Pearson Edexcel

Mark Scheme (Results)

Summer 2022

Pearson Edexcel GCE
In Biology A Salters Nuffiled (8BN0)
Paper 2: 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.

Question Number	Answer	Mark
1(a)(i)	The only correct answer is – C A is incorrect because A is a chloroplast B is incorrect because B is the nucleus D is incorrect because D is the Golgi apparatus	(1)

Question Number	Answer	Mark
1(a)(ii)	The only correct answer is – C A is incorrect because chloroplasts are not reinforced by lignin B is incorrect because the nucleus is not reinforced by lignin D is incorrect because the Golgi apparatus is not reinforced by lignin	(1)

Question Number	Answer	Mark
1(a)(iii)	The only correct answer is – D A is incorrect because it is a chloroplast B is incorrect because it is the nucleus C is incorrect because the cell wall does not have vesicles	(1)

Question Number	Answer	Additional guidance	Mark
1(b)(i)	A description that makes reference to the following: • { a group of / many/several} similar cells (1) • that work together for a common function (1)	ALLOW same type of cell or identical cells	(2)

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	An explanation that makes reference to the following: • to allow time for the dye to travel through and stain the xylem (1) • making the { tissue/ xylem } visible (under the microscope) (1)		(2)

Question Number	Answer	Additional guidance	Mark
2(a)	• correct values for ab and aB	<table><tr><td>AB</td><td>ab</td><td>Ab</td><td>aB</td></tr><tr><td>49.5</td><td>49.5</td><td>0.5</td><td>0.5</td></tr></table>	(1)

Question Number	Answer	Additional guidance	Mark
2(b)	An answer that makes reference to the following: • arrangement 2 (1) • {genes/ loci }are close together (1) • therefore are most likely to be inherited together (1)	ALLOW converse for marking points 2 and 3 if referring to reason it cannot be arrangement 1 IGNORE alleles ALLOW are least likely to be separated by crossing over	(3)

Question Number	Answer	Additional guidance	Mark
2(c)	• correct calculation for number of eggs produced per year with alleles A and B (1) • correct calculation for number produced in 11 years (1)	Example of calculation 1600 × 0.495 = 792 = 8712 or 8.71×10^3 ALLOW one mark for 17600 as total number of eggs in 11 years Correct answer with no working gains full marks	(2)

Question Number	Answer	Additional guidance	Mark
3(a)(i)	An answer that makes reference to the following: • acrosome shown as a rounded shape at front of head, separate from cell membrane, correctly labelled (1) • nucleus correctly labelled (1) • location of mitochondria correctly labelled (1)		(3)

Question Number	Answer	Additional guidance	Mark
3(a)(ii)	The only correct answer is – B A is incorrect because the enzymes do not digest the cell membrane C is incorrect because the acrosome does not release hormones D is incorrect because the acrosome does not release hormones		(1)

Question Number	Answer	Additional guidance	Mark
3(b)(i)	• correct mean for buffer with calcium ions (1) • correct mean for buffer without calcium ions (1) • correct difference calculated (1)	Example of calculation = (25+21+20) ÷ 3 = 22.0 = (70+69+77) ÷ 3 = 72.0 =50% Correct answer with no working gains full marks	(3)

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	An answer that makes reference to the following: • in the presence of calcium ions the acrosome (vesicle) fuses with the cell membrane (1) • (therefore) calcium ions cause the acrosome reaction to take place (1)	ALLOW in the absence of calcium ions the acrosome reaction could not take place ALLOW the acrosome releases enzymes in the presence of calcium	(2)

Question Number	Answer	Mark
4(a)(i)	The only correct answer is D – S A is incorrect because DNA is not replicated during G1 B is incorrect because DNA is not replicated during G2 C is incorrect because DNA is not replicated during mitosis	(1)

Question Number	Answer	Mark
4(a)(ii)	The only correct answer is A – G1 B is incorrect because cells only grow slightly during the G2 phase C is incorrect because cells do not increase in size during mitosis D is incorrect because cells do not increase in size during S phase	(1)

Question Number	Answer	Additional guidance	Mark
4(b)(i)	• volume of nucleus correctly calculated (1) • volume of cell correctly calculated (1) • correct volume given to two significant figures (1)	Example of calculation $V = (4 \div 3) \times \pi \times 3^3 = 113.04$ ALLOW 110.27 – 113.1 V of cell = 113.04 ÷ 0.09 = 1256 $=1300\ (\mu m^3)$ Correct answer with no working gains full marks	(3)

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	An answer that makes reference to the following: • samples from different distances from the tip of the root taken (1) • measure distance from tip using an eyepiece graticule (1) • details of root tip squash procedure (1) • use of an appropriate named stain (1) • detail of how to assess percentage of cells undergoing mitosis (1)	ALLOW sensible range of distances stated that could be measured with a ruler e.g. correct use of hydrochloric acid, maceration procedure, squashing to produce single layer of cells e.g. toluidine blue, (ethanoic) orcein e.g. count total number of cells and number of mitotic cells	(5)

Question Number	Answer	Mark
5(a)	The only correct answer is – A is double-stranded and found in the cytoplasm B is incorrect because bacteria do not have a nucleus C is incorrect because bacterial DNA is not single-stranded D is incorrect because bacteria do not have a nucleus	(1)

Question Number	Answer	Additional guidance	Mark
5(b)(i)	A description that makes reference to four of the following: • (polypeptide is) folded within the { rough endoplasmic reticulum /rER } (1) • packaged into vesicles (1) • (transport) vesicles fuse with Golgi apparatus (1) • (polypeptide is) modified within the Golgi apparatus (1) • exocytosis / vesicle fuses with cell surface membrane (1)	ALLOW reference to tertiary / 3D structure e.g. transport or secretory vesicles ALLOW enzymes activated in Golgi apparatus	(4)

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation that makes reference to four of the following: • the gene (for lysostaphin) is activated in (milk producing) cells (1) • only these cells have the gene transcribed / mRNA only produced from active gene (1) • mRNA is translated (on ribosomes) to produce {polypeptide / lysostaphin} (1) • lysostaphin is secreted from cells that produce milk (1) • gene (for lysostaphin) was deactivated in muscle cells (so no lysostaphin found in tissue) (1)	ALLOW reference to gene being switched on ALLOW converse for muscle cells ALLOW converse for muscle cells ALLOW gene methylated in muscle cells	(4)

Question Number	Answer	Additional guidance	Mark
6(a)(i)	An explanation that makes reference to the following: • increases population size of species (1) • {maintains/increases} genetic diversity (1) • therefore prevents extinction of species (1)	ALLOW description of genetic diversity	(3)

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	An explanation that makes reference to the following: • to prevent related animals from breeding (with each other or a parent) (1) • to prevent inbreeding depression (1) • to increase genetic variation within { the offspring / populations in other zoos / the species} (1)	ALLOW so they can be matched with unrelated partners ALLOW description of inbreeding depression or the problems of inbreeding	(3)

Question Number	Answer	Additional guidance	Mark
6(b)(i)	A description that makes reference to the following: • numbers (always) greater in captivity than in the wild (1) • numbers in the wild and in captivity have decreased (1) • wild population decreased at a similar rate to the captive population (1)		(3)

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An explanation that makes reference to two of the following: • they are needed {to maintain captive population / for breeding programme } (1) • not enough suitable habitat / they would be at risk if released (1) • they are not prepared for reintroduction (1)	ALLOW are needed for captive breeding programme e.g. at risk from poachers ALLOW lack of hunting skills in captive bred animals	(2)

Question Number	Answer	Additional guidance	Mark
7(a)	A description that makes reference to four of the following: • cellulose is a polymer of beta glucose (1) • (the glucose molecules are) held together by glycosidic bonds (1) • β-glucose monomers form (long) straight chains (1) • (the cellulose molecules are) held together by hydrogen bonds (1) • microfibrils are composed of many cellulose molecules (1)	ALLOW polysaccharide for polymer	(4)

Question Number	Answer	Additional guidance	Mark
7(b)	An description that makes reference to the following: • tensile strength increases with lignin content (1) • there is no relationship between cellulose content and tensile strength (1)	e.g. hemp has highest percentage cellulose but not the highest tensile strength. (1)	(2)

Question Number	Answer	Additional guidance	Mark
7(c)	An answer that makes reference to the following: • {extract / select} fibres with a range of diameters including fibres less than 0.09mm (1) • a relevant variable controlled (1) • attach fibres to clamp stands and add masses until fibre breaks (1) • repeat and calculate a mean (1) • describe how to calculate tensile strength by dividing force by cross sectional area (1) • plot values on graph to establish if there is a correlation (1)	e.g. length of fibre, temperature or humidity ALLOW add 'weights' ALLOW use a relevant stats test	(6)

Question Number	Answer	Additional guidance	Mark
8(a)(i)	An answer that makes reference to two of the following: • asexual reproduction (1) • mitosis (1) • cloning (1)		(2)

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	An explanation that makes reference to three of the following: • more species present in mixed forest / fewer species in pando (1) • therefore, species richness is low (in pando) (1) • low genetic diversity as all the plants are {clones / genetically identical } (1) • fewer animal species because there are fewer {habitats / food sources / niches} (1)	ALLOW low index of diversity ALLOW converse for mixed forest	(3) E

Question Number	Answer	Mark
8(b)(i)	The only correct answer is – C A is incorrect because production of phenolic glycosides are physiological B is incorrect because production of phenolic glycosides are physiological D is incorrect because production of ramets are anatomical	(1)

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	An explanation that makes reference to four of the following: • (mitosis) produces genetically identical clones (1) • lack in genetic variation (1) • do not have characteristics more suitable to the environment (1) • (leading to) no evolution occurring (1)	ALLOW same genotype ALLOW no natural selection takes place	(4)

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. **Grazing** • Without a fence/control, 299 new saplings are produced but few grow taller than 2m • Therefore grazing reduces the regeneration of the colony • With the fence there are 1204 ramets greater than 2m • Therefore preventing grazing increases the number of ramets and their growth. **Burning** • Burning undergrowth results in fewer competing plants • Therefore increases the number of ramets produced from 208 in the control to 639 per hectare • Burning undergrowth increases percentage cover of colony from 18 to 21% **Competition** • Undergrowth could be competing for mineral ions and water • A conclusion that fencing combined with the burning of undergrowth would have a better effect on maintaining the colony • Because the increased number of ramets produced after burning will not be eaten by grazing animals.

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.	Effects of grazing and/or burning described – but not explained.
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.	Effects of grazing and burning on number of ramets explained e.g. in terms of animals damaging plants or competition from other plant species
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.	Effects of burning and grazing described and explained as well as a conclusion that both management strategies will be best – in terms of preventing grazing and then reducing competition for resources.

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