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Mark Scheme (Results)

Summer 2019

Pearson Edexcel
Advanced Subsidiary in 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.
- 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)(i)	translation		**(1)**

Question Number	Answer	Mark
1 (a) (ii)	**The only correct answer is A** ***B*** *is not correct because translation does not occur in the Golgi apparatus* ***C*** *is not correct because transcription not translation takes place in the nucleus* ***D*** *is not correct because the smooth endoplasmic reticulum does not have any ribosomes for translation*	**(1)**

Question Number	Answer	Mark
1 (a)(iii)	**The only correct answer is D** ***A*** *is not correct because ester bonds are in lipids* ***B*** *is not correct because glycosidic bonds are in carbohydrates* ***C*** *is not correct because hydrogen bonds are bonds in the secondary not primary structure of the protein*	**(1)**

Question Number	Answer	Mark
1(a)(iv)	**The only correct answer is C** ***A*** *is not correct because an anticodon is on the tRNA* ***B*** *is not correct because a base pair is two complementary bases joined by hydrogen bonds* ***D*** *is not correct because the a DNA triplet would be found on a DNA molecule in the nucleus*	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(v)	amino acid		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(b)	• 25.2 (1) • 21.4 (1) • 0.0 (1)	[NB. penalise just once for inappropriate decimal places] ACCEPT 25 ACCEPT 21 ACCEPT 0	**(3)**

Question Number	Answer	Mark
2(a)(i)	**The only correct answer is B** ***A*** *is not correct because in stage I the DNA remains at 5 a.u.* ***C*** *is not correct because in stage III the DNA remains at 10 a.u.* ***D*** *is not correct because in stage IV the DNA content reduces not increases*	**(1)**

Question Number	Answer	Additional Guidance	Mark
2(a)(ii)	An explanation that makes reference to two of the following: • joins sections of DNA together / repairs breaks in the phosphodiester backbone (1) • by forming phosphodiester bonds (1) • (forms bonds) between phosphate and {deoxyribose / sugar / pentose } (1)	ACCEPT join Okazaki fragments / joins fragments produced from copying the lagging strand / needed for working in 3' to 5' direction ACCEPT between (mono) nucleotides	**(3)**

Question Number	Answer	Additional Guidance	Mark
2(b)	A description that makes reference to the following: • DNA content halves (1) • cytoplasm is dividing / cytokinesis (1) • because two (daughter) cells are formed (1)	ACCEPT from 10 to 5 au ACCEPT cell elongates / spindle fibres push poles apart / cell membrane contracts at equator of the cell	**(3)**

Question Number	Answer	Mark
3(a)(i)	**The only correct answer is A** ***B*** *is not correct because the carboxyl group is drawn at the other end of the polypeptide chain* ***C*** *is not correct because a hydroxyl group would be on a side chain or part of the carboxyl group at the other end of the molecule* ***D*** *is not correct because there is no oxygen in the functional group at the nitrogen side of an amino acid*	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	An answer that makes reference to the following: • 3 dimensional {shape / folding} of protein (1) • held together by bonds between R groups (1)	ACCEPT suitable named bonds involved	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)	A line with the following characteristics: • must be below the other line (1)	ACCEPT horizontal line showing no reaction	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(c)	An explanation that makes reference to three of the following: • mercaptoethanol changes the (tertiary) structure of the enzyme (1) • therefore RNase will be {denatured / active site will have changed shape} (1) • so the RNase will no longer be able to catalyse the reaction (1) • therefore the (initial) rate of reaction { will be much lower / will not take place} (1)	ACCEPT fewer (functioning) enzymes available / lower concentration of (functioning) enzyme available / no longer active (if qualified)	**(3)**

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	An explanation that makes reference to the following: • meiosis (1) • because haploid gametes produced from a diploid cell /number of chromosomes is halved (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	An explanation that makes reference to the following: • mitosis (1) • because the number of chromosomes remains the same (1)	ACCEPT haploid cells can only divide by mitosis / do not need reduction division	**(2)**

Question Number	Answer	Mark
4 (a)(iii)	**The only correct answer is C** ***A*** *is not correct because random fusion of gametes can't produce a haploid male* ***B*** *is not correct because independent assortment of chromosomes and crossing over can occur in the formation of gametes used to form a fertilised egg (a female)* ***D*** *is not correct because random fusion of gametes would occur to form a fertilised egg (a female)*	**(1)**

Question Number	Answer	Mark
4(b)(i)	**The only correct answer is D** ***A*** *is not correct because W is not a meristem* ***B*** *is not correct because X is not a meristem* ***C*** *is not correct because Y is not a meristem*	**(1)**

Question Number	Answer	Additional Guidance	Mark
4 (b) (ii)	(acetic) orcein	ACCEPT Feulgen, acetocarmine, toluidine blue	**(1)**

Question Number	Answer	Additional Guidance	Mark
4 (b)(iii)	An explanation that makes reference to two of the following: • heat to intensify the stain (1) • {squash / tease} the tissue to separate the cells (1) • apply a coverslip {in order to view at high magnification / stop evaporation} (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
5(a)	• would not have membrane bound organelles	ACCEPT would not have named organelle e.g nucleus / nuclear envelope / mitochondria / Golgi apparatus / RER ACCEPT could have smaller ribosomes / cell wall / nucleoid / plasmid	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(b)(i)	Arrows showing two of the following: • movement from RER to Golgi (1) • from Golgi to vesicles and out of the cell (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
5(b)(ii)	An answer that makes reference to four of the following: • amino acids incorporated into {proteins / polypeptides / enzymes} (1) • radioactivity decreases in RER as proteins moved to Golgi apparatus (1) • radioactivity decreases after 40 minutes in Golgi apparatus as protein packaged into vesicles (1) • radioactivity increases in vesicles ready for secretion (1) • total radioactivity decreases as proteins {secreted from cell / in other parts of the cytoplasm} (1)	ACCEPT converse	**(4)**

Question Number	Answer	Additional Guidance	Mark
5(c)(i)	An explanation that makes reference to two of the following: • {fewer / no} enzymes found (1) • therefore higher concentration of {undigested food / protein / starch / polysaccharides} (1)	 ACCEPT prevents enzymes going to the small intestine ACCEPT more {undigested food / protein / starch / polysaccharides} ACCEPT lower concentration of { amino acids / sugars / glucose }	**EXP**

Question Number	Answer	Additional Guidance	Mark
5(c)(ii)	An explanation that makes reference to two of the following: • pancreas will be {damaged / cells digested} (1) • resulting in fewer {enzymes / hormones } produced / diabetes (1)	 ACCEPT pancreatic duct damaged ACCEPT digests insulin (in the pancreas)	**(2)**

Question Number	Answer	Mark
6(a)	**The only correct answer is A** ***B*** *is not correct because Q is not a polar body* ***C*** *is not correct because P is a germ cell not an oocyte* ***D*** *is not correct because P is a germ cell not an ovum*	**(1)**

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	A calculation that shows: • data read from table and subtracted (1) • percentage change calculated (1)	<u>Example of calculation</u> • 733000 – 389300 = 343700 • 343700 / 733000 X 100/1 = 46.9% ACCEPT both positive and negative answers correct answer gets both marks ACCEPT 47% and 46.89%	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(b)(ii)	produced before birth (1)	ACCEPT during gestation, pregnancy	**(1)**

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	spermatids have no {tail / flagellum / acrosome} (1)	ACCEPT converse / spermatids have fewer {enzymes / mitochondria }	**(1)**

Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	An explanation that makes reference to the following: • spermatids are non–motile / cannot swim to the egg (1) • therefore spermatids are unable to penetrate the egg (1)	ACCEPT stationary ACCEPT so no fusion with the oocyte occurs / no acrosome reaction / unable to fertilise the egg	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)(iii)	An explanation that makes reference to the following: • {fittest / fastest / most developed / healthiest } will fertilise the oocyte (1) • therefore pass on advantageous alleles (1)	ACCEPT converse ACCEPT natural selection can take place	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)(iv)	A description that makes reference to two of the following: • interference with natural process e.g. fertilising male gamete chosen by doctor rather than natural competition (1) • embryo may be abnormal because of {lack of competition from other sperm/ lack of natural selection / damage due to technique / chromosome abnormality / gene mutation passed on} (1) • provides possibility of {eugenics / artificial selection / designer babies} (1)		**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	An explanation that makes reference to the following: • lowers the pH which denatures the {polyphenol oxidase / enzyme} (1) • so that the phenols no longer fit the active site (1)	ACCEPT lower pH changes {structure/shape} of the {enzyme / active site} ACCEPT can't form enzyme-substrate complex / prevents binding of the substrate to the enzyme	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	An explanation that makes reference to the following: • digests the {polyphenol oxidase / enzyme} (1) • because this is a protein (1)	ACCEPT effects on substrate or product ACCEPT {breaks down / hydrolyses} the enzyme ACCEPT the enzyme digests protein	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(b)(i)	An explanation that makes reference to the following: • as time increases more melanin is produced (1) • increase is {non-linear / reduces after 120 seconds} (1) • because substrate {concentration is reducing / is used up} (1)	ACCEPT end product inhibition	**(3)**

Question Number	Indicative content
7(b)(ii)	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. **Examples for level 1:** • Temperature as the independent variable • Concentration of melanin produced as the dependent variable • Control of other variables eg. apple {mass, volume, surface area, variety, source }, pH **Examples for level 2:** • A suitable range of temperatures with at least 5 specified and how the temperature will be controlled • Description of method to measure the melanin produced • Description of how to control the variables e.g. use of a pH buffer, etc • Apple slice obtained with mass or volume and source controlled **Examples for level 3:** • Reference to suitable time scale for taking measurements made e.g. 120 seconds linked to the data already obtained • Discussion of what effect the variable would have if it was not controlled. E.g. what effect would changing mass of apple have on the concentration of melanin produced • Repeats at each temperature to improve validity of the data • Suitable control to check the effect of temperature on melanin

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 = the dependent and independent variables have been identified and some attempt has been made to control other variables

Level 2 response = the dependent, independent and at least two control variables have been clearly specified and most have clear descriptions of how they are to be measured/controlled.

Level 3 response = the dependent, independent and at least two control variables have been clearly specified and most have clear descriptions of how they are to be measured/controlled. Clear reference and use has been made of the existing technique and data e.g. in determining the time scale for measurement of melanin concentration. Understanding may be shown through some appreciation of why the control variables are significant and/or limitations on determining end points, etc

Question Number	Answer	Additional Guidance	Mark
8(a)(i)	A description that makes reference to two of the following: • fibrous proteins have little or no tertiary structure unlike tubulin (1) • fibrous proteins are insoluble whereas tubulin can be (semi) soluble (in water) (1) • fibrous proteins are made of long polypeptide chains (with cross-linkages) whereas tubulin is folded into a globular shape (1)	ACCEPT fibrous proteins have hydrophobic groups on the outside / converse ACCEPT fibrous proteins are {longer / tougher}	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(a)(ii)	A calculation that shows: • µm converted to nm (1) • And divided by 25 (1)	<u>Example of calculation</u> • 40 µm = 40000 nm / 25 nm = 0.025 µm ACCEPT correct standard form • 40000/ 25 = 1600 correct answer gains both marks	**(2)**

Question Number	Answer	Additional Guidance	Mark
8(b)(i)	An evaluation that makes reference to four of the following: • centrioles are clearly needed because the microtubules did not increase in length (significantly) in the absence of centrioles (1) • the concentration of tubulin is significant because 1.40 produced longer microtubules than 0.95 (in the first 30 minutes) (1) • because the higher concentration of substrate increased {the number of collisions / rate of reaction} (1) • the rate of increase of microtubule growth is non-linear / mean microtubule length appears to reach a maximum at {17 μm / after 30 min} (1) • this suggests that there is another limiting factor (1)	ACCEPT greater concentration of tubulin produces longer microtubules	**(4)**

Question Number	Answer	Additional Guidance	Mark
8 (b) (ii)	An explanation that makes reference to the following: • a buffer can prevent change to the pH (1) • equilibrate because the experiment is carried out at 35 °C (1) • a change in {pH / too high temperature} may {denature / change the shape} of the {proteins / tubulin /centriole fragments} (1) • because {hydrogen / ionic} bonds may be {changed / disrupted} (1)	ACCEPT description of equilibration ACCEPT may prevent bonding between {tubulin molecules / tubulin and centrioles}	**(4)**

Question Number	Answer	Additional Guidance	Mark
8(c)	An explanation that makes reference to two of the following: • they shorten in the same way as they do during cell division (1) • some of the microtubules may break / were shortened by the centriole (1) • tubulin can detach from the microtubules as well as join (1)	ACCEPT the {equilibrium between forming and breaking / optimum length} was reached at approximately 30 minutes	**(2)**

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