Mark Scheme (Results)

Summer 2018

Pearson Edexcel GCE
In Biology Spec A (8BN0) Paper 02
Development, Plants and the Environment

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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)	• locus (1)	ALLOW loci	**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	An explanation which makes reference to the following: • (diagram / chromosome) C (1) • because the genes are furthest apart (1) • more likely { to be separated during crossing over / chiasmata forming between the two genes } (1)	ALLOW genes are further apart	**(3)**

Question Number	Answer	Mark
1(b)	**C** –ABc *The only correct answer is C* *A is not correct because B and C are on the same chromosome* *B is not correct because B and C are on the same chromosome* *D is not correct because b and c are on the same chromosome*	**(1)**

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Question Number	Answer	Additional Guidance	Mark
2(a)	• (A) nuclear pore (1) • (B) Golgi { apparatus / body } (1) • (C) secretory vesicles / lysosome (1)	ALLOW rER / rough endoplasmic reticulum	(3)

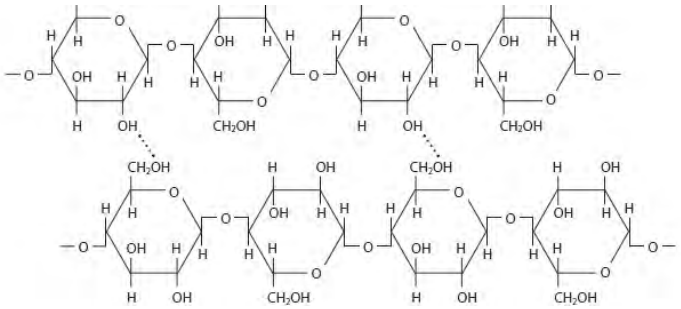
Question Number	Answer	Additional Guidance	Mark
2(b)	A description which makes reference to the following: • {vesicles fuse with / protein enters} Golgi apparatus (1) • modification of protein inside Golgi apparatus (1) • {protein / enzyme} packaged into (secretory) vesicles (1) • vesicles fuse with cell (surface) membrane (1)		(4)

Question Number	Answer	Additional Guidance	Mark
2(c)	An explanation which makes reference to three of the following: • genes can be activated or deactivated (1) • (these cells) receive the same stimulus (1) • (all of these cells) have the gene for the enzyme { activated / switched on } (1) • resulting in production of mRNA for the enzyme (1)	ALLOW switched on or off	**(3)**

Question Number	Answer	Mark
2(d)	**C** - both possess ribosomes - prokaryotic cells do not possess endoplasmic reticulum *The only correct answer is C* *A is not correct because prokaryotic cells can contain plasmids* *B is not correct because eukaryotic cells do not contain pili* *D is not correct because eukaryotic cells do not contain pili*	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	plasmodesma (1)	ALLOW plasmodesmata	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	An explanation which makes reference to the following: • cytoplasmic connection (between cells) (1) • which allows { transport / communication } (between cells) (1)	 ALLOW cytoplasm continuous between the cells ALLOW exchange of materials between cells	**(2)**

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	• a link between the O of an OH group with H on an adjacent molecule (1)	e.g. 	**(1)**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	An answer which makes reference to the following: Similarities: • both are {polysaccharides / polymers of glucose} (1) • both contain (1,4) glycosidic bonds (1) Differences: • cellulose contains { β /beta } glucose whereas amylopectin contains { α / alpha } glucose (1) • cellulose { is not branched / does not contain 1-6 glycosidic bonds } (1)	ALLOW alternate monomers are inverted in cellulose ALLOW converse for amylopectin	**(3)**

Question Number	Answer	Mark
3(c)	**D** - store starch granules *The only correct answer is D* *A is not correct because amyloplasts do not allow fluid exchange* *B is not correct because amyloplasts do not consist mainly of pectin* *C is not correct because amyloplasts are not membranes surrounding the vacuole*	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(a)(i)	• sclerenchyma correctly labelled (1)	Any identification within shown region 	**(1)**

Question Number	Answer	Additional Guidance	Mark
4(a)(ii)	• correct measurement of scale bar (1) • conversion to micrometres (1) • division of image length by actual length to give magnification (1)	<u>Example of calculation:</u> 35mm or 3.5cm 35000 (or measured value multiplied by relevant figure if value incorrect) (35000) ÷ 50 = (x) 700 Correct answer with no working gains full marks	**(3)**

Question Number	Answer	Mark
4(b)(i)	**A** - companion cell *The only correct answer is A* *B is not correct because sclerenchyma fibres do not contain nuclei* *C is not correct because sieve tubes do not contain nuclei* *D is not correct because xylem vessels do not contain nuclei*	**(1)**

Question Number	Answer	Mark
4(b)(ii)	**A** - provide support *The only correct answer is A* *B is not correct because neither xylem nor sclerenchyma transport glucose* *C is not correct because neither xylem nor sclerenchyma transport hormones* *D is not correct because sclerenchyma does not transport mineral ions*	**(1)**

Question Number	Answer	Mark
4(b)(iii)	**D -** sclerenchyma fibres have thickened, lignified cell walls *The only correct answer is D* *A is not correct because phloem sieve tubes having no organelles does not explain a greater percentage of the total mass of the sclerenchyma* *B is not correct because phloem sieve tubes do not have lignified walls* *C is not correct because sclerenchyma fibres do not contain organelles*	**(1)**

Question Number	Answer	Additional Guidance	Mark
5(a)(i)	• mean number of fruit for plants grown in soil with all minerals (1) • mean number of fruit for plants grown in soil without calcium ions (1) • difference between these values calculated (1)	<u>Example of calculation:</u> (644×9.2) ÷ 100 = 59.248 / 59.25 (392×5.4) ÷ 100 = 21.168 / 21.17 59.25 - 21.17 = 38.08 Correct answer with no working gains full marks	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(a)(ii)	An answer which makes reference to the following: • deficiency in both ions reduces flowering and fruit formation (1) • flower number reduced more by a deficiency in calcium than a deficiency in magnesium (1) • fruit production reduced more by a deficiency in magnesium than a deficiency in calcium (1)	ALLOW calcium deficiency has most effect on flower number ALLOW magnesium deficiency has most effect on fruit production	**(3)**

Question Number	Answer	Additional Guidance	Mark
5(b)	An answer which makes reference to five of the following: • use of plants that are { clones / same variety / same age } (1) • a range of (at least) five different nitrate concentrations (1) • description of how an abiotic variable will be controlled (1) • grown for a set period of time (1) • relevant measure of growth (1) • repeats (at each nitrate concentration) to calculate mean values (1)	e.g. suitable method for controlling temperature or light described or pH of soil or presence of all other mineral ions in soil or volume of water provided e.g. height or mass	**(5)**

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	An explanation which makes reference to two of the following: • (each zygote is formed) from different gametes / random fertilisation (1) • each gamete contains different combinations of alleles (1) • (different combination of alleles due to) { independent assortment / crossing over } (during meiosis) (1)	ALLOW not monozygotic twins	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	An explanation which makes reference to the following: • cortical reaction / fusion of cortical granules with egg cell (surface) membrane (1) • resulting in { thickening / hardening } of the zona pellucida (1) • therefore (other) sperm cells cannot reach egg cell (surface) membrane (1)		**(3)**

Question Number	Answer	Additional Guidance	Mark
6(b)(i)	• (range of heights) show continuous variation (1)	ALLOW continuous data	**(1)**

Question Number	Answer	Mark
6(b)(ii)	**B** - controlled by more than one gene *The only correct answer is B* *A is not correct because a polygenic trait is not controlled by a large number of alleles of one gene* *C is not correct because a polygenic trait is not controlled by one gene from each parent* *D is not correct because a polygenic trait is not controlled by one gene and the environment*	**(1)**

Question Number	Answer	Additional Guidance	Mark
6(b)(iii)	An answer which makes reference to the following: • 70 cm (1) • the highest frequency (of antelopes) (1)	ALLOW 'most common' height	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)(i)	An explanation which makes reference to the following: • (*Saiga* more closely related to *Antilope*) because they shared a common ancestor more recently (1) • there are more similarities in the protein (1)	 e.g. similar sequences of amino acids in the protein	**(2)**

Question Number	Answer	Additional Guidance	Mark
6(c)(ii)	An answer which makes reference to the following: • they are less closely related (1) • DNA { profiling / analysis / comparison } (1) • (detected) more differences in the mitochondrial genome (1)		**(3)**

Question Number	Answer	Additional Guidance	Mark
7(a)(i)	A description which makes reference to the following: • pine and larch { have greater antimicrobial properties / act faster } than spruce (1) • pine and larch equally effective (1)	ALLOW converse	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(ii)	An answer which makes reference to two of the following: • the conclusion is not valid (1) • time is not shown as a continuous scale (1) • no data between 4 and 8 days (1)	ALLOW description of non-linear time scale	**(2)**

Question Number	Answer	Additional Guidance	Mark
7(a)(iii)	An answer which makes reference to four of the following: • shorter time intervals / hourly measurements (1) • { between 0 and 1 day / within first 24 hours } (1) • because no bacterial growth in either after 1 day (1) • test with different bacterial cultures (1) • because antimicrobial properties may vary (1)		**(4)**

Question Number	Answer	Additional Guidance	Mark
7(b)	An answer which makes reference to the following: • (Figure 1 shows) bacterial growth decreases faster at higher temperatures (1) • (therefore) antimicrobial properties (of pine) more active at higher temperatures (1) • (Figure 2 shows) moisture content decreases at higher temperatures (1) • loss of moisture could reduce bacterial growth (1)	ALLOW converse ALLOW converse ALLOW converse ALLOW converse or loss of moisture could cause antimicrobial chemicals to become more concentrated	**(4)**

Question Number	Answer	Additional Guidance	Mark
8(a)	An answer which makes reference to the following: • (behavioural) slow moving/sleep for long periods (1) • (physiological) slow metabolism (1) • (anatomical) hooked claws (1)	ALLOW sleep for 15 hours	**(3)**

Question Number	Answer	Additional Guidance	Mark
8(b)(i)	An explanation which makes reference to the following: • they are no longer able to interbreed to produce fertile offspring (1) • because populations have become reproductively isolated (1)		**(2)**

Question Number	Answer	Mark
8(b)(ii)	**D** - The role of *C. hoffmanni* in its environment *The only correct answer is D* *A is not correct because the area where C. hoffmanni is found is not a description of niche* *B is not correct because the preferred diet of C. hoffmanni is not a description of niche* *C is not correct because the risk of C. hoffmanni becoming extinct is not a description of niche*	**(1)**

Question Number	Indicative content
8(c)	Answers will be credited according to candidate's 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. Species number may increase due to: • Fragmentation of habitat / geographical isolation • Different selection pressures on populations of *C. hoffmanni* • Different allele frequencies within separate populations • Evolution leading to formation of new species Species number may decrease due to: • *B. pygmaeus* is currently critically endangered • Only one population • Therefore could be vulnerable to inbreeding depression • At risk of natural disaster, disease, predation etc • Therefore may become extinct

Level	Marks		Additional Guidance
0	0	No awardable content	
1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information with a focus on mainly just one piece of scientific information. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.	Geographical isolation. *B. pygmaeus* is currently critically endangered. *C. hoffmanni* becoming more than one species or *B. pygmaeus* becoming extinct
2	3-4	An explanation will be given with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.	*C. hoffmanni* Different habitats with different selection pressures leading to natural selection. Or *B. pygmaeus* has only one population / endemic to one island
3	5-6	An explanation is made which is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.	(Must consider both species) *C. hoffmanni* populations accumulate different allele frequencies and develop into different species. *B. pygmaeus* more vulnerable to becoming extinct with reasons.

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