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Mark Scheme (Results)

November 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**	**Additional guidance**	**Mark**
1(a)	An explanation that makes reference to the following points: • burning of / combustion of / eq (1) • (more) petrol / fuel / diesel / eq (1)	**Ignore** cars release carbon dioxide	**2**

Question Number	Answer	Additional guidance	Mark
1(b)	An explanation that makes reference to two of the following points: • carbon dioxide is a greenhouse gas / causes a greenhouse effect / eq (1) • traps (IR) radiation / prevents escape of (IR) radiation / traps heat / eq (1) • causes global warming / causes increase in temperature / eq (1)	**Accept** it is a greenhouse gas **Accept** absorbs heat **Ignore** traps light	**2**

Question Number	Answer	Additional guidance	Mark
1(c)	An explanation that makes reference to the following points: • carbon dioxide is a reactant / raw material / is needed for photosynthesis / eq (1) • carbon dioxide can be a limiting factor / eq (1)	**Accept** carbon dioxide is used in photosynthesis / required by photosynthesis **Accept** equation	**2**

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Question Number	Answer	Additional guidance	Mark
1(d)	An explanation that makes reference to two of the following points: • (carbon sink) absorbs more CO_2 (than it releases) / eq (1) • respiration releases carbon dioxide / eq (1) • deforestation releases carbon dioxide by decomposition / decay / combustion / eq (1)	**Accept** fewer trees / deforestation results in less photosynthesis / less carbon dioxide absorbed	**2**

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Question Number	Answer	Additional guidance	Mark
1(e)	A description that makes reference to three of the following points: • place leaves in test tubes / eq with hydrogen-carbonate indicator (1) • leaf in light and leaf in dark / eq (1) • in light, indicator turns purple / dark red / eq / in dark turns yellow / eq (1) • same size leaf / species leaf / same age of leaf / same time / same temperature / same volume of indicator / same concentration of indicator / eq (1)	**Accept** change distance of lamp / place in bright light and dark room / other correct method **Accept** stays orange in dim light **Accept** use pond weed **Accept** control for same	**3**

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Question Number	Answer	additional guidance	Mark
1(f)	2 stomata in area of 0.4mm × 0.4mm = 0.04 cm × 0.04 cm 2 in 0.0016cm^2 therefore density = 2 ÷ 0.0016 stomata per cm^2 total number in 150 cm^2 = 150 × (2÷ 0.0016) =150 × 1250 = **187500 stomata (3)** **OR** 150 / 0.0016 = 93750 93750 x 2 = 187500	**Allow** full marks for correct answer no working If not correct answer, look for: **Accept** 1875 (or other versions e.g. 18750) for 2 marks **Accept** 93750 (or other versions e.g. 9.375) for 2 marks **OR** **Accept** ÷ '16' (e.g. 0.0016 or 16) for 1 mark **AND** **Accept** x 150 or 150 divided by another number for 1 mark	**3**

Question Number	**Answer**	**Mark**
1(g)	An explanation that makes reference to the following points: • water loss / transpiration / evaporation / diffusion (through stomata) / (set up) transpiration stream / eq (1) • draws water up from roots / up stem / up xylem / into leaf / creates a (water potential) gradient / eq (1)	**2**

Total 16 marks

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Question Number	Answer	Mark
2(a)	An answer that makes reference to: • (biological) catalyst / substance that speeds up reactions / protein that speeds up reactions / eq (1)	**1**

Question Number	Answer	Mark
2(b)	An answer that makes reference to: • increased surface area / so more catalase exposed to the H_2O_2 / speeds up reaction / eq (1)	**1**

Question Number	Answer	Additional guidance	Mark
2(c)(i)	An answer that makes reference to: • volume of gas (released in 5 minutes) / eq (1)	**Ignore** amount	**1**

Question Number	Answer	Mark
2(c)(ii)	An answer that refers to two of the following: • concentration of peroxide / eq (1) • temperature (1) • volume of (pH) buffer / eq (1)	**2**

Question Number	Answer	additional guidance	Mark
2(d)(i)	2.4- 0.8 = 1.6 ÷ 0.8 × 100 = **200% (2)**	allow full marks for correct answer no working **Accept** 1 mark for 1.6 **OR** (2.4 – 0.8)	**2**

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Question Number	Answer	Additional guidance	Mark
2(d)(ii)	An explanation that makes reference to two of the following points: • substrate / H_2O_2 is being used up / reaction complete / concentration of H_2O_2 decreases / eq (1) • so fewer enzyme substrate-complexes / fewer collisions / eq (1) • water formed dilutes H_2O_2 / eq (1)	**Accept** peroxide has been broken down / converted to products **Accept** fewer collisions between particles	**2**

Question Number	Answer	Mark
2(d)(iii)	An explanation that makes reference to the following points: • pH changes from <u>optimum pH</u> / enzymes have <u>optimum pH</u> / eq (1) • pH denatures enzyme / alters the bonding / alters shape of active site / eq (1) • substrate and enzyme no longer fit / ES complexes cannot form / substrate cannot bind / enzyme and substrate are no longer complementary / eq (1)	**3**

Total 12 marks

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Question Number	Answer	Mark
3(a)(i)	The only correct answer is **C (S)** A is not the answer as P is not the Bowman's capsule B is not the answer as R is not the Bowman's capsule D is not the answer as T is not the Bowman's capsule	**1**

Question Number	Answer	Mark
3(a)(ii)	The only correct answer is **B (Q)** A is not the answer as P is not the Loop of Henle C is not the answer as S is not the Loop of Henle D is not the answer as U is not the Loop of Henle	**1**

Question Number	Answer	Mark
3(a)(iii)	The only correct answer is **A (P)** B is not the answer as Q is not affected C is not the answer as S is not affected D is not the answer as T is not affected	**1**

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Question Number	Answer	Additional guidance	Mark
3(b)(i)	An explanation that makes reference to three of the following points: • glucose passes from glomerulus / glucose passes into renal / Bowman's capsule / eq (1) • reabsorbed / absorbed back into blood / eq (1) • by active transport / eq (1) • (reabsorbed) in the proximal convoluted tubule / PCT / first convoluted tubule / eq (1)	**Accept** glucose passes out from R / passes into S **Accept** in T	**3**

Question Number	Answer	**Additional guidance**	**Mark**
3(b)(ii)	A description that makes reference to two of the following points: • add Benedict's solution (and heat) / eq (1) • red / orange / yellow / green colour show positive result / eq (1)	**Accept** Clinistix / eq **Accept** Fehling's **Accept** Clinistix go brown / eq	**2**

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Question Number	Answer	Mark
3(c)	A description that makes reference to the following points: • less urine / lower volume / less water / eq (1) • more concentrated / more urea / darker / eq (1)	**2**

Total 10 marks

Question Number	Answer	Mark
4(a)	An answer that makes reference to: • (a rare random) change to DNA / change to gene / change to genetic material / eq (1)	**1**

Question Number	Answer	Mark
4(b)	An explanation that makes reference to five of the following points: • transcription makes mRNA / eq (1) • (mRNA will have) different codons / triplets / (base) sequence / order of bases / eq (1) • different tRNA binds / different amino acids / different anticodon (on tRNA) / eq (1) • different <u>sequence</u> of amino acids / <u>order</u> of amino acids / <u>chain</u> of amino acids (1) • different protein / different polypeptide / different structure of protein / different shape of protein / different enzyme / different enzyme properties / eq (1) • active site no longer fits substrate / ES complexes cannot form / eq (1) • may have no effect as same amino acid used / similar amino acid used (1)	**5**

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Question Number	Answer	additional guidance	Mark
4(c)(i)	132.6 + 43.2 = 175.8÷2 = **87.9 (× 10^8) (2)**	 allow full marks for correct answer no working **Accept** 132.6 + 43.2 or 175.8 for 1 mark **Accept** 88 for 2 marks	**2**

Question Number	Answer	Mark
4(c)(ii)	An answer that makes reference to: • two divisions in meiosis / one division in mitosis / mitosis and meiosis have different numbers of divisions / eq (1)	**1**

Question Number	Answer	Mark
4(c)(iii)	An answer that makes reference to four of the following points: • meiosis has higher mutation (in all strains) / mitosis has lower mutation / eq (1) • high(est) difference (between mitosis and meiosis) in 5207 (1) • small(est) difference between (between mitosis and meiosis) in 5209 (1) • low(est) mutation rates (for mitosis / meiosis) in 5209 (1) • high(est) rate for mitosis in 5160 (1) • high(est) rate for meiosis in 5207 (1) • differences between repeats of each strain / eq (1)	**4**

Total 13 marks

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Question Number	Answer	Additional guidance	Mark
5(a)(i)	An explanation that makes reference to two of the following points: • to make amino acids / eq (1) • for protein (synthesis) / eq (1) • for growth / eq (1)	 **Accept** DNA / RNA / chlorophyll **Accept** correct named protein **Accept** growth is slow without nitrates	**2**

Question Number	Answer	Mark
5(a)(ii)	• V nitrogen fixation / nitrogen fixing / nitrogen fixing bacteria (1) • X nitrification / nitrifying / nitrifying bacteria (1) • Y denitrification / denitrifying / denitrifying bacteria (1)	**3**

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Question Number	Answer	additional guidance	Mark
5(b)(i)	An answer that makes reference to four of the following points: *Descriptions* • both increase / both have similar pattern up to 1970 / eq (1) • river nitrate more stable than nitrogen on fields / nitrogen on fields fluctuates / nitrogen on fields is more variable / relationship is less clear from 1980 / eq (1) *Explanations* **Max 2** • nitrate leaches into river / washed into river / eq (1) • farmers add different amounts of nitrogen / fertiliser / nitrates to field / eq (1) • different crops are grown / eq (1) • river has other sources of nitrate / eq (1)	 **Accept** nitrate in river increases as well as nitrogen on field **Accept** positive correlation **Accept** nitrogen on fields goes down (as well as up) **Accept** changes in rainfall	**4**

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Question Number	Answer	Additional guidance	Mark
5(b)(ii)	A description that makes reference to three of the following points: • more algal growth / eutrophication / algal bloom / growth of plants / eq (1) • (more) decomposers / bacteria / microorganisms / eq (1) • more turbidity / cloudiness / increased organic waste / less light penetration / eq (1) • less oxygen in river / anoxic / high BOD / eq (1) • fewer fish species / death of animals / death of organisms / lower biodiversity / fewer underwater plants / eq (1)	**Accept** use of oxygen by bacteria / eq	**3**

Total 12 marks

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Question Number	Answer	additional guidance	Mark
6(a)	A description that makes reference to two of the following points: • undifferentiated / unspecialised / can differentiate / can become specialised cells / eq (1) • and can become different <u>cell types</u> / eq (1) • can continue to divide / continue to multiply / can divide several times / eq (1)	**Accept** can divide whilst remaining undifferentiated = 2 marks	**2**

Question Number	Answer	Additional guidance	Mark
6(b)	An explanation that makes reference to three of the following points: • can make different (blood) cells / red cells and white cells / red cells and platelets / white cells and platelets (1) *Max two from:* • red blood cells to treat anaemia / ensure oxygen transport around body / eq (1) • white blood cells to kill infections / kill bacteria / remove viruses / improve immunity / increase antibodies / eq (1) • platelets to treat blood clotting problems / eq (1) • any one blood cell type to treat bone marrow cancer / treat leukaemia / treat lymphoma / treat myeloma / recover from chemotherapy / eq	**Accept** any two types of blood cell, e.g. phagocytes and lymphocytes **Accept** to treat sickle cell anaemia / thalassemia / eq	**3**

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Question Number	Answer	Mark
6(c)	An explanation that makes reference to two of the following points: • have same proteins / antigens / eq (1) • genetically identical / same genes / eq (1) • no rejection / immune response / no need for immunosuppressant drugs / cells are accepted by body / cells are compatible / cells have same blood group / eq (1) • no transfer of other disease / infections / viruses (1)	**2**

Total 7 marks

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