Mark Scheme (Results)

Summer 2022

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.

Question Number	Answer		Mark
1 (a)(i)	methane / nitrous oxides / CFCs / water <u>vapour</u> / eq (1)	**Accept** other correct named greenhouse gases **Reject** carbon monoxide	**1**

Question Number	Answer	Additional guidance	Mark
1 (a)(ii)	1.8×10^{13} (3)	**Accept** 18 000 000 000 000 or 18 trillion for **two marks** **Accept** 18×10^{12} for **two marks** **Accept** 18 or (727 + 37 - 746) or 18 with other incorrect standard form for **one mark** *Example of calculation:* • *727 + 37 - 746 = 18* • *x 1 000 000 000 000* • *conversion to standard form*	**3**

Question Number	Answer	Additional guidance	Mark
1 (a)(iii)	An answer that makes reference to two of the following. • ice (caps) melt / glaciers melt / eq (1) • flooding / sea level rises / eq (1) • loss of habitat / desertification / droughts (1) • extinctions / disrupted food chains / migration of species / damaged ecosystems / decreased plant yields / decreased productivity / eq (1) • destruction of coral reefs / coral bleaching / eq (1) • spread of disease / pests / pathogens / eq (1) • extreme weather / climate change / changes in weather patterns / eq (1)	**Accept** two correct answers within one answer space	**2**

Question Number	Answer	Additional guidance	Mark
1 (b)	An explanation that makes reference to four of the following. • plants take in / absorb, carbon dioxide (1) • for photosynthesis (1) • carbon (dioxide) is converted into / stored as suberin / locked up in suberin / eq (1) • suberin does not decay for long periods / suberin decomposes slowly / suberin remains for long period of time / eq (1) • perennial plants remain for long periods of time / do not die off / grow for many years / don't die each year / don't have to be replanted / eq (1) • slower / less carbon dioxide is released from decomposition / decay / (respiration of) decomposers (1)	**Ignore** carbon **Accept** roots decompose slowly / eq **Ignore** carbon	**4**

Question Number	Answer	Additional guidance	Mark
1 (c)	The only correct answer is D A is incorrect as the amylase digests starch B is incorrect as ligase sticks DNA C is incorrect as lipase digests fats		**1**

Question Number	Answer	Additional guidance	Mark
1 (d)	An answer that makes reference to two of the following. • prevent water loss (1) • (due to) osmosis (1) • when water moves from a higher water potential to a lower water potential / eq prevents plant cells becoming flaccid / wilting / stay turgid (1)	 **Ignore** water gain **Ignore** waterproof **Allow** water moves from dilute solution to more concentrated solution **Accept** movement from high concentration <u>of water</u> to low concentration <u>of water</u>	**2**

Question Number	Answer	Additional guidance	Mark
1 (e)	An answer that makes reference to three of the following. • produce large numbers / large scale / eq (1) • fast (process) / quick(er) / eq (1) • all crops produce suberin / all plants are (genetically) identical / all clones / eq / (1) • less risk of cross pollinating (with wild plants) / pollinating wild plants / spreading (trans)gene into wild / eq (1) • can be done at, any time of year / all year / eq (1)	**Ignore** faster growth of plants **Accept** no variation / guarantees characteristics/ all have the gene	**3**

(Total for Question 1 = 16 marks)

Question Number	Answer	Additional guidance	Mark
2(a)	An answer that makes reference to one of the following. • sterilised / unsterilised / eq (1) • presence of bacteria / absence of bacteria / eq (1) • heated / unheated soil / eq (1) • soil sample / soil used (1)		**1**

Question Number	Answer	Additional guidance	Mark
2 (b)(i)	An answer that makes reference to two of the following. • remove / dissolve / wash away nitrate present / get rid of nitrates / eq (1) • (so any) nitrate made must have been from the ammonium salt / are due to ammonium salts / eq (1) • so a fair comparison is made / so the test is valid / so the test is fair (1)	**Accept** make sure no nitrate present **Accept** to see if the nitrates come from the ammonia **Ignore** accurate / reliable	**2**

Question Number	Answer	Additional guidance	Mark
2 (b)(ii)	An answer that makes reference to four of the following. • nitrates present in unsterilised soil (1) • nitrates produced /made from ammonium / ammonia (1) • <u>nitrifying</u> bacteria / <u>nitrification</u> (1) • ammonium is converted into nitrite / nitrite is converted into nitrate (1) • nitrates not present in sterilised soil because there are no bacteria / bacteria were dead / killed / removed (1)	Ammonium to nitrite to nitrate = **2 marks** (mp2 and mp4)	**4**

	• not repeated / no measure of quantity of nitrates / qualitative not quantitative (1)		

(Total for Question 2 = 7 marks)

Question Number	Answer	Mark
3 (a)(i)	The only correct answer is D (protoctists) A is incorrect as the animals do not have chloroplasts B is incorrect as bacteria do not have nuclei C is incorrect as plants are multicellular	**1**

Question Number	Answer	Mark
3 (a)(ii)	The only correct answer is B (cell membrane and mitochondrion) A is incorrect as animal cells do not have chloroplasts C is incorrect as animal cells do not have chloroplasts D is incorrect as animal cells do not have cell walls	**1**

Question Number	Answer	Additional guidance	Mark
3 (b)	• one mark for $6CO_2 + 6H_2O$ (on LHS) (1) • one mark for $C_6H_{12}O_6$ (on RHS) (1)	**Accept** $6H_2O + 6CO_2$	**2**

Question Number	Answer	Additional guidance	Mark
3 (c)(i)	An explanation that makes reference to two of the following. • low / less / no light (1) • photosynthesis is slower than respiration / photosynthesis is less than respiration / respiration is faster than photosynthesis / eq (1)	 **Accept** dark **Accept** no photosynthesis but respiration occurs	**2**

	• more oxygen taken in than released / more oxygen used than produced / there is a <u>net</u> movement of oxygen in / eq (1)	**Ignore** respiration <u>gets</u> faster **Accept** less oxygen released than taken in	

Question Number	Answer	Additional guidance	Mark
3 (c)(ii)	An explanation that makes reference to three of the following. • at 10 (au) respiration (rate) and photosynthesis (rate) are equal / at the compensation point respiration and photosynthesis are equal (1) • rate of photosynthesis increases (as light intensity increases) (1) • photosynthesis rate is greater than respiration rate (1) • levels off / eq, because another factor / temperature / carbon dioxide is limiting (1)	**Accept** converse **Accept** levels off as light is no longer limiting **Accept** at (value between 45 (a.u.) and 55(a.u.) / 40 mm^3) another factor / temperature / carbon dioxide is limiting)	**3**

Question Number	Answer	Additional guidance	Mark

3(c)(iii)	**two marks** for 48 (2)	**one mark** for correct reading of 38 (1) OR **one mark** for +10 (1)	**2**

Question Number	Answer	Additional guidance	Mark
3 (d)	A description that makes reference to three of the following. • move lamp different distances / eq (1) • place same mass / number / volume / concentration *Chlorella* / algae, in (hydrogen-carbonate indicator) (1) • same volume / concentration of indicator / same temperature / leave for same or stated time / same starting colour of indicator / use a control tube (with no *Chlorella*) (1) • (indicator turns) yellow with low light / covered tube / **and** red / purple with high light / uncovered tube (1)	**Accept** other correct methods e.g. cover with cloths / foil / change bulb power / use of variable resistor **Ignore** place in dark and light unqualified **Ignore** amount **Accept** place bung in / seal tubes **Accept** yellow with increase in carbon dioxide / and red / purple with decrease of carbon dioxide **Accept** correct references to	**3**

		photosynthesis and respiration	

(Total for Question 3 = 14 marks)

Question Number	Answer	Additional guidance	Mark
4 (a)	A: ureter (1) B: bladder (1)	**Allow** phonetic spellings that cannot be mistaken for urethra, e.g. ureta **Reject** urethra **Reject** gall bladder	**2**

Question Number	Answer	Additional guidance	Mark
4 (b)(i)	An answer that makes reference to the following. • protein is large (1) • (so) does not pass out of glomerulus / capillary / through basement membrane / does not pass into (Bowman's) capsule (1)		**2**

Question Number	Answer	Additional guidance	Mark
4 (b)(ii)	An answer that makes reference to two of the following. • glucose is <u>re</u>absorbed / absorbed into the blood / selectively <u>re</u>absorbed (1) • at the proximal convoluted tubule / pct / eq (1)	**Ignore** absorbed unqualified	**2**

	• by active transport / uptake (1)		

Question Number	Answer	Additional guidance	Mark
4 (c)	An explanation that makes reference to four of the following. • hypothalamus detects / osmoreceptors detect high (salt) concentration of blood / low water of blood (1) • pituitary releases ADH / eq (1) • collecting duct (1) • increased permeability (1) • more water (re)absorbed / enters blood / eq (1)	**Accept** pituitary produces ADH	**4**

(Total for Question 4 = 10 marks)

Question Number	Answer	Additional guidance	Mark
5 (a)(i)	0.57 (3)	0.57 gains all **three marks** **Accept** 0.90 for **two marks** OR **Accept** 0.56 or 0.56(66666….7) or 0.56	**3**

		recurring for **two marks** **Accept** 0.9 or 0.8975 or 1.7 or ÷3 for **one mark** *Example calculation (not mark points):* *(0.55 + 0.54 + 0.61) = 1.7* *÷ 3* *to two dp* Correct answer with no working gains all three marks.	

Question Number	Answer	Additional guidance	Mark
5 (a)(ii)	• amino acids / peptides (1)	**Accept** polypeptide	**1**

Question Number	Answer	Additional guidance	Mark
5 (b)(i)	An answer that makes reference to two of the following. • temperature (1) • height / volume / mass / concentration of gelatine / protein/ eq (1) • volume / concentration, of, enzyme / bromelain / pineapple juice / eq (1) • volume of buffer (1) • time (in incubator) (1) • surface area of gelatine / SA:vol ratio / width of tube (1)	**Ignore** amount **Accept** gel for gelatine **Ignore** type / source of protein **Ignore** type / source of juice	**2**

Question Number	Answer	Additional guidance	Mark
5 (b)(ii)	An explanation that makes reference to three of the following. • volume digested increases up to (pH) 5 then decreases (above 5) / volume digested decreases above and below 5 / eq (1) • <u>optimal pH</u> / <u>optimum pH</u> (1) • (away from optimal pH / 5) enzyme denatures / (active site) shape changes / eq (1) • substrate no longer binds / fits / shape not complementary to substrate (1)	**Accept** rate increases up to 5 then decreases **Accept** denatures at high pH / low pH **Accept** E/S complexes do not form	**3**

Question Number	Answer	Additional guidance	Mark

5 (c)	A description that makes reference to the following. • add biuret (reagent) / add biuret A and biuret B / sodium hydroxide & copper sulfate (1) • turns lilac / purple / pink / mauve / eq (1)	**Accept** correct, alternative tests e.g. ninhydrin test goes red / brown xanthoproteic test goes yellow	**2**

(Total for Question 5 = 11 marks)

Question Number	Answer	Additional guidance	Mark
6 (a)	An explanation that makes reference to two of the following. • less oxygen (transported) (1) • to muscles (1) • less respiration / less ATP production / less energy release / more lactic acid / more anaerobic respiration (1)		**2**

Question Number	Answer	Additional guidance	Mark
6 (b)(i)	UUACCGCCGAGU (2)	one mark for one incorrect pairing or use of T instead of U e.g. UUACC**A**CCGAGU – one mark **TT**ACCGCCGAG**T** – one mark	**2**

Question Number	Answer	Additional guidance	Mark
6 (b)(ii)	A description that makes reference to four of the following. • <u>transcription</u> occurs in nucleus (1) • production of messenger RNA / mRNA (from DNA) (1) • translation occurs on ribosome / mRNA binds to ribosome / mRNA goes to ribosome (1) • tRNA brings / has amino acids (1) • codon binds to anticodon / codons are complementary to anticodons / (complementary) triplets on tRNA and mRNA bind / eq (1)	**Ignore** protein	**4**

	• polypeptide produced / amino acids joined together /amino acid chain produced / eq (1)	produced / synthesised	

Question Number	Answer	Additional guidance	Mark
6 (b)(iii)	An answer that makes reference to four of the following. *Pros* ***(max 3)*** • patients produce red blood cells / can exercise / are not breathless / have more energy / eq (1) • independent life / transfusions not needed / better quality of life / no need to keep visiting hospitals / eq (1) • no rejection (1) • less risk of infectious disease (from blood) (1) • permanent treatment / long lasting / lasts a lifetime / cure / works for at least 15 months	**Accept** converse **Accept** blood transfusions need frequent hospital visits need to be done often **Accept** transfusions have risk of infections **Accept** transfusions need to be done for life	**4**

	(1) *Cons* ***(max 3)*** • need to spend long time in isolation (for treatment) / eq (1) • side effects (1) • small sample size / only tested on two people / needs further testing / more repeats / eq (1) • could cause mutations in DNA / cause cancers (1) • need to be tested for more than 15 months / for longer / eq (1)	**Accept** need 15 months / several months in hospital **Accept** few side effects from transfusions **Accept** might not work for everyone / no mention of age / sex / health state/ eq **Accept** time period is too short to tell	

(Total mark for question 6 = 12 marks)

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