



Mark Scheme (Results)

November 2023

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

Question Number	Answer	Additional guidance	Mark
1(a)	<p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> • 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)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • 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) 	<p>Accept it is a greenhouse gas</p> <p>Accept absorbs heat</p> <p>Ignore traps light</p>	2

Question Number	Answer	Additional guidance	Mark
1(c)	<p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> • carbon dioxide is a reactant / raw material / is needed for photosynthesis / eq (1) • carbon dioxide can be a limiting factor / eq (1) 	<p>Accept carbon dioxide is used in photosynthesis / required by photosynthesis</p> <p>Accept equation</p>	2

Question Number	Answer	Additional guidance	Mark
1(d)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • (carbon sink) absorbs more CO₂ (than it releases) / eq (1) • respiration releases carbon dioxide / eq (1) • deforestation releases carbon dioxide by decomposition / decay / combustion / eq (1) 	<p>Accept fewer trees / deforestation results in less photosynthesis / less carbon dioxide absorbed</p>	2

Question Number	Answer	Additional guidance	Mark
1(e)	<p>A description that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • 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) 	<p>Accept change distance of lamp / place in bright light and dark room / other correct method</p> <p>Accept stays orange in dim light</p> <p>Accept use pond weed Accept control for same</p>	3

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

Question Number	Answer	Mark
1(g)	<p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> • 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

Question Number	Answer	Mark
2(a)	An answer that makes reference to: <ul style="list-style-type: none"> (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: <ul style="list-style-type: none"> increased surface area / so more catalase exposed to the H₂O₂ / speeds up reaction / eq (1) 	1

Question Number	Answer	Additional guidance	Mark
2(c)(i)	An answer that makes reference to: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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 $= 1.6 \div 0.8 \times 100$ = 200% (2)	allow full marks for correct answer no working Accept 1 mark for 1.6 OR (2.4 - 0.8)	2

Question Number	Answer	Additional guidance	Mark
2(d)(ii)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • substrate / H₂O₂ is being used up / reaction complete / concentration of H₂O₂ decreases / eq (1) • so fewer enzyme substrate-complexes / fewer collisions / eq (1) • water formed dilutes H₂O₂ / eq (1) 	<p>Accept peroxide has been broken down / converted to products</p> <p>Accept fewer collisions between particles</p>	2

Question Number	Answer	Mark
2(d)(iii)	<p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> • 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

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

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

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

Question Number	Answer	Additional guidance	Mark
3(b)(i)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • glucose passes from <u>glomerulus</u> / glucose passes into <u>renal</u> / <u>Bowman's capsule</u> / eq (1) • <u>reabsorbed</u> / absorbed back into blood / eq (1) • by active transport / eq (1) • (reabsorbed) in the proximal convoluted tubule / PCT / first convoluted tubule / eq (1) 	<p>Accept glucose passes out from R / passes into S</p> <p>Accept in T</p>	3

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	<p>A description that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • add Benedict's solution (and heat) / eq (1) • red / orange / yellow / green colour show positive result / eq (1) 	<p>Accept Clinistix / eq Accept Fehling's</p> <p>Accept Clinistix go brown / eq</p>	2

Question Number	Answer	Mark
3(c)	<p>A description that makes reference to the following points:</p> <ul style="list-style-type: none"> • 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)	<p>An answer that makes reference to:</p> <ul style="list-style-type: none"> • (a rare random) change to DNA / change to gene / change to genetic material / eq (1) 	1

Question Number	Answer	Mark
4(b)	<p>An explanation that makes reference to five of the following points:</p> <ul style="list-style-type: none"> • 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

Question Number	Answer	additional guidance	Mark
4(c)(i)	$132.6 + 43.2$ $= 175.8 \div 2$ $= \mathbf{87.9 (\times 10^8) (2)}$	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: <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> 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

Question Number	Answer	Additional guidance	Mark
5(a)(i)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • to make amino acids / eq (1) • for protein (synthesis) / eq (1) • for growth / eq (1) 	<p>Accept DNA / RNA / chlorophyll</p> <p>Accept correct named protein</p> <p>Accept growth is slow without nitrates</p>	2

Question Number	Answer	Mark
5(a)(ii)	<ul style="list-style-type: none"> • V nitrogen fixation / nitrogen fixing / nitrogen fixing bacteria (1) • X nitrification / nitrifying / nitrifying bacteria (1) • Y denitrification / denitrifying / denitrifying bacteria (1) 	3

Question Number	Answer	additional guidance	Mark
5(b)(i)	<p>An answer that makes reference to four of the following points:</p> <p><i>Descriptions</i></p> <ul style="list-style-type: none"> • 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) <p><i>Explanations</i></p> <p>Max 2</p> <ul style="list-style-type: none"> • 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) 	<p>Accept nitrate in river increases as well as nitrogen on field</p> <p>Accept positive correlation</p> <p>Accept nitrogen on fields goes down (as well as up)</p> <p>Accept changes in rainfall</p>	4

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	<p>A description that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • 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) 	<p>Accept use of oxygen by bacteria / eq</p>	3

Total 12 marks

Question Number	Answer	additional guidance	Mark
6(a)	<p>A description that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • 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)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • can make different (blood) cells / red cells and white cells / red cells and platelets / white cells and platelets (1) <p><i>Max two from:</i></p> <ul style="list-style-type: none"> • 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 	<p>Accept any two types of blood cell, e.g. phagocytes and lymphocytes</p> <p>Accept to treat sickle cell anaemia / thalassaemia / eq</p>	3

Question Number	Answer	Mark
6(c)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none">• 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