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Mark Scheme (Results)

Summer 2023

Pearson Edexcel International GCSE
In Biology (4BI1) Paper 2B

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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.

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Question Number	Answer	Mark
1(a)	The only correct answer is C (respiration) *A is incorrect as active transport does not produce ATP* *B is incorrect as diffusion does not produce ATP* *D is incorrect as transpiration does not produce ATP*	**1**

Question Number	Answer	Additional guidance	Mark
1(b)(i)	An explanation that makes reference to three of the following. • soil erosion / soil erodes (1) • fertiliser / organic material (1) • run off / leaching / washed in / eq (1) • (increased) magnesium / nitrates / phosphate / minerals (1) • for correct **matched** function e.g. magnesium for chlorophyll production / nitrates for amino acids / nitrates for proteins (1) • (more) carbon dioxide for photosynthesis (1)	**Allow** roots do not hold soil together **Allow** other correct minerals **Ignore** nutrients Functions must be matched to minerals **Ignore** growth / repair	**3**

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Question Number	Answer	Additional guidance	Mar
1(b)(ii)	An explanation that makes reference to two of the following. • decomposition / decay / respiration / eq (1) • (by) bacteria / fungi / microorganisms / microbes (1) • less photosynthesis (1)	**Ignore** rot **Ignore** breakdown **Ignore** viruses	**2**

Question Number	Answer	Mark
1(c)	**The only correct answer is C (nitrifying)** *A is incorrect as decomposers do not release nitrates* *B is incorrect as denitrifying bacteria do not release nitrates* *D is incorrect as nitrogen fixing bacteria do not convert ammonium to nitrates*	**1**

Question Number	Answer	Additional guidance	Mark
1(d)(i)	70 (2)	**One mark** for ÷ 15 **or** ÷2 **or** ÷ 30 **or** 1050 **or** 140 **Correct answer gains all marks**	**2**

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Question Number	Answer		Mark
1(d)(ii)	An explanation that makes reference to four of the following. • mutation (produced glowing dinoflagellates) (1) • (produces) variation (1) • (glowing dinoflagellates) survive / not eaten / eq (1) • reproduce / make offspring / eq (1) • pass allele / gene (for glowing on to offspring) (1)	**Allow** converse for non glowing throughout pass allele gene onto offspring = 2 marks	**4**

Question Number	Answer		Mark
1(e)	An answer that makes reference to three of the following. • photosynthesis (1) • takes in carbon dioxide / less carbon dioxide in atmosphere / less carbon dioxide released / eq (1) • less / no use of electricity / eq (1) • less fossil fuel use / oil / coal / gas / eq (1) • less (enhanced) greenhouse effect / global warming (1) • less sulfur dioxide / less acid rain (1)	**Ignore** carbon neutral (in text) **Allow** will reduce carbon dioxide / less carbon emissions **Allow** less greenhouse gas	**3**

(Total for Question 1 = 16 marks)

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Question Number	Answer	Additional guidance	Mar
2(a)	An answer that makes reference to the following. • prevent evaporation (from surface of water) / eq (1)	**Allow** ensure water loss is from plant / eq **Ignore** stops water loss unqualified	**1**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	• 4.4 **or** 4.38 **or** 4.375 (2)	**Allow** 4.37 **One mark** 35 **or** ÷ 8 **Ignore** 4.3 but credit any correct working **Correct answer gains all marks**	**2**

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Question Number	Answer	Additional guidance	Mar
2(b)(ii)	An answer that makes reference to four of the following. • both / volume **<u>and</u>** mass, decrease / eq (1) • volume changes more than mass / more water is taken up than lost (up to 4 or 8 days) / eq (1) • water loss and uptake are same between <u>4 and 8 days</u> / <u>after 4 days</u> / eq (1) • correct numerical manipulation (1) • transpiration occurs / water evaporates (from leaves) / water lost through stomata (1) • (some) water is retained / stored in cells / (used for) turgor (1) • used in photosynthesis (1)	Need not be stated in same sentence **Allow** volume decreases more than mass = 2 marks e.g. 35 (cm^3) lost / 10 (g) lost after 4 days **Ignore** quoting data	**4**

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Question Number	Answer	Additional guidance	Mar
2(c)	An explanation that makes reference to three of the following. • more transpiration / more evaporation / higher (water loss) / faster (water loss) / eq (1) • (wind) blows /moves, the water away / removes still air / removes humid air / eq (1) • increases / maintains / steeper diffusion <u>gradient</u> / concentration <u>gradient</u> / eq (1)	**Allow** converse for all mark points **Allow** more water (moves) into air **Allow** keeps air dry **Allow** water potential <u>gradient</u> **Allow** maintains a difference in concentration	**3**

(Total for Question 2 = 10 marks)

Question Number	Answer	Mark
3(a)	**The only correct answer is A (proximal convoluted tubule)** *B is incorrect as it is the distal convoluted tubule* *C is incorrect as it is the collecting duct* *D is incorrect as it is the loop of Henle*	**1**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	0.03 (2)	**Allow** 0.031 **or** 0.0314 **or** other correct significant figures **Allow** 3.14×10^{-2}, 3×10^{-2} **One mark** for 0.1 **or** 100/1000 **or** 31400 **Correct answer gains all marks**	**2**

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Question Number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation that makes reference to two of the following. • increases the pressure / creates high pressure / eq (1) • (for) ultrafiltration (1) • so that plasma / small molecules / fluid / filtrate, leave glomerulus / enter Bowman's capsule / eq (1)	**Allow** generates pressure **Allow** renal capsule **Allow** correct named small molecule e.g. urea **Allow** small particles **Ignore** blood	**2**

Question Number	Answer	Additional guidance	Mark
3(c)	A description that makes reference to the following. • biuret (reagent) (1) • lilac / purple / pink / mauve / eq (1)	**Allow** ninhydrin **Allow** uristix / clinistix **Allow** ninhydrin goes pink / red **Allow** uristix / clinistix go brown / green	**2**

(Total for Question 3 = 7 marks)

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Question Number	Answer	Mark
4(a)(i)	**The only correct answer is B (guard)** *A is incorrect as it is the cuticle* *C is incorrect as it is a palisade cell* *D is incorrect as it is a stoma*	**1**

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	An explanation that makes reference to three of the following. • <u>spongy</u> mesophyll / <u>spongy</u> cells / <u>spongy</u> tissue / <u>spongy</u> layer (1) • has air spaces / gaps between cells / spaces / eq (1) • (for) diffusion / gas exchange (1) • carbon dioxide moves in (to palisade cells) / oxygen out (from palisade cells) / eq (1) • xylem to transport water (1)	**Ignore** chloroplasts / chlorophyll **Reject** palisade **Allow** pockets (of air) **Ignore** phloem	**3**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	An answer that makes reference to the following. • temperature (of water bath) (1)	**Ignore** heat	**1**

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Question Number	Answer	Additional guidance	Mar
4(b)(ii)	An answer that makes reference to two of the following. • light (1) • changes stomatal opening / (affects) photosynthesis / eq (1) **OR** • volume / concentration of (hydrogen carbonate) indicator (1) • different volumes / concentrations would release / absorb different amounts of carbon dioxide /eq (1) **OR** • size of tube (1) • would affect concentration of carbon dioxide / eq (1) **OR** • pH (1) • affects enzymes / photosynthesis / eq (1) **OR** • age of leaf (1) • may affect chloroplast number / amount of photosynthesis / eq (1) **OR** • **<u>starting</u>** concentration of carbon dioxide (1) • (carbon dioxide) is needed for photosynthesis/ is a limiting factor (1)	**max one for factors** **Mark in pairs reason can only be awarded if factor is correct except for carbon dioxide** **Allow** to prevent light being a limiting factor **Ignore** amount of indicator **Allow** different volumes would affect time to change colour / different volumes would result in different colour change / eq **Allow for this one case only** correct reason if just says carbon dioxide as factor	**2**

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Question Number	Answer	Additional guidance	Mark
4(b)(iii)	An answer that makes reference to the following. • control (experiment) / to compare / show effect of temperature on indicator / show that leaf is required to affect the colour / eq (1)	**Ignore** control **variable** **Allow** shows changes are due to leaf / photosynthesis	**1**

Question Number	Answer	Additional guidance	Mark
4(c)(i)	• 27 (2)	**One mark** for 26.7 **or** 26.67 **or** 26.667 **or** 26.6667 **or** 26.66667 **or** other correct decimal places **or** 26.6 recurring **or** 27.0 **Ignore** 26.6 **Answer on answer line takes precedence over answer in table** **Correct answer gains all marks**	**2**

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Question Number	Answer	Additional guidance	Mar
4(c)(ii)	An explanation that makes reference to three of the following. • faster photosynthesis / eq (1) • (more) carbon dioxide is removed / taken in / absorbed / eq (1) • increased collisions / more (kinetic) energy / faster movement of molecules / eq (1) • (levels off as) another factor limits / light intensity limits the rate / temp no longer limiting / eq (1)	**Ignore** references to respiration **Allow** less carbon dioxide (in solution / tube) **Allow** more E/S complexes / optimum temperature for <u>enzymes</u>	**3**

Question Number	Answer	Additional guidance	Mark
4(d)	An explanation that makes reference to two of the following. • respiration is faster than photosynthesis / more respiration than photosynthesis / eq (1) • so carbon dioxide is released / increases (in indicator / tube) / eq (1)	**Allow** respiration but no photosynthesis **Reject** if candidate suggests that respiration **ONLY** starts after photosynthesis stops e.g. respires **instead of** photosynthesising	**2**

(Total for Question 4 = 15 marks)

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Question Number	Answer	Additional guidance	Mark
5(a)(i)	pituitary (gland) (1)	**Ignore** anterior or posterior	**1**

Question Number	Answer	Mark
5(a)(ii)	**The only correct answer is D** *A is incorrect as it is oestrogen* *B is incorrect as it is LH* *C is incorrect as it is FSH*	**1**

Question Number	Answer	Additional guidance	Mark
5(a)(iii)	A description that makes reference to the following. • (FSH) matures eggs / follicles / eq (1) • (FSH) stimulates oestrogen (release) / eq (1) • (LH) induces ovulation / egg release / eq (1) • (LH) stimulates progesterone / oestrogen (release) / stimulates corpus luteum (development) / eq (1)	 **Allow** grows / develops **Allow** oocytes **Allow** FSH makes (ovary / follicle) release oestrogen **Allow** estrogen / estradiol **Allow** oocyte **Allow** (LH) makes (ovary / corpus luteum) release progesterone / oestrogen **Allow** yellow body	**4**

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Question Number	Answer	Additional guidance	Mark
5(b)	An answer that makes reference to five of the following. **Overall comments** 1. tablets are less effective / tablets have a wider range of effectiveness / implants or injections are more effective / eq (1) 2. no protection against HIV / (any method) may cause side effects / eq (1) **Tablets** 3. ***max one advantage from:*** • tablets are easy to use / no need for medical treatment / no need for doctor / surgery / good if people scared of needles / not painful / eq (1) • easy to stop if, change mind / want to have children / quick to restart cycle (1) 4. ***max one disadvantage from:*** • tablets easy to forget / need to take every day / eq (1) • tablets may not be effective if vomiting / may be affected by food / eq (1) **Injection** 5. ***max one advantage from:*** • injections last long time / don't need to keep going to doctor / eq (1) • can't forget to take / don't need to take every day / no need to keep remembering (1) 6. ***max one disadvantage from:*** • need to be given by doctor / health professional / eq (1) • can be painful /some people are scared of needles / eq (1) • longer for cycle to return / difficult to change mind / eq (1) **Implant** 7. ***max one advantage from:*** • implant last long(est) time / don't need to keep going to doctor / eq (1) • can't be forgotten / no need to keep remembering / don't need to take every day (1) • good for people who have less access to doctors (as it lasts for 3 years) / eq (1) 8. ***max one disadvantage from:*** • need to be given by doctor / health professional / eq (1) • could cause infection / damage tissues / leave scars / painful / eq (1) • implant could produce very high hormone levels / eq (1) • not easy to change mind / will take longer to return to normal with implant / eq (1)	**Allow** mp2 for any method **Allow** STI / other STIs/ named side effects **Allow** tablets easy to obtain / may be obtained from pharmacist **Ignore** injection lasts 12 weeks **unqualified** **Ignore** implant last 3 years **unqualified** Injection and implant are long lasting = two marks	**5**

(Total for Question 5 = 11 marks)

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Question Number	Answer	Additional guidance	Mar
6(a)(i)	A description that makes reference to the following. • select plants with bright flowers and pollinate / breed / cross / eq (1) • select offspring (with bright flowers) and pollinate / breed / cross / repeat with offspring / eq (1)	**Allow** desired characteristics **Allow** breed two plants with bright flowers **Allow** repeat over several generations if mp1 has been awarded **Ignore** repeat if not about offspring / next generations	**2**

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	A description that makes reference to three of the following. • take small samples / small tissue / few cells / scrape cells off / remove growth tips / eq (1) • sterilise / wash with ethanol / alcohol / disinfectant / antiseptic / eq (1) • (place into) agar (1) • provide minerals / glucose / carbohydrates / amino acids / eq (1) • plant growth substances / auxin / rooting powder (1)	**Allow** any idea of small pieces of plant e.g. fragment **Allow** meristems Sterile agar = 2 marks **Allow** bleach **Allow** agarose **Ignore** nutrient **Allow** named minerals **Allow** sugar **Allow** hormones	**3**

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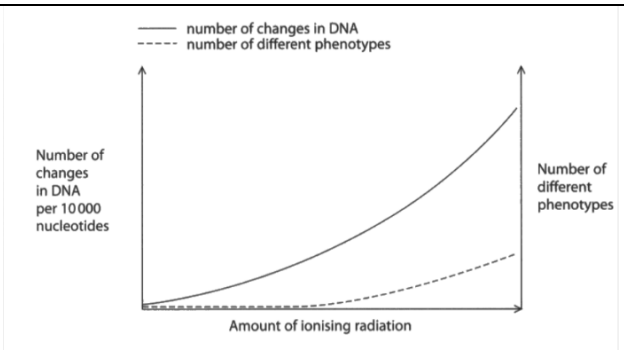
Question Number	Answer	Additional guidance	Mar
6(b)(i)	An answer that makes reference to the following. • all plants will be <u>genetically</u> identical / have same DNA / same <u>genetic</u> material / same genes / same alleles / eq (1)	**Allow** so they will be clones	**1**

Question Number	Answer	Mark
6(b)(ii)	**The only correct answer is B (genome)** *A is incorrect as all the DNA is not a gene* *C is incorrect as all the DNA is not a genotype* *D is incorrect as all the DNA is not a nucleoid*	**1**

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Question Number	Answer	Additional guidance	Mar
6(b)(iii)	An answer that makes reference to four of the following. • more radiation increases the number of changes in DNA / genotypes **and** number of different phenotypes / eq (1) • mutations (have occurred in the DNA) (1) • (mutations) change amino acid sequences / different protein / different enzyme / eq (1) • changes in DNA increases more / steeper (than number of different phenotypes) / changes in DNA occur with lower amount (of radiation) / eq (1) • (some) DNA changes / mutations, have no effect / are silent / code for same amino acid / have similar amino acid / enzymes still work / proteins still work / eq (1) • DNA changes / mutations, may be recessive (so do not affect phenotype) / eq (1)	**Allow** increase number of mutations **and** number of phenotypes **Allow** positive correlation between DNA changes **and** phenotypes **Ignore** more rapid increase **Allow** converse **Allow** some mutations do not affect phenotype **Allow** mutations occur in non-coding DNA	**4**

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(Total for Question 6 = 11 marks)

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