Pearson Edexcel

Mark Scheme (Results)

October 2020

Pearson Edexcel GCE
In AS Biology (8BI0)
Paper 01: 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

Question Number	Answer	Mark
1 a i	**The only correct answer is B** ***A*** *is not correct because glycosidic bonds are in carbohydrates* ***C*** *is not correct because phosphodiester bonds are between the phosphate and base forming the backbone of the DNA molecule* ***D*** *is not correct because peptide bonds are in proteins*	**(1)**

Question Number	Answer	Mark
1 a ii	**The only correct answer is D** ***A*** *is not correct because proteins fold with bonds between amino acids and not with mRNA* ***B*** *is not correct because replication does not involve mRNA* ***C*** *is not correct because transcription forms mRNA from a DNA template*	**(1)**

Question Number	Answer	Mark
1 a iii	**The only correct answer is C** ***A*** *is not correct because proteins fold with bonds between amino acids and not with DNA* ***B*** *is not correct because replication is not involved in protein synthesis* ***D*** *is not correct because translation does not involve DNA*	**(1)**

Question Number	Answer	Mark
1(b)(i)	GTACGTATAGCC	**(1)**

Question Number	Answer	Mark
1(b)(ii)	GUACGUAUAGCC	**(1)**

Question Number	Answer	Mark
1(b)(iii)	4	**(1)**

Question Number	Answer	Mark
1(c)	**The only correct answer is B** ***A*** *is not correct because A + T will not equal C +G* ***C*** *is not correct because* A × T will not equal C × G ***D*** *is not correct because A/C will not equal T/G*	**(1)**

Question Number	Answer	Mark
2(a)(i)	**The only correct answer is C** ***A*** *is not correct because there are no chloroplasts in an animal cell* ***B*** *is not correct because lysosomes do not have a folded inner membrane* ***D*** *is not correct because ribosomes are much smaller and do not have a membrane*	**(1)**

Question Number	Answer	Mark
2(a)(ii)	**The only correct answer is B** ***A*** *is not correct because it is not at the cell surface* ***C*** *is not correct because the rough endoplasmic reticulum is irregular in shape and is labelled P in the diagram* ***D*** *is not correct because the structure has ribosomes on the surface*	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(iii)	A calculation that shows: • image size measured correctly (1) • image size / 9000 with suitable units (1)	<u>Example of calculation</u> 8mm 8/9000 = 0.00089mm / / 0.0009mm / 0.89µm / 0.9µm / 889nm / 8.9 x10^{-7} Allow ECF from image size +/- 1mm for one mark correct answer gets both marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
2(a)(iv)	A description that makes reference to the following: • P is (rough endoplasmic reticulum) where {translation / protein synthesis} takes place (1) • S is (Golgi apparatus) where protein is {packaged / sorted / quaternary structure produced} (1) • T are (vesicles) in which {proteins / enzymes} are transported to the cell membrane (1)	**Allow** exocytosis	**(3)**

Question Number	Answer	Mark
2(b)	**The only correct answer is C** ***A*** *is not correct because there are no plasmids in an animal cell* ***B*** *is not correct because Prokaryotes do not have a nucleolus* ***D*** *is not correct because Prokaryotes do have ribosomes and plasmids*	**(1)**

Question Number	Answer	Additional Guidance	Mark
2 (c)	An explanation that makes reference to two of the following: • light has a longer wavelength than electrons (1) • therefore a light microscope has a lower resolution (than the electron microscope) (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	• juvenile and nymph both 16 (1) • eggs and sperm both 8 (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	M on arrows before eggs and sperm		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)	An explanation that makes reference to the three from the following: • Asexual reproduction occurs due to mitosis (1) • when DNA replication takes place (1) • so that, mitosis can divide sister chromatids equally into each cell (1) • therefore cells produced have no genetic variation (1)	**Allow** Cells receive identical chromosomes / {chromosomes or DNA } from only one parent **Allow** no {independent assortment of chromosomes or random fusion of gametes or crossing over} takes place	**(3)**

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(c) (i)</td><td>
<table>
<tr><th>Feature</th><th>Mitosis</th><th>Meiosis I</th><th>Meiosis II</th></tr>
<tr><td>homologous chromosomes pair together</td><td>×</td><td>✓</td><td>×</td></tr>
<tr><td>crossing over can cause genetic variation</td><td>×</td><td>✓</td><td>×</td></tr>
<tr><td>homologous chromosomes separate</td><td>×</td><td>✓</td><td>×</td></tr>
<tr><td>sister chromatids separate</td><td>✓</td><td>×</td><td>✓</td></tr>
<tr><td></td><td>(1)</td><td>(1)</td><td>(1)</td></tr>
</table>
</td><td></td><td>(3)</td></tr>
</table>

Question Number	Answer	Mark
3 (c) (ii)	**The only correct answer is B** ***A*** *is not correct because crossing over does not alter the DNA sequence of a gene to produce new alleles* ***C*** *is not correct because independent assortment does not alter the DNA sequence* ***D*** *is not correct because random fusion of gametes does not alter the DNA sequence*	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(a)	A diagram showing the following: • two glucose molecules (1) • correct H and OH groups on each glucose (1) • water clear as substrate not product (1)	**Accept** two molecules of α-glucose	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(b)	An explanation that includes four of the following: • mass of contents of the beaker reduce over time (1) • because oxygen is released (1) • the rate of decrease in mass is non-linear / loss of mass reduces over time (1) • because the substrate is used up / lower substrate concentration (1) • resulting in fewer collisions between the active site and the substrate (1)	**Allow** oxygen is a gas (NOT gas has no mass) **Allow** Rate of reaction decreases **Allow** fewer enzyme substrate complexes	**(4)**

Question Number	Answer	Additional Guidance	Mark
4(c)	An explanation that makes reference to the following: • change in the sequence of DNA (1) • results in {missing / different} {amino acid / codon} (1) • results in {different / missing / shorter} {protein / enzyme} (1)	 **Allow** description e.g. frameshift, deletion **Allow** change to {start / stop} codons; different {amino acid sequence / primary structure}	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(a)	A description that includes: • enzymes {hydrolyse / digest} the tissue (of the style) (1) • provides {nutrients / energy /ATP} for pollen tube growth (1) • clears path for pollen tube growth / allows pollen tube to enter ovule (1)	**Allow** enzymes {regulate the production of growth hormones / extend the cytoskeleton / are involved in aerobic respiration / produce new cell membranes} **Allow** provides cell structures needed for growth	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(b)	An explanation that includes: • enzymes {hydrolyse / digest} the (m)RNA (1) • this prevents {translation / protein synthesis / enzyme synthesis} (1) • which prevents {digestion of style / pollen tube growth / pollen tube reaching ovule / prevents self-pollination} (1)		**(3)**

Question Number	Answer	Additional Guidance	Mark
5(c)	An explanation that includes four of the following: • one (male nucleus) fuses with two polar nuclei (1) • which produces a triploid (endosperm) nucleus (1) • which therefore, provides nutrients (for germination) (1) • one (male nucleus) fuses with the female gamete nucleus (1) • which produces the diploid zygote (1)	**Allow** pollen/egg/ova/fertilises	**(4)**

Question Number	Answer	Additional Guidance	Mark
6(a)	An description that makes reference to four of the following: • germ cells divide by mitosis / form {spermatogonia / primary spermatocytes} (1) • which divide by meiosis to form secondary spermatocytes (1) • which divide to form spermatids / 2nd meiotic division forms haploid spermatids (1) • which develop into {(mature) spermatozoa / sperm} (1) • which includes {an acrosome / flagellum} (1)	**Allow** differentiate	**(4)**

Question Number	Answer	Additional Guidance	Mark
6(b)	A calculation that shows: • total number of spermatozoa calculated (1) • answer given in standard form (1)	<u>Example of calculation</u> • 3400×17000 • $= 5.8 \times 10^7$ **Allow** 5.78×10^7	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)	A calculation that shows: • speed of sperm travel = 0.11 cm min^{-1}	<u>Example of calculation</u> 3 × 60 = 180 19 ÷ 180 = 0.11 / 0.106	**(1)**

Question Number	Answer	Additional Guidance	Mark
6(d)(i)	• two correct straight lines drawn (1) • possibly fertile (1)	**Allow** 11 - 13	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(d)(ii)	• off the bottom of the scale therefore person is infertile	**Allow** infertile (on the scale)	**(1)**

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	An explanation that makes reference to the following: • gene {not present / mutated} in R-strain (1) • so that the {enzymes / proteins} needed for synthesising capsule are not present (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	An explanation that makes reference to the following: • R-strain {picked up something from / transformed by} the dead S-strain (1) • therefore, R-strain now has the genes for {enzymes / proteins} needed for synthesising capsule (1) • therefore, R-strain now has a capsule / R-strain now virulent (1)		**(3)**

Question Number	Answer	Additional Guidance	Mark
7(b)			(3)

Enzyme used to treat the heat killed S-strain bacteria	Mouse infected with live R-strain and treated S-strain [Dead or Alive]
protease	dead (1)
DNAase	alive (1)
lipase	dead (1)

Question Number	Answer	Additional Guidance	Mark
7(c)(i)	carbon, oxygen and nitrogen are found in both DNA and protein (1)		(1)

Question Number	Answer	Additional Guidance	Mark
7(c) (ii)			(1)

Phage type (label)	Bacterial cells	Phage ghosts
A (^{32}P)	Y	N
B (^{35}S)	N	Y

Question Number	Answer	Additional Guidance	Mark
8(a)	A calculation that shows: • An initial gradient line drawn / a relevant early value read off graph (1) • Gradient measured / divide amount of product produced by time taken (1)	<u>Example of calculation</u> • (2.5 - 2.6) after 1 hour / (1.3-1.4) after 30min • $2.6 \div 60 = 0.043$ (mmol dm^{-3} min^{-1}) **Allow** answers between 0.041-0.047 correct answer gets both marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(b)	An explanation that makes reference to the following: • the enzyme may have denatured at 65 ºC / the enzyme's active site may have changed shape at 65 ºC (1) • because {hydrogen bonds / bonding} has been disrupted (1)	**Allow** converse	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(c)	An analysis that makes reference to three of the following: • higher temperatures mean molecules have more kinetic energy (1) • therefore there is a greater chance of a collision between the enzyme and substrate (1) • therefore more chance of an enzyme-substrate complex being formed (1) • reaction mixture {is warming up / has not reached equilibration / not hot enough to denature enzyme yet } (1)		**(3)**

Question Number	Indicative content
8 (d)	Answers will be credited according to candidates' deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. • temperature not controlled at the start • allow time for equilibration in the water bath before mixing and starting the reaction • rate of reaction changes while the mixture warms up • Only two temperatures tested • Use a wider range of temperatures • It would help identify the temperature at which the enzyme is denatured • pH not controlled • use a buffer • pH affects shape of active site and therefore rate of reaction • separate experiments not repeated • repetition of each experiment • so you can {calculate a mean average / deal with anomalies / statistical analysis} • values and reactants, products not specified • specific e.g. how product measured etc • Volume of mixture removed not mentioned • Removal of mixture may alter concentrations in reaction mixture • Enzyme may continue to hydrolyse starch while measuring maltose concentration • Same volume of amylase and starch used • Initial concentrations the same • Comment on timings e.g. the same sampling used for both / more frequent sampling could take place

	• The same sampling time will mean there will be the same reduction of volume in each mixture

Level	Marks	
0	0	No awardable content
1	1-2	An explanation of how the investigation should be carried out may be attempted but with limited analysis, interpretation and/or evaluation of the scientific information. Generalised comments made. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.
2	3-4	An explanation of how the investigation should be carried will be given with occasional evidence of analysis, interpretation and/or evaluation of the scientific information, including some consideration of the limitations of the data obtained The explanation shows some linkages and lines of scientific reasoning with some structure.
3	5-6	An explanation of how the investigation should be carried out is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information, including consideration of the value of the results and additional data that may be required. The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured.

Additional Guidance

Level 1 response = two issues that could {reduce / help} validity identified OR two suggestions made on how to improve the validity which are not related to any issues identified [e.g. two random points from indicative contents met]

Level 2 response = at least two suggestions made on how to improve the validity related to specific issues identified [e.g. at least two pairs from the indicative content]

Level 3 response = a range of suggestions made on how to improve the validity related to specific issues identified with some appreciation on the impact of the {issue / improvement} on the data obtained [e.g. at least two triplets with some additional indicative content]

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