of DNA **ACCEPT** (return to) 68 arbitrary units of DNA	**(5)** **EXP**

Question Number	Answer	Additional Guidance	Mark
7(a)	An explanation that makes reference to the following: • enzymes are made of polypeptide chains with bonds between (R groups) to form a 3D tertiary structure (1) • catalase has four subunits so has quaternary structure (1) • because proteins with {non-protein / haem} groups have quaternary structure (1)	**ACCEPT** are (semi) soluble so fold into a {3D shape / globular structure} in water **ACCEPT** more than one polypeptide chain	**(3)** **EXP**

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	An explanation that makes reference to two of the following: • because as soon as the reaction starts the substrate is {broken down / decreasing} (1) • so the substrate concentration is no longer controlled (1) • substrate concentration should not limit the rate of reaction (1)		**(2)** **EXP**

Question Number	Indicative content
*7(b)(ii)	**Indicative content:** • {pieces / extract} of red peppers used • peppers at various stages of ripeness tested • red pepper added to flask containing hydrogen peroxide • volume of oxygen collected recorded at regular (short) time intervals • temperature controlled using water bath • pH controlled using a buffer • same {volume / concentration} of hydrogen peroxide • same {type / size} of red pepper used • investigation repeated with different red peppers at each stage of ripeness • graph plotted of volume of oxygen collected against time (for each pepper) • tangent drawn to work out initial rate of reaction • cm^3 per minute • graph plotted of initial rate against ripeness of red pepper Level 1 : method described to measure activity of catalase in red peppers Level 2 : method includes using red peppers at varying degrees of ripeness with a consideration of controlling other variables for valid data Level 3 : method includes a description of how to measure initial rate of reaction

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	An explanation that makes reference to two of the following: • to produce several diploid primary spermatocytes (1) • so that lots of sperm can be produced from a single spermatogonium (1) • to replace the spermatogonia (1)		**(2)** **EXP**

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	An explanation that makes reference to the following: • crossing over (in prophase I) (1) • to produce new combinations of alleles on a chromatid (1) • independent assortment (in metaphase I) (1) • to increase the combination of chromosomes in each daughter cell (1)	increase variety of combinations of maternal and paternal chromatids / alleles	**(4)** **EXP**

Question Number	Answer	Additional Guidance	Mark
8(a)(iii)	An answer that makes reference to one similarity and two differences : **Similarities** • haploid cells produced from diploid cells in both (1) **Differences** • {stage 2 / meiosis I} results in two secondary spermatocytes but only one secondary oocyte (1) • {stage 3 / meiosis II} results in four spermatids but one {ovum / egg cell} (1) • polar bodies are produced in oogenesis but not in spermatogenesis (1)		**(3)** **EXP**

Question Number	Answer	Additional Guidance	Mark
8(a)(iv)	An explanation that makes reference to the following: • Contains enzymes (1) • to enable the sperm to digest through the membrane of the (secondary oocyte) (1)		**(2)** **EXP**

Question Number	Answer	Additional Guidance	Mark
8(b)	An answer that makes reference to four of the following: • storage time increases the percentage of sperm with structural defects (1) • storage time decreases the percentage of sperm that can swim (1) • because the error bars for no storage and 30 hours of storage do not overlap (1) • increase in storage time may not correlate with an increase in the number of defects and / or decrease in the number of sperm that can swim (1) • as a number of the error bars {overlap / are large} (in both sets of data) (1)	**ACCEPT** clear use of data to illustrate point **ACCEPT** clear use of data to illustrate point	**(4)** **EXP**