Pearson Edexcel

Mark Scheme (Result)

November 2021

In Biology A Salters Nuffield (8BN0)
Paper 2: Development, Plants and the Environment

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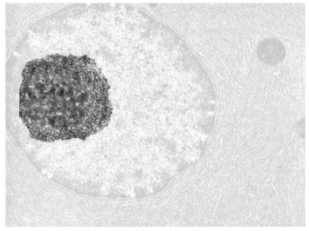
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General Marking Guidance

- 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	Additional guidance	Mark
1(a)(i)	• nucleolus correctly labelled	 within area shown	**(1)**

Question Number	Answer	Mark
1(a)(ii)	The only correct answer is – B prokaryotic cells do not have a nucleus A is incorrect because prokaryotic cells do contain DNA C is incorrect because prokaryotic cells do not only contain RNA D is incorrect because prokaryotic cells do not only contain single-stranded DNA	**(1)**

Question Number	Answer	Additional guidance	Mark
1(a)(iii)	An explanation that makes reference to the following: • because the nuclear membrane is broken down (1) • because DNA is { coiled / condensed } into individual chromosomes (1)		**(2)**

Question Number	Answer	Mark
1(b)(i)	The only correct answer is – C 16 and 20 hours A is incorrect because cells are in early interphase B is incorrect because cells are replicating DNA from 12 hours D is incorrect because cells are in interphase from 24 to 36 hours	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	An explanation that makes reference to the following: • to ensure that {diploid number of chromosomes / one copy of each chromosome } in each daughter cell (1) • to ensure daughter cells are genetically identical (1)	ALLOW correct number of chromosomes in each cell	**(2)**

Question Number	Answer	Additional guidance	Mark
1(b)(iii)	An explanation that makes reference to the following: • phenotype is determined by the genotype and the effect of the environment (1) • mitosis produces cells with the same genotype (1)	ALLOW mitosis produces genetically identical cells	**(2)**

Question Number	Answer	Additional guidance	Mark
2 (a)	• number of bags × mass in kilograms (1) • correct answer given in standard form (1)	Example of calculation $(7.6 \times 10^9) \times 0.0055$ 4.18×10^7 Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	A description that makes reference to three of the following: • starch is a polysaccharide made from alpha glucose (1) • monomers in the chains are joined by 1,4 glycosidic links (1) • starch contains {unbranched chains / amylose} and {branched chains / amylopectin} (1) • branches are joined to chains by 1,6 glycosidic links (1)	ALLOW branches involve 1,6 glycosidic links	**(3)**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that makes reference to the following: • because starch comes from plants that can be regrown (1) • however not 100% starch so some oil-based products needed (1)		**(2)**

Question Number	Answer	Additional guidance	Mark
2(c)	An explanation that makes reference to the following: • the second method will be more accurate (because the exact value will be shown on the forcemeter) (1) • the first method is less accurate because the true value will be between two masses (1)		**(2)**

Question Number	Answer	Mark
3(a)(i)	The only correct answer is – **C** phase 2 A is incorrect because no humans are involved in preclinical trials B is incorrect because only healthy volunteers are involved in phase 1 D is incorrect because patients had previously been involved in phase 2	**(1)**

Question Number	Answer	Mark
3(a)(ii)	The only correct answer is – **B** phase 1 A is incorrect because no humans are involved in preclinical trials C is incorrect because side effects will have been identified prior to phase 2 D is incorrect because side effects will have been identified prior to phase 3	**(1)**

Question Number	Answer	Additional guidance	Mark
3(b)	An explanation that makes reference to the following: Placebo • because it provides a control group for comparison (1) • therefore ensuring that the { active ingredient / drug } is causing the effect (1) Double Blind Trial • because neither doctors nor patients know who has been given the actual drug (1) • therefore ensures that bias is removed from the trial (1)	ALLOW that improvement is not due to a psychological effect	**(4)**

Question Number	Answer	Additional guidance	Mark
3(c)	An answer that makes reference to the following: • the drug did not show a significant improvement when compared with the placebo (1) • because the ranges overlapped (1) • because some people in the trial had an increased blood pressure (1)		**(3)**

Question Number	Answer	Mark
4(a)(i)	The only correct answer is – A anaphase B is incorrect because the cell is not in interphase C is incorrect because the cell is not in metaphase D is incorrect because the cell is not in telophase	**(1)**

Question Number	Answer	Mark
4(a)(ii)	The only correct answer is – D A is incorrect because root tips are not involved with reproduction B is incorrect because root tip cells do not divide by meiosis C is incorrect because root tips are not involved with reproduction	**(1)**

Question Number	Answer	Additional guidance	Mark
4(a)(iii)	A description that makes reference to the following: • description of use of appropriate part of the root tip (1) • an appropriately named stain (1) • details of root tip squash procedure (1)	 e.g. toluidine blue, (ethanoic) orcein e.g. use of hydrochloric acid to prepare tissue sample, maceration procedure, squashing under cover slip	**(3)**

Question Number	Answer	Additional guidance	Mark
4(a)(iv)	• number of cells undergoing mitosis divided by total number of cells (1) • correct answer given as a percentage (1)	Example of calculation 7 ÷ 30 = 23.3% Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional guidance	Mark
4(b)	An answer that makes reference to the following: • radiation can cause damage to chromosomes (1) • cells with (a functioning) P21 gene show reduced cell division (1) • with faulty P21 gene cell division remains high (1) • suggests P21 prevents cell progressing through mitosis if DNA damaged (1)	ALLOW after 72 hours mitosis is reduced as cells are not viable ALLOW P21 regulates the cell cycle	**(4)**

Question Number	Answer	Additional guidance	Mark
5(a)(i)	• indication of a position only on the X chromosome		**(1)**

Question Number	Answer	Additional guidance	Mark
5(a)(ii)	An explanation that makes reference to the following: • genetic diagram to show that males can only inherit one of the F8 alleles (1) • correct offspring identified (1) • male parents must pass their Y chromosome to their male offspring (1) • male parents can only pass on their faulty F8 allele to female offspring (1)	<table><tr><td></td><td>X^h</td><td>Y</td></tr><tr><td>X^H</td><td>X^hX^H</td><td>**X^HY**</td></tr><tr><td>X^H</td><td>X^hX^H</td><td>**X^HY**</td></tr></table> ALLOW male offspring get their X chromosome from female parent	**(4)**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	A description that makes reference to the following: • a characteristic showing continuous variation (1) • caused by multiple genes at different loci (1)		**(2)**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	• calculation of percentage of F9 mutations that cause severe symptoms (1) • same percentage used to calculate number of F8 mutations causing severe symptoms (1)	Example of calculation 575 ÷ 1133 = 0.5075 / 0.51 51% ALLOW 50.75% 2931 x 0.51 = 1495 ALLOW 1487 or 1488 Correct answer with no working gains full marks	**(2)**

Question Number	Answer	Additional guidance	Mark
6(a)	• a tissue is made of one type of cell and an organ is made of different tissues	ALLOW descriptions of tissue and organ	**(1)**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	An explanation that makes reference to the following: • cells are not totipotent (1) • therefore some genes have already been activated and deactivated (1) • therefore, will not be able to specialize into cornea cells (1)	ALLOW cells are only pluripotent ALLOW some genes have already been switched on or off ALLOW will only be able to become a specific selecton of cells	**(3)**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that makes reference to the following: • chemicals cause some genes (related to the cornea) to be {activated/switched on} (1) • these genes are transcribed producing specific mRNA (1) • specific mRNA is translated into specific proteins (1) • these proteins cause the cell to develop into a corneal cell (1)	Allow reference to genes being deactivated/switched off	**(4)**

Question Number	Answer	Additional guidance	Mark
6(c)	A description that makes reference to three of the following: • embryonic stem cells are totipotent and can be used in a wider range of therapies (1) • source of embryonic stem cells has to be {considered / regulated} (1) • {moral / ethical} issues as the use of embryonic stem cells destroys embryos (1) • need for research establishments to be {regulated / licensed} (1)		**(3)**

Question Number	Answer	Mark
7(a)	The only correct answer is – C chlorophyll A is incorrect because magnesium ions are not in amino acids B is incorrect because magnesium ions are not in amylose D is incorrect because magnesium ions are not in DNA	**(1)**

Question Number	Answer	Additional guidance	Mark
7(b)	An answer that makes reference to four of the following: • the effect of magnesium deficiency is shown earlier than the effect of calcium (1) • because the first leaf to die is leaf five in Group B plants (1) • plants continue to grow in solution lacking magnesium (1) • plants stop growing in solution lacking in calcium (1) • without calcium for the middle lamella new leaves cannot grow fully (1)	ALLOW leaves are stunted	**(4)**

Question Number	Answer	Additional guidance	Mark
7(c)	An answer that makes reference to the following: • range of magnesium ion concentrations (1) • measurement of germination rate (1) • use of seedlings germinated in solutions containing all mineral ions (1) • measurement of seedling growth (1) • environmental variables controlled {temperature / humidity} (1)		**(5)**

Question Number	Answer	Additional guidance	Mark
8(a)(i)	• N(N-1) is calculated (1) • sum of n(n-1) is calculated (1) • correct value for diversity index calculated (1)	Example of calculation 41 x 40= 1640 480 3.4 / 3.42 Correct answer with no working gains full marks	**(3)**

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	An explanation that makes reference to the following: • the value will decrease (1) • because there will be fewer species present (1)		(2)

Question Number	Answer	Mark
8(b)	The only correct answer is – D pollinates the orchid A is incorrect because *E. longicornis* does not feed on the orchid B is incorrect because the term niche does not relate to the location of an organism C is incorrect because the term niche does not relate to appearance of the organism	**(1)**

Question Number	Indicitive content Mark
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. The diversity will reduce due to increased self-pollination Populations that self-pollinate will still produce some variation in their offspring This variation will be reduced as only one parents' alleles are used Genetic drift may occur Similarities to *E. longicornus* may not be as obvious Because there is no advantage / selection pressure to look like a bee Chance of different gene pool Leading to formation of two new species The lack of *E. Longicornus* in areas of the UK will increase the chance of new species of bee orchid developing there

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.	Reduced biodiversity – less pollination by bees Fewer bees mean that more orchids will self-pollinate
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.	Self-pollination will cause reduced diversity Change in allele frequencies in the population
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.	Idea of genetic drift – loss of alleles from populations If not pollinated by bees, alleles leading to that adaptation no longer an advantage Phenotype may change – may result in new species evolving Areas where there are fewer bees will be more likely to have new orchid species evolving

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