

Mark Scheme (Results)

Summer 2024

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)	**C (oak tree)** A is not the answer as beetle is not the producer B is not the answer as deer is not the producer D is not the answer as tick is not the producer	**1**

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	oak / tree → caterpillar → mouse → tick (2)	Allow 1 for correct order. No credit for pyramids	**2**

Question Number	Answer	Mark
1(a)(iii)	**D (mouse)** A is not correct as the ant is not at two levels B is not correct as the blue jay is not at two levels C is not correct as the caterpillar is not at two levels	**1**

Question Number	Answer	additional guidance	Mark
1(b)(i)	Calculation method **not marking points** Measurement of line 10.4 cm / 104 mm Measurement of line ÷ 3.5mm = 29-30 (2) Correct answer = 2 marks	**allow 1 mark** for correct measurement of line 10.3-10.5cm or 103-105 mm with units **or** allow 1 mark for dividing by 3.5 or 35 allow range 29.0 - 30.0 for 2 marks	**2**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	An explanation makes reference to four of the following: • substance 1 (1) • required for function 1 (1) • substance 2 (1) • required for function 2 (1)	Function must match substance not credit for function alone Naming two correct substances gains 2 marks ignore blood cells / platelets / oxygen / hormones / antibodies / enzymes allow named vitamin / or vitamins / for one mark minerals / named mineral for one mark examples allow glucose (1) for energy / respiration (1) Iron (1) for haemoglobin / red blood cells / eq (1) allow amino acids (1) for protein (synthesis) / eq (1) allow proteins / named protein / eq for growth / eq (1) allow cholesterol / fatty acids / lipoproteins / eq (1) for energy / insulation / eq (1) allow water (1) for keeping body hydrated/ transport /as solvent / eq (1) allow Vitamin C (1) for prevents / scurvy /eq (1)	**4**

Question Number	Answer	additional guidance	Mark
1(b)(iii)	An answer that makes reference to two of the following: • tick picks up / bites / sucks up / absorbs **blood** from infected animal / animal with disease / eq (1) • bacteria / virus / pathogen / eq (1) • feed / bite / (new / uninfected) other animal /eq (1)	Allow transfer if ref to biting in answer	**2**

total 12 marks

Question Number	Answer	Mark
2(a)(i)	**B (Q)** A is not the answer as P is not the style C is not the answer as S is not the style D is not the answer as T is not the style	**1**

Question Number	Answer	Mark
2(a)(ii)	**D (U)** A is not the answer as P does not release pollen B is not the answer as R does not release pollen C is not the answer as T does not release pollen	**1**

Question Number	Answer	Mark
2(a)(iii)	**A (P)** B is not correct as pollen grains do not germinate on R C is not correct as pollen grains do not germinate on S D is not correct as pollen grains do not germinate on U	**1**

Question Number	Answer	Mark
2(b)	A description that makes reference to the following: • P feathery / large surface area / outside flower /exposed / eq (1) • R absent / smaller / not coloured / green / eq (1) • T longer / hinged / outside flower / exposed / eq (1)	**3**

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

Question Number	Answer	additional guidance	Mark
2(c)(ii)	• cuttings / grafting / layering / tissue culture / micropropagation / eq (1)	Reject cloning	**1**

Question Number	Answer	additional guidance	Mark
2(d)	An answer that makes reference to the following: Allow two / three in one numbered line • no gametes produced in asexual / no meiosis in asexual / gametes produced in sexual / meiosis in sexual / one parent <u>cell</u> (1) • no fusion or fertilisation in asexual / present in sexual (1) • offspring are clones / show no **<u>genetic</u>** variation in asexual / **<u>genetic</u>** variation in sexual /eq (1) • asexual faster / shorter time / sexual slower / longer time / eq (1)	Only mitosis in asexual ignore ref to number of parents sexual involves fusion of gametes scores mp 1 and mp 2	**3**

Question Number	Answer	additional guidance	Mark
2(e)	An explanation makes reference to three of the following: • selective breeding / artificial selection (1) • cross red (flower)/ unscented (flower) with white (flower) / scented (flower)/ eq (1) • select / breed / offspring with red and scent /eq (1) • repeat / for many generations eq (1)	Ignore ref to GM as it is the farmer Cross varieties / the plants ignore desired characteristics alone	**3**

total 14 marks

Question Number	Answer	additional guidance	Mark
3	• milk (1) • pasteurisation / sterilisation (1) • killed (1) • *Lactobacillus* / *Streptococcus* (1) • lactose (1) • anaerobic (1) • lactic acid / lactate (1)	allow dead / destroyed	**7**

total 7 marks

Question Number	Answer	additional guidance	Mark
4(a)	$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O$ (2)	Unbalanced but correct symbols scores 1 No credit for word equation	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	An explanation that makes reference to two of the following • bubble would not move / CO_2 also moves / shifts bubble /eq (1) • carbon dioxide is produced / released /eq (1) • (only) oxygen consumption measured / eq (1)	not just CO_2 present	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	• water bath / eq (1)	Allow description of beaker filled with water and Bunsen Ignore Bunsen alone	**1**

Question Number	Answer	additional guidance	Mark
4(c)(i)	Calculation method not marking points 22 + 25 + 24 = 71 71 ÷ 3 = 24 (2)	 Allow 1 mark for 71 or ÷ 3 or 23.7/ 23.67/ 23.6 recurring	**2**

Question Number	Answer	Additional guidance	Mark
4(c)(ii)	An explanation that makes reference to three of the following: • increases (kinetic) energy of molecules / molecules move faster / eq (1) • collide more frequently / form more enzyme substrate complexes/eq (1) • respiration (rate) increases / eq (1) • more oxygen consumed / oxygen used faster/ eq (1) • ref to/ nearer to optimum temperature for <u>enzymes</u> / eq (1)	 not energy of bubble no credit for increased movement of bubble	**3**

total 10 marks

Question Number	Answer	Mark
5(a)(i)	**C (1,2 and 4 only)** A is not correct as water vapour is a greenhouse gas B is not correct as oxygen is not a greenhouse gas and water vapour is a greenhouse gas D is not correct as oxygen is not a greenhouse gas	**1**

Question Number	Answer	Mark
5(a)(ii)	An explanation that makes reference to the following: • IR / long wave radiation is absorbed / traps IR / long wave radiation / traps heat / prevents heat escaping / eq (1) • (so) increases (global) temperature / earth warms / global warming /eq (1)	**2**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	**Calculation method not marking points** readings = agriculture 50, energy 110, business 118, transport 175 adding together 50 + 110 + 118+ 175 = 453 % energy = (110 ÷ 453) × 100 = 24% (3) allow range 23.9-24.9	23.9-24.9= 3 marks Full marks for answer no working / wrong working If not correct answer allow 1 mark for all correct readings even if unlabelled (+/- 1) allow 1 mark for dividing 110 (109-111) by their total	**3**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An answer that makes reference to five of the following: 1. overall emissions fall / less mass / eq (1) 2. **energy** most in 1990 / falls the most / (large) fall in energy /eq(1) 3. **energy** now generated by wind / solar / less from coal / gas power stations / less burning of fossil fuels/ eq (1) 4. **transport** increases / increases then falls / transport falls from 2009 / 2010 / eq (1) 5. more cars / more emissions / (then) change to / more electric / hybrid cars / less travelling to work / eq (1) 6. **agriculture** drops / eq (1) 7. less cattle farmed / less methane released / eq (1) 8. **business** little change / drops slightly / eq (1)	allow all fall after 2020 allow more renewable energy allow transport drops after 2020 allow drops after 2020	**5**

total 11 marks

Question Number	Answer	Mark
6(a)(i)	**B (oxygen)** A is not the answer as carbon dioxide is not released C is not the answer as methane is not released D is not the answer as nitrogen is not released	**1**

Question Number	Answer	Mark
6(a)(ii)	**A (chloroplast)** B mitochondrion is not the site of photosynthesis C nucleus is not the site of photosynthesis D ribosome is not the site of photosynthesis	**1**

Question Number	Answer	Mark
6(a)(iii)	• temperature / carbon dioxide concentration / pH / background light / same bulb/ lamp / time period / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
6(b)(i)	An answer that refers to the following • scale linear and plot half grid on y (1) • lines straight and through points (1) • axis correct way around (distance on x axis) (1) • points correctly plotted (1) • units distance from lamp in cm **and** bubbles per minute (1)	at least 2.5 large square on y No P if all 3 lines plotted No P if extrapolate rate to 0 Max 4 for bar chart No L	**5**

Question Number	Answer	additional guidance	Mark
6(b)(ii)	An explanation that refers to three of the following • as distance increases rate falls / fewer bubbles / eq (1) • as light intensity reduces / less light energy / light becomes limiting factor (1) • slower rate of / less photosynthesis (1) • less <u>oxygen</u> released / fewer <u>oxygen</u> bubbles released (1)	Mp1 No credit for converse Allow converse for mp 2 and mp 3 Not just less light Mp4 No credit for converse	**3**

total 11 marks

Question Number	Answer	Additional guidance	Mark
7(a)	An answer that refers to three of the following • red cell has no nucleus eq (1) • red cell biconcave disc / eq (1) • red cell small(er) /eq (1) • red cell contains haemoglobin / eq (1)	 white cell has nucleus white cell not biconcave / irregular shape white cell large(r) white cell no haemoglobin	**3**

Question Number	Answer	additional guidance	Mark
7(b)(i)	**Calculation method not marking points** 4.3 × 5.2 = 22.36 22.4 × 10^{12} 2.2 × 10^{13} (3)	 Allow 1 mark for × 5.2 Allow 2 mark for 22.4 × 10^{12} or 22.36 x 10^{12} for correct answer but not in correct standard form allow full marks for 2.236 × 10^{13} 2.24 × 10^{13}	**3**

Question Number	Answer	additional guidance	Mark
7(b)(ii)	**Calculation method not marking points** 151 – 148 = 3 (3÷ 148) × 100 = 2.03% (2)	 Allow 1 mark for 3 or 151 -148 Allow 2.027 / 2.027027 etc	**2**

Question Number	Answer	additional guidance	Mark
7(b)(iii)	An answer that makes reference to five of the following: 1. large numbers / study / reliable results / eq (1) 2. fewer people in study / lower numbers at altitude than sea level /eq(1) 3. more women than men / eq (1) 4. no information on age /health / body mass / eq (1) 5. Hb increases from 0 to 1890 / from 0 to 2270 / with altitude eq (1) 6. (as) more red cells (produced) (at 1890) (at 2270) / eq (1) 7. as less partial pressure of oxygen / less (availability of) oxygen / eq (1) 8. to enable oxygen transport / uptake / aerobic respiration / eq (1) 9. little change in Hb / (slight) reduction from 1890 to 2270 / eq (1) 10. as small(er) increase in altitude / eq (1) 11. drop in red cells from 1890 to 2270 / eq (1) 12. men have more Hb/ more red cells (at every altitude) than women / eq (1)	allow lower oxygen concentration allow for gas exchange	**5**

total 13 marks

Question Number	Answer	Mark
8(a)	• an allele that is only expressed in the homozygote / only in phenotype of homozygote / only shown in (phenotype) if two copies/ needs two copies to be expressed / not expressed in the heterozygote / not expressed if dominant allele present / not always expressed / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
8(b)(i)	An answer that includes A Ff / heterozygous (1) B Ff / heterozygous (1) C ff / homozygous recessive (1)	Allow other symbols	**3**

Question Number	Answer	additional guidance	Mark
8(b)(ii)	An answer that includes the following: • Ff and Ff (1) • F and f (1) • FF Unaffected Ff Unaffected (x2) (Ff) ff affected 1 / allow correct phenotype ratio (1)	Allow from Punnett square If correct gametes and offspring from incorrect parents allow TE 1 max Allow any letters so long as genetics correct ignore X and Y but allow X and x or Y and y Must have genotypes and phenotypes	**3**

Question Number	Answer	additional guidance	Mark
8(c)(i)	An explanation that refers to three of the following • pancreas produces / releases amylase / proteases / lipases / eq (1) • no / less digestion of starch to maltose /eq (1) • no / less digestion of proteins to amino acids / (poly)peptides to amino acids /eq (1) • no / less digestion of lipid to fatty acids and glycerol (1) • less absorption of smaller molecules / soluble molecules / amino acids / glucose / fatty acids / eq (1)	allow 1 mark for less digestion / break down as fewer enzymes released **only if mp 2 or 3 or 4 not awarded**	**3**

Question Number	Answer	Additional guidance	Mark
8(c)(ii)	An explanation that refers to two of the following • reduce likelihood of pregnancy / less likely to conceive / eq (1) • sperm / semen cannot enter <u>fallopian tube</u> / <u>oviduct</u> 1) • <u>fertilisation</u> less likely / no <u>fertilisation</u> / <u>fusion</u> (of gametes) (1)	Ignore no / less reproduction	**2**

total 12 marks

Question Number	Answer	additional guidance	Mark
9(a)(i)	An answer that makes reference to two of the following: • sunlight / light / eq (1) • volume /mass of solution / eq (1) • number of plants / number of leaves / size of leaves / size of plant /health of leaves (at start)/ eq(1) • same species / use duckweed /eq (1) • time / duration/ eq (1) • all jars covered /eq (1)	Not temperature not amount of solution allow amount of leaves	**2**

Question Number	Answer	additional guidance	Mark
9(a)(ii)	An explanation that makes reference to two of the following: • it (complete solution) (contains all minerals) so produces normal growth / ideal growth / eq (1) • distilled water contains no minerals / plant would be lacking all minerals / would not grow normally /eq (1) • so any difference in growth due to missing one mineral / eq (1)		**2**

Question Number	Answer	additional guidance	Mark
9(a)(iii)	An explanation that makes reference to two of the following: • photosynthesis /eq (1) • to produce glucose (for respiration) / eq (1) • for growth / to allow normal growth / eq (1)		**2**

Question Number	Answer	Mark
9(a)(iv)	• mineral that is missing / absent from solution / minerals present / composition of solution / solution / eq (1)	**1**

Question Number	Answer	Mark
9(b)(i)	• (quantitative / number of leaves) uses number / is measured / counted / **and** (qualitative / size of leaf) is a type / category / uses words / observed / subjective /opinion / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
9(b)(ii)	An answer that makes reference to 6 of the following: 1. **complete / no minerals lacking/ A** have most leaves / largest leaves / eq(1) 2. **complete / no minerals lacking / A** have dark green / greenest leaves /eq (1) 3. **minus nitrate / B** have few / least / smaller / smallest leaves / less green /yellow/ eq (1) 4. nitrate required for amino acid / protein / chlorophyll / chloroplasts / nitrate required for growth /eq (1) 5. **minus magnesium / C** have few / small**er** / less green / yellow / eq (1) 6. magnesium required for chlorophyll / chloroplasts / photosynthesis /eq(1) 7. **minus iron / D have** few / small**er** leaves / less green / least green / yellow / eq (1) 8. iron required for chlorophyll /chloroplasts / photosynthesis / eq (1) 9. Not repeated / not reliable / few plants used / eq (1)	allow iron required for respiration	**6**

total 14 marks

Question Number	Answer	additional guidance	Mark
10	An answer that makes reference to six of the following: C use glasshouses with three or more concentrations / levels / amounts of carbon dioxide / eq (1) O use crop plants of same species eq/ (1) R repeat each concentration /eq (1) M1 measure mass / kg / amount of seeds / number of leaves / fruit / size (of leaves) / eq (1) M2 after **stated** time / eq (1) S1 temperature / (sun)light / same season / eq (1) S2 same soil / water / humidity / fertiliser / minerals/ pH/ eq (1)	at least 3 concentrations of CO_2 use 3 different conc. OK the conc. don't need to be stated allow high / medium /zero Not yield alone not height	**6**

total 6 marks

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