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Mark Scheme (Results)

January 2022

Pearson Edexcel International GCSE
In Biology (4BI1) Paper 1B and Science
(Double Award) (4SD0) Paper 1B

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January 2022
Question Paper Log Number P69470A
Publications Code 4BI1_1B_2201_MS
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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) (i)	An explanation that makes reference to two of the following: • (Flask B) as (mouthpiece) connected to long tube in flask B / (mouthpiece) connected to flask A is shorter / eq (1) • (Flask B) tube (from mouthpiece) in limewater / tube in liquid in flask B / causes bubbles (in limewater) in B / not in liquid / draws air in flask A / eq (1) • cannot inhale in flask B as limewater would be sucked in / would get mouthful of liquid / Flask A for inhalation as no liquid drawn up eq (1)	No credit if identify flask A air into limewater limewater not breathable	**2**

Question Number	Answer	additional guidance	Mark
1 (a) (ii)	An explanation that makes reference to two of the following: • (Limewater) in flask A stays clear / no change / <u>less</u> cloudy / goes cloudy slowly / eq (1) • (Limewater in) flask B goes (more) cloudy / milky / cloudy quicker / (1) • as less carbon dioxide in inhaled / atmospheric air / (more) carbon dioxide in exhaled / eq (1) • due to respiration (1)	allow stays clear cloudy in both flasks scores 1 no credit for changes colour or cloudy (in both) as contains CO_2 also scores 1	**2**

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		ignore no CO_2 in inhaled	

Question Number	Answer	Mark
1 (a) (iii)	• Sodium hydrogen-carbonate / sodium bicarbonate (solution)/ hydrogen-carbonate / bicarbonate indicator (1)	**1**

Question Number	Answer	Additional guidance	Mark
1 (b)	An answer that makes reference to four of the following: • diaphragm contracts (1) • diaphragm flattens / moves down /eq (1) • (external) intercostal muscles contract (1) • rib cage raised / moves out (1) • volume (of chest cavity / thorax) increases (1) • pressure in (chest cavity / thorax) decreases / reduces (1) • air drawn into lungs / lungs inflate /eq (1)	ignore volume of lungs	**4**

total 9 marks

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Question Number	Answer	Mark
2(a)(i)	The only correct answer is **A** P is the anther **B** is not the answer as it is the filament **C** is not the answer as it is the stigma **D** is not the answer as it is the style	**1**

Question Number	Answer	Mark
2(a)(ii)	The only correct answer is **B** Q is the petal **A** is not the answer as it is the leaf **C** is not the answer as it is the stem **D** is not the answer as it is the style	**1**

Question Number	Answer	Mark
2(a)(iii)	The only correct answer is **D** structure S the stigma **A** is not the answer as they do not germinate on P anther **B** is not the answer as they do not germinate on Q petal **C** is not the answer as they do not germinate on R stem	**1**

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Question Number	Answer	Mark
2(b)	An answer that makes reference to the following: • P / anthers exposed / hanging out / outside / eq (1) • S / stigma feathery / exposed / hanging out / longer /outside / eq (1) • Q / petals smaller/ absent / green / not coloured / not scented / eq (1)	**3** allow hairy

Question Number	Answer	Additional guidance	Mark
2(c)(i)	runners / eq	**allow** corms / bulbs / rhizomes/ tubers	**1**

Question Number	Answer	Additional guidance	Mark
2(c)(ii)	cuttings/ eq	**allow** grafting / layering / micropropagation **/** tissue culture	**1**

Question Number	Answer	Additional guidance	Mark
2(c)(iii)	An answer that makes reference to two the following: • no / (less) <u>genetic</u> variation /a clone / eq (1) • maintain phenotype / colour / flavour / desired characteristic / same characteristics / eq (1) • faster / eq (1) • seeds not viable / produce rare plants / eq (1)	allow converse for sexual not just get a copy off ign more plants	**2**

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total 10 marks

Question Number	Answer	Mark
3(a)	Carbon / C (1)	**1**

Question Number	Answer	Mark
3(b)(i)	The only correct answer is **A** W is combustion **B** is not the answer as W is not decomposition **C** is not the answer as W is not feeding **D** is not the answer as W is not respiration	**1**

Question Number	Answer	Mark
3(b)(ii)	The only correct answer is **D** X is respiration **A** is not the answer as X is not combustion **B** is not the answer as X is not decomposition **C** is not the answer as X is not feeding	**1**

Question Number	Answer	Mark
3(c)	bacteria / fungi / allow correct genus and species names (1)	**1**

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Question Number	Answer	additional guidance	Mark
3(d)	A description that makes reference to six of the following points: • C different pH of organic material / add acid /alkali / add buffers/ eq (1) • O same organic material / plant / age / species / type / mass / volume of organic material(1) • R repeat (at each different pH) (1) • M1 measure <u>change</u> / <u>loss</u> in mass of organic material / initial mass – final mass /volume of carbon dioxide released / change in hydrogen-carbonate indicator / change in limewater /eq (1) • M2 after stated time period (1) • S1 same temperature / oxygen / eq (1) • S2 same water / same mineral ions / same humidity / same volume of each acid /alkali/ buffer / same bacteria / fungi / decomposer added / eq (1)	 same state of decay or allow time taken M2 for same mass M1 to decompose 1 hour + allow same number of bacteria /decomposers / eq	**6**

total 10 marks

Question Number	Answer	additional guidance	Mark
4(a)(i)	356 / (356+1331) 356 /1687 x 100 = 21.1% (2)	 allow 1 mark for 356 / 1687 or 356 / (356+1331) allow full marks for correct answer allow 21	**2**

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Question Number	Answer	Additional guidance	Mark
4(a)(ii)	85147 and 7206 ratio = 11.82:1 12:1 (2)	allow full marks for correct answer allow 1 mark for 85147 **and** 7206	**2**

Question Number	Answer	Additional guidance	Mark
4(b)	An answer that that makes reference to six the following points: yes smoking important • higher % of low birth mass (at every age) / smokers have more low mass babies/ eq (1) • large numbers in study (1) No because • big age effect / more with low birth mass at under 19 • more with low birth mass over 35 (1) • greater effect of smoking at older ages above 35 (1) • as older mothers may have smoked for many years / no information on number of years mothers have smoked for (1) • no information on mothers' mass / weight (1) • no information on mothers' health care / medical condition / alcohol / diet / drugs / eq (1) • no information on premature birth /eq (1) • no information on frequency of smoking or	allow correlation between smoking and low birth mass ignore lifestyle	**6**

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	when during pregnancy (1) own knowledge • smoking reduces oxygen / eq (1) • less respiration / eq (1)		

total 9 marks

Question Number	Answer	Mark
5 (a)	An explanation that makes reference to two of the following: • anaerobic respiration (1) • (by) bacteria / named bacteria (1) • produces lactic acid / eq (1)	**2**

Question Number	Answer	Mark
5 (b)	• temperature / volume / mass of milk / lactose content of milk / type of milk / eq	**1**

Question Number	Answer	Additional guidance	Mark
5(c)(i)	A graph that makes includes: • scales linear and at least half page and axes the correct way around time on x axis (1) • (time in) minutes **and** acidity %(1) • straight lines joining points (1) • points correctly plotted (1) • key to identify normal and low oxygen (1)	Allow truncated y axis if starts at 0.2 or 0 and // within a small square	**5**

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Question Number	Answer	additional guidance	Mark
5 (c)(ii)	An explanation that makes reference to the following: • reduced oxygen (more) anaerobic respiration (of milk) / less <u>aerobic</u> respiration / eq (1) • acidity increases <u>faster</u> / sooner / more rapidly / eq (1)	allow converse for more oxygen	**2**

total 10 marks

Question Number	Answer	Mark
6 (a)	A oesophagus / gullet (1) B stomach (1) C small intestine / ileum / duodenum / jejunum (1) D large intestine / colon / eq (1)	**4**

Question Number	Answer	additional guidance	Mark
6 (b)	An explanation that makes reference to three of the following: • (plants contain) cellulose (1) • digested by cellulase / enzyme (1) • into <u>glucose</u> (1) • energy released / respiration / eq (1)	 allow broken down by cellulase converse for no cellulase energy not released / energy lost in feaces / eq	**3**

Question Number	Answer	Mark
6 (c)(i)	• humans do not digest cellulose / do not eat only plant material / omnivores / eat fewer / less plants / vegetables / eq (1)	**1**

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Question Number	Answer	additional guidance	Mark
6 (c)(ii)	An answer that makes reference to two the following: • removes <u>useful</u> bacteria / fewer / no useful bacteria / eq (1) • reduces competition / eq (1) • pathogenic bacteria increase / survive / multiply / grow / more harmful bacteria / eq (1)	not just appendix contains useful bacteria as this is in stem allow toxic / bad / eq to harmful bacteria	**2**

total 10 marks

Question Number	Answer	Mark
7(a)(i)	The only correct answer is D oak tree A blackbird is not correct as it is not the producer B centipede is not correct as it is not the producer C earthworm is not correct as it is not the producer	**1**

Question Number	Answer	Mark
7(a)(ii)	The only correct answer is A blackbird is a secondary and tertiary consumer B earthworm is not a secondary and tertiary consumer	**1**

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	C ground beetle is not a secondary and tertiary consumer D sparrowhawk is not a secondary and tertiary consumer	

Question Number	Answer		Mark
7 (b)(i)	An explanation that makes reference to the following: • some light / colours / wavelengths reflected (1) • light falls on flowers / not on leaves / some does not fall on chloroplasts / chlorophyll / eq (1)	ignore shade allow not enough chloroplasts	**2**

Question Number	Answer	additional guidance	Mark
7 (b)(ii)	• producer to primary consumer 1.4 / 87 x 100 = 1.61 % (1) allow 1.6% • primary to secondary consumer 1.6 / 14 x 100 = 11.4 % (1) allow 11% 11.43% or ENERGY LOST producer to primary 98.4% (1) ENERGY LOST primary to secondary 88.6% (1) so student is incorrect primary to secondary consumer most efficient	must calculate % to score allow 1 mark for each correct calculation allow calc of energy lost	**2**

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Question Number	Answer	Mark
7 (c)(i)	• involuntary / automatic / does not involve the brain / spontaneous / without thinking / unconscious / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
7 (c)(ii)	• protects from predators / only exposes hard shell /eq (1)	ignore danger / harm /injury	**1**

Question Number	Answer	additional guidance	Mark
7(c)(iii)	An answer that makes reference to four of the following: • (gene) mutation/ mutated gene / eq (1) • variation (1) • woodlice that roll up survive / not eaten /eq (1) • reproduce / eq (1) • pass on <u>alleles</u>/ <u>genes</u> (for rolling behaviour) (1)	 allow converse allow converse not just pass on mutation /behaviour	**4**

total 13 marks

Question Number	Answer	additional guidance	Mark
8 (a)	0.04% = 0.04 in 100 1000000 ÷100 = 10000 10000 x 0.04 = 400 (ppm) (2)	allow 2 marks for correct answer no working allow 1 mark for 10000	**2**

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Question Number	Answer	Mark
8 (b)(i)	An answer that makes reference to the following: • (increasing CO_2) increases (relative)(rate of photosynthesis) (1) • (begins to) level off / reaches maximum (at 0.10 % at 1.12) / rate of increase steepest up to 0.06 %/ eq (1)	**2**

Question Number	Answer	additional guidance	Mark
8 (b)(ii)	An answer that makes reference to two the following: • steepest increase / most effect at 35°C / higher temperatures / eq (1) • increasing CO_2 increases (relative) rate of photosynthesis at all temperatures (1) • at CO_2 of 0.03 %, temperature is not the limiting factor / CO_2 is limiting factor so increasing the temperature has little effect.(1)	allow converse	**2**

Question Number	Answer	Mark
8 (b)(iii)	An explanation that makes reference to three the following: • increasing temperature increases (relative) rate of photosynthesis (1) • as more (kinetic) energy (supplied to molecules) /eq (1) • more (frequent) collisions / faster collisions (between substrate and enzyme molecules) / more enzyme substrate complexes formed/ eq (1) • temperature becomes limiting factor at 5°C / increasing CO_2 has less effect on rate/eq (1)	**3**

Question Number	Answer	additional guidance	Mark
8 (c)(i)	An explanation that makes reference to one pair of the following: • nitrate (1) • for / amino acids/ proteins /stunted growth/	 allow	**2**

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	yellow leaves / eq OR • magnesium (1) • for chlorophyll / yellow leaves chlorosis /eq (1) OR • other correct mineral (1) • correct effect (1)	chloroplasts allow chloroplasts must have named mineral to get effect	

Question Number	Answer	additional guidance	Mark
8 (c)(ii)	An explanation that makes reference to two of the following: • (increasing) light (intensity) (1) • provides energy for / required for photosynthesis / absorbed / trapped / used by chloroplasts /chlorophyll / stomata open more / eq (1) OR • changing wavelength / colour of light (1) • some not absorbed / affect photosynthesis (1) OR • (availability of) water (1) • as reactant / substrate / used in photosynthesis (1)	allow no light no photosynthesis= required for	**2**

total 13 marks

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Question Number	Answer	additional guidance	Mark
9 (a)	• only expressed / seen in phenotype of homozygous / requires two / both (copies) to be expressed in phenotype / only seen / expressed / shown if no dominant allele present / not expressed if dominant allele present / eq (1)	allow only expressed if aa / cc etc	**1**

Question Number	Answer	additional guidance	Mark
9 (b)(i)	• Parents Aa and Aa (1) • gametes A and a (1) • offspring genotypes AA Aa aa (1) • offspring phenotypes or ratio 3 no symptoms to 1 alkaptonuria / eq (1) eg parents AN and AN gametes A and N offspring AA AN AN NN	allow other symbols allow different letters eg A and N if cross works NOT X and Y gametes circled or in Punnet or separated allow ecf for max 2 marks for correct gametes and offspring ie mp 2 and 3 allow full marks for Punnet square	**4**

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Question Number	Answer	Mark
9 (b)(ii)	0.375/ 37.5% / 3/8 / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
9 (c)(i)	did not receive the drug / no treatment / eq (1)	current best treatment / placebo	**1**

Question Number	Answer	Additional guidance	Mark
9(c)(ii)	An answer that that makes reference to five of the following points: yes • control group so valid study /eq (1) • showed improvement /reduced symptoms / activity / life / eq (1) • quicker to stand up/eq (1) • improved distance walked/ eq (1) No because • small group size / should be tested on more people / repeat study / eq (1) • not all finished study/ eq (1) • adverse / side effects / eq (1) • one died in drug group /eq (1) • no information on age / mass / sex / other health conditions / activity / exercise / eq (1)	allow converse for control	**5**

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Question Number	Answer	additional guidance	Mark
9(d)	An answer that that makes reference to two of the following points: • patients may not know what foods contain these / what proteins contain these/ eq (1) • present in many / most foods / most proteins /eq (1) • proteins required for growth / repair / eq (1)	 allow contain these proteins allow provide essential amino acids	**2**

total 14 marks

Question Number	Answer	Mark
10(a)	The only correct answer is C it is specific A it lasts a short time is not correct B it leads to bioaccumulation is not correct D it is quicker is not correct	**1**

Question Number	Answer	additional guidance	Mark
10(b)(i)	An answer that includes the following • sucrose / sugars (1) • amino acids / eq (1)	ignore water reject starch / glucose allow named amino acid	**2**
Question Number	Answer	additional guidance	Mark
10(b)(ii)	An explanation answer that makes reference to four of the following:		**4**

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	• less respiration / eq (1) • less ATP / less energy (1) • less active transport/ less minerals absorbed / eq (1) • less / remove / eat carbohydrate / sucrose / sugars / less amino acids / eq (1) • less growth (of leaves / tubers /bulbs /grain/ fruit) (1) • less starch stored / less proteins (synthesis) (1) • less photosynthesis (1) • less nectar (1) • less (insects for) pollination (1) • spread disease / infection / eq (1)	not glucose stored or carried in phloem	

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Question Number	Answer	Additional guidance	Mark
10(c)	An answer that that makes reference to five the following points: yes • hoverflies eat / consume more aphids / eq (1) • at each/ all temperature(s) / eq (1) • therefore fewer hoverflies need to be used (1) • greatest / most difference (×3) at 12 °C /eq / least at 18 °C (×1.9) (1) • (both) flies consume more at higher temperatures /eq (1) but not conclusive because • only one larvae used /should use more larvae / not repeated / eq (1) • (less valid) not natural habitat / not a field study / done in laboratory setting / eq (1) • only 2 species hoverfly and silverfly compared / eq (1)	allow % difference	**5**

total 12 marks

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