

Mark Scheme (Results)

Summer 2023

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

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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)	An answer that makes reference to two of the following: • (require) nutrition / food / eq (1) • respire /eq (1) • excrete (waste) /eq (1) • respond to surroundings / sensitivity / eq (1) • move /eq (1) • control their internal conditions / homeostasis /eq (1) • reproduce /eq (1) • grow / develop /eq (1)	**2**

Question Number	Answer	Mark
1(a)(ii)	The only correct answer is **D** *Pneumococcus* A is not the answer as *Chlorella* does not cause bacterial disease in humans B is not the answer as *Lactobacillus bulgaricus* does not cause bacterial disease in humans C is not the answer as *Mucor* does not cause bacterial disease in humans	**1**

Question Number	Answer	Additional guidance	Mark
1 (b) (i)	• Tobacco mosaic virus/ TMV (1) • discoloured leaves / yellow leaves / yellow spots / white leaves / white spots / no chlorophyll/ no chloroplasts / less chlorophyll / no photosynthesis / less photosynthesis /eq (1)	Allow other correctly named plant virus and effect not just less growth effect without correct virus scores zero	**2**

Question Number	Answer	Additional guidance	Mark
1 (b) (ii)	An answer that makes reference to three of the following: Virus • smaller / eq (1) • protein coat (1) • no cell wall (1) • no cell membrane / eq (1) • no cytoplasm / organelles / ribosomes / no vacuole / eq (1) • no plasmids (1) • no flagella (1)	**Mark first 3 answers** allow converse ignore nucleus mitochondria Golgi ignore chloroplasts loop or circles of DNA	**3**

Total 8 marks

Question Number	Answer	Additional guidance	Mark
2(a)(i)	plants → worms (that eat roots) → small arthropods → large arthropods → birds (dead) plants → fungi → small arthropods → large arthropods → birds (dead) plants → bacteria → small arthropods → large arthropods → birds	1 mark for 5 including birds correct order and 1 for arrow direction correct food chains with 5 and birds but lines or incorrect arrow scores 1 No credit for pyramid	**2**

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	A description that makes reference to three of the following • digest / decompose / decays / break down / eq (1) • enzymes (1) • saprophytic / saprotrophic / dead / eq (1) • respiration / produce ATP / (1)	ignore rot digestive enzymes = mp 1 and mp 2	**3**

Question Number	Answer	Mark
2(b)	An explanation that makes reference to three of the following • fewer birds / eq (1) • as fewer (large arthropods) to eat / less food / eq (1) • more worms / eq (1) • as fewer eaten (by small arthropods) / fewer predators of worms /eq (1)	**3**

Question Number	Answer	Additional guidance	Mark
2(c)	An answer that makes reference to five of the following 1. more **mites** collected (in all types/ each type of trap)/eq (1) 2. fewest **arthropods** collected (in all types/ each type of trap) / eq (1) 3. as more mites (in soil) / eq (1) 4. most **mites** collected by cul de sac traps / eq (1) 5. little difference in **mite** number between cul de sac and basket / eq (1) 6. fewest **mites** collected by pitfall traps /eq (1) 7. most **springtails** collected by basket / eq (1) 8. little difference in **springtail** numbers between cul de sac and basket / eq (1) 9. fewer **springtails** collected by pitfall / eq (1) 10. number of **arthropods** almost equal in all three traps / most arthropods collected in cul de sac/ eq (1) 11. Cul de sac collects most animals (in total) / Pitfall collects least (1)	**no credit for quoting figs without comparator** allow cul de sac most effective / best at collecting mites pitfall least effective at mites basket most effective with springtails pitfall least effective at springtails C most effective overall / P least effective	**5**

Total 13 marks

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

Question Number	Answer	Mark
3(a)(ii)	The only correct answer is A P is the site of photosynthesis B is not the answer as Q is not the site of photosynthesis C is not the answer as R is not the site of photosynthesis D is not the answer as T is not the site of photosynthesis	**1**

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

Question Number	Answer	Mark
3(a)(iv)	The only correct answer is C U is the ribosome is the site of protein synthesis A chloroplast is not the site of protein synthesis B mitochondrion not the site of protein synthesis D starch granule is not the site of protein synthesis	**1**

Question Number	Answer	Additional guidance	Mark
3(b)	Volume = 0.053 × 0.053 × 0.053 = 0.000 148 877 or 0.00015 SA = 6 × 0.053 × 0.053 = 0.016 854 or 0.017 SA to volume = 0.016 854/ 0.000 148 877 113.21 or 113.2 or 113.33 or 113.3 (to 1)	**allow full marks for correct answer no working** **allow 1 mark for SA** 0.016 854 or 0.017 or other dec places in std form such as 1.7×10^{-2} **allow 1 mark for Vol** 0.000 148 877 or 0.00015 or other dec places or in std form such as 1.5×10^{-4} Accept 113 (to 1) 110 (to 1) as 110 is 2 sig figs same as data	**3**

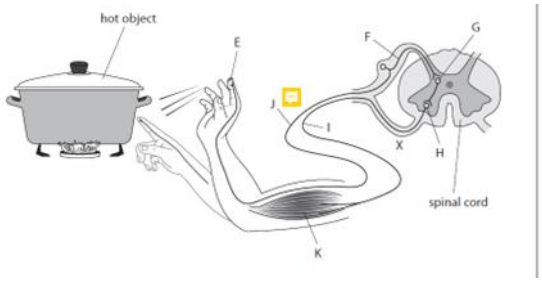
Question Number	Answer	Additional guidance	Mark
3(c)(i)	An explanation that makes reference to three of the following • water enters cell due to <u>osmosis</u> / eq (1) • correct ref to water potential (high to low water potential (gradient) /low (solute) concentration to higher (solute) concentration / low water potential in cell / high water potential outside / eq (1) • as cannot prevent expansion / (keeps) expanding / expands / swells /eq (1) • animal cells / blood cells burst / eq (1)	allow from high concentration of water to lower concentration	**3**

Question Number	Answer	Additional guidance	Mark
3(c)(ii)	An explanation that makes reference to two of the following • water leaves cell due to <u>osmosis</u> / eq (1) • correct ref to water potential (high to low water potential (gradient) /low (solute) concentration to higher (solute) concentration / low water potential outside cell / high water potential inside / eq(1)	allow from high concentration of water to lower concentration **ignore flaccid**	**2**

	• animal cells / blood cells crenate / collapse / shrivel / eq (1)	**reject plasmolysed**	

Total 12 marks

Question Number	Answer	Mark
4(a)(i)	• withdrawal / somatic / simple / involuntary / automatic / unconscious (1)	**1**

Question Number	Answer	Additional guidance	Mark
4(a)(ii)		arrow at X away from spinal cord/ towards muscle	**1**

Question Number	Answer	Mark
4(a)(iii)	The only correct answer is A E is where the stimulus is detected B is not the answer as F is not where stimulus is detected C is not the answer as H is not where stimulus is detected D is not the answer as K is not where stimulus is detected	**1**

Question Number	Answer	Mark
4(a)(iv)	The only correct answer is C I is the motor neurone A is not the answer as F is not the motor neurone B is not the answer as G is not the motor neurone D is not the answer as K is not the motor neurone	**1**

Question Number	Answer	Additional guidance	Mark
4(b) (i)	1.10 ÷ 120 0.0092 9.2×10^{-3} (2)	allow 1 mark for correct answer but not in correct standard form 0.0092 or 0.00917 or 0.009167 etc or 92×10^{-4} allow full marks for correct answer alone allow 9.17×10^{-3} allow 9.167 etc $\times 10^{-3}$ 9.16 recurring $\times 10^{-3}$ full marks	**2**

Question Number	Answer	Mark
4(b)(ii)	A description that makes reference to two of the following • in a <u>synapse</u> (1) • <u>neurotransmitter</u> / named neurotransmitter (travels / moves) (1) • by diffusion / chemical coordination / eq (1)	**2**

Question Number	Answer	Additional guidance	Mark
4(c)(i)	An explanation that makes reference to two of the following • prevents / stops movement / walking / running / eq (1) • prevents further damage /injury /eq (1) • allows rest / recovery / healing / repair/ eq (1) • learn to avoid painful situations/ eq (1)	not putting weight / pressure (on ankle)	**2**

Question Number	Answer	Additional guidance	Mark
4(c)(ii)	An answer that makes reference to four of the following : • prevent detection of pain / stimulus /eq (1) • by receptor / eq (1) • prevent transmission of impulse / prevent generation of impulse / fewer impulses passed / sent / generated/ eq (1) • in sensory neurone / eq (1) • in relay neurone / eq (1) • synapses / prevent synaptic transmission /eq (1)	allow stops feeling pain stop impulses being sent/ moving along ignore signal/ message ignore motor neurone allow one mark for neurones/ nerves unqualified	**4**

Total 14 marks

Question Number	Answer	Additional guidance	Mark
5(a)	An answer that makes reference to the following • plasma (1) • platelets (1)	Mark first two answers only	**2**

Question Number	Answer	Additional guidance	Mark
5(b)	A description that makes reference to four of the following points (Stage 1 and Stage 2) • phagocyte / phagocytosis (1) • engulf / pseudopodia / surround /eq (1) • bacterium / pathogen inside white cell / inside vesicle / inside phagosome / eq (1) (Stage 3) • vesicles fuse with bacterium / vesicle fuses with phagosome eq (1) • enzymes digest (bacterium / pathogen) / enzymes break down (bacterium / pathogen) /eq (1) (Stage 4) • products (of digestion) expelled (from white cell) / (from the phagosome/ from the vesicle) eq (1)	allow marking points (in order) even if no reference to stages this can be gained in any stage allow enclosed completely engulfed allow lysosome allow digestive enzymes (waste) products / remains of bacterium / (broken down) bacterium pathogen secreted / excreted / released / exocytosis	**4**

Question Number	Answer	Additional guidance	Mark
5(c)(i)	measurement of diagram 5.7 (5.5-5.9) cm or 55 -59 mm conversion of units cm × 10,000 or mm × 1,000 magnification = 57000 (55000- 59000) ÷8.1 = 7037 (6790 – 7284) (3)	allow 1 mark for measurement with units 1 mark for 5.7 ×10,000 or 57 × 1000 or allow 8.1 ÷10,000 or ÷ 1000 allow full marks for correct answer alone allow **6800-7300** given to 2 sig figs for 3 marks	**3**

Question Number	Answer	Additional guidance	Mark
5(c)(ii)	An answer that makes reference to five of the following	no credit for quoting figures alone unless ref to only higher etc	**5**
	1. **normal blood flow % oxygen /saturation** is higher (than slow) / (in non-anaemic / anaemic patients) eq (1)	lower in slow	
	2. **normal blood flow rate of deoxygenation** higher (in non-anaemic / anaemic patients) / eq (1)	lower in slow flow	
	3. **% oxygen /saturation lower in anaemic** (in normal and slow blood flow) / eq (1)	higher in non-anaemic	
	4. greater difference in **% oxygen/ saturation** between non-anaemic and anaemic in slow blood flow than normal blood flow/ eq (1)		
	5. fewer red blood cells / less haemoglobin in anaemic patients / eq (1)	more in non-anaemic	
	6. (fewer red cells)to carry oxygen (1)		
	7. anaemic patients tissues deoxygenate faster / eq (1)	non-anaemic deoxgenate slower	
	8. little difference in deoxygenation (between normal and slow blood flow patients) / eq (1)		
	9. reference to high numbers of non-anaemic / lower numbers especially of anaemic slow blood flow (so data less reliable)		
	10. factors such as smoking/ mass / sex / diet / blood pressure / activity / genetics / eq (1)		

Total 14 marks

Question Number	Answer	Additional guidance	Mark
6(a)	An answer that makes reference to the following • genotypes of parents AA and aa (1) • gametes formed A a (1) • genotype of offspring all Aa (1)	allow all marks from Punnet square (even if unlabelled) if incorrect parent genotypes allow TE for Gamete mark for **1 max** **to score any marks must have a capital and lower case** allow any suitable letter including different letters	**3**

Question Number	Answer	Additional guidance	Mark
6(b) (i)	858 – 608 = 250 ratio = 608 to 250 2.43 or 2.4 or 2.432 (2)	allow 1 mark for unsimplified ratio 608:250 in working or as answer	**2**

Question Number	Answer	Additional guidance	Mark
6(b) (ii)	An explanation that makes reference to three of the following • expected ratio is 3:1 / 75% and 25%(1) • role of chance / probability / random /eq (1) • fertilisation / which gametes fuse /eq (1) • fewer axial survive / germinate / selection / fewer axial pollinated / eq	 allow self fertilisation random fertilisation scores mp 2 and 3 allow converse	**3**

6 (c)	C axial flower plants and terminal flower plants / eq (1) O of same species / named species / age /colour / size / condition / with same number of flowers/ eq (1) R repeat / calculate mean (for many plants of axial and terminal) / eq (1) M1 count how many seeds/ number of seeds / amount of seeds / mass of seeds (per plant / per flower) / eq (1) M2 collect seed after same / stated time period/ ensure they self pollinate / pollinate using brush / cover and allow to self pollinate / eq (1) S1 grow at same temperature / same light / in green house / same carbon dioxide / eq S2 same water / same mineral ions / same soil / eq (1)	**6**

Total 14 marks

Question Number	Answer	Additional guidance	Mark
7(a)	• so that enzyme / substrate / test tube / beaker / solutions are at / reach correct temperature / same temperature / 20^{O}C / eq (1)	ignore reach optimum temperature / keep temperature constant	**1**

Question Number	Answer	Mark
7(b)(i)	• time taken (to lose pink colour / change colour for milk / lipid to be digested) / rate of reaction / digestion / eq (1)	**1**

Question Number	Answer	Mark
7(b)(ii)	• volume of lipase / volume of milk / volume of sodium carbonate / time left in water bath (in stages 6 and 7) / volume / number of drops of phenolphthalein / eq (1)	**1**

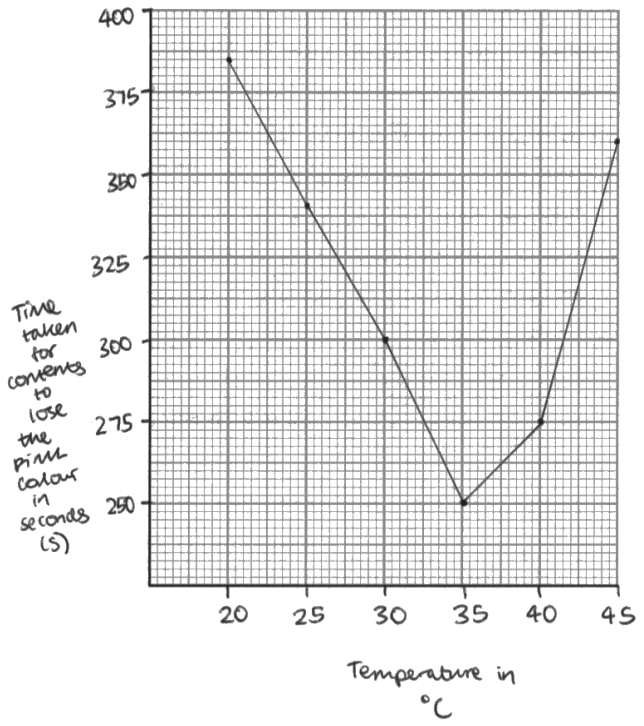
Question Number	Answer	Mark
7(c)	• to show all lipid digested / milk digested/ show fatty acids produced/ to show end (point) of reaction / show (changes in) pH / eq (1)	**1**

Question Number	Answer	Additional guidance	Mark
7 (d)	An answer that includes • graph plot covering at least 2.5 large squares for height and scale linear (1) • Lines straight and through all points (1) • Axes correct way round (temp x and time y) (1) • Units labelled with temperature in °C and time in seconds / s (1) • Points correctly plotted within half a small square (1)	allow full or truncated axis No L if extrapolated No L if bar chart even if unlabelled	**5**

Plot a line graph to show the effect of temperature on the time taken for the contents of the test tube to lose the pink colour.

Use a ruler to join your points with straight lines.

(5)



Question Number	Answer	Additional guidance	Mark
7(e)	An explanation that makes reference to four of the following • increased (kinetic) energy / molecules move faster/ more collisions / more enzyme substrate complexes formed / eq (1) • so time (to lose pink colour) decreases (1) • (up to/ till) optimum temperature / eq (1) • (time increases as) bonds in active site break / enzymes denature / eq (1) • (enzyme) active site changes shape / substrate can no longer fit / bind with enzyme / active site / eq (1)	 allow low energy at low temp allow rate increases / reaction quicker / allow slow rate at lower temp / lipase digests lipid quicker allow enzyme and substrate no longer complementary	**4**

Total 13 marks

Question Number	Answer	Additional guidance	Mark
8(a)	• Keep constant temperature / maintain temperature / control temperature / eq (1)	ignore heat / cool	**1**

Question Number	Answer	Additional guidance	Mark
8(b)	An explanation that includes the following either • lime water (1) • turns cloudy (with carbon dioxide) (1) or • hydrogen carbonate / bicarbonate / sodium hydrogencarbonate / eq (1) • turns yellow / orange (with carbon dioxide) /eq (1)	Can only get change if correct indicator given	**2**

Question Number	Answer	Mark
8(c)	an answer that refers to one of the following • stopwatch / stopclock / timer /eq (1) • syringe / measuring cylinder / burette / eq (1)	**1**

Question Number	Answer	Additional guidance	Mark
8(d)(i)	An explanation that makes reference to four of the following • provide **oxygen** (for respiration) / eq (1) • aerator / sparger / air inlet (1) • maintain optimum **temperature** / suitable temperature / prevent overheating / cool fermenter / eq (1) • temperature monitor / temperature probe (cold)-water jacket / eq (1) • maintain optimum **/** suitable **pH** / eq (1) • pH probe / pH monitor / control of inlet to acid / alkali / eq (1) • prevent **contamination**/ keep aseptic /growth of other bacteria / microorganisms/ eq (1) • air filter to remove dust / bacteria / sterilised / steam cleaned (before use)/ eq (1) • to **mix contents** / evenly distribute contents / nutrients / fungi / organisms / oxygen / heat /eq (1) • stirrer / paddles / eq(1)	idea is pairs of **named condition** and method **can only score method if condition named.** allow to exclude oxygen if anaerobic oxygen replaced with N_2 or CO_2 / eq ignore maintain high temp	**4**

Question Number	Answer	Additional guidance	Mark
8(d)(ii)	An explanation that makes reference to four of the following points • a mutation in bacteria / eq (1) • (can confer) <u>resistance</u> to antibiotic / (makes these) bacteria <u>resistant</u> / eq (1) • (only) resistant bacteria survive / no / less competition with other non-resistant bacteria (1) • resistant bacteria reproduce / multiply /eq (1) • passing on alleles / genes (for resistance) (1) • increase in frequency / population / increase in numbers of resistant bacteria / most illness disease caused by resistant strains / eq (1)	ignore immune non-resistant die non-resistant do not reproduce non-resistant do not pass on alleles	**4**

Total 12 marks

Question Number	Answer	additional guidance	Mark
9(a)	An explanation that includes four of the following points • restriction enzyme used to cut gene / DNA / gene coding for (production of human) insulin / eq (1) • (same) restriction enzyme to cut bacterial plasmid (1) • (to produce) complementary pairings / sticky ends / eq (1) • ligase enzyme used to join / insert gene / DNA into plasmid (1) • plasmid / vector inserted into / taken up by bacterium (1)	insulin gene / insulin DNA	**4**

Question Number	Answer	additional guidance	Mark
9(b)	An explanation that makes reference to two of the following • causes liver / muscles to take up blood glucose or (convert) glucose to glycogen / eq (1) • when blood glucose _ concentration/ blood glucose / increases / is high / eq (1) • reduces blood glucose /eq (1)	not breaks down glucose to glycogen allow blood sugar allow blood sugar ignore controls glucose	**2**

Question Number	Answer	Additional guidance	Mark
9(c)(i)	An explanation that makes reference to the following • insulin is a protein / eq (1) • digested / broken down / eq (1) • by protease / pepsin / trypsin / in stomach / in small intestine / into amino acids / eq (1)	allow denatured in stomach for mp 2 and mp 3	**2**

Question Number	Answer	Mark
9(c)(ii)	• (exercise) uses glucose / (exercise) increases glucose use / (exercise) increases sugar use / (exercise) reduces (blood) glucose / reduces (blood) sugar / (blood) glucose / sugar might get too low / become hypoglycaemic /eq (1)	**1**

Question Number	Answer	Additional guidance	Mark
9(c)(iii)	• control / limit the carbohydrates / sugars / glucose in their diet / eq (1)	allow replace sugar with starch / eq	**1**

Total 10 marks

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