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Mark Scheme (Results)

November 2021

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

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Question Number	Answer	additional guidance	Mark
1(a)	A description that makes reference to the following points: • iodine (1) • blue black / blue / black /eq (1)	 allow purple	**2**

Question Number	Answer	Mark
1(b)(i)	The only correct answer is B fungus A is not correct because it is not a bacterium C is not correct because it is not a protoctist D is not correct because it is not a virus	**1**

Question Number	Answer	Mark
1(b)(ii)	The only correct answer is A amylase B is not correct because it is not digested by ligase C is not correct because it is not digested by lipase D is not correct because it is not digested by protease	**1**

Total 4 marks

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Question Number	Answer	Mark
2(a)(i)	$\underline{6.0 \times 10^3}$	**1**

Question Number	Answer	Mark
2(a)(ii)	The only correct answer is D 5.0×10^{12} A is not correct as it is not 5.0×10^6 B is not correct as it is not 5.0×10^9 C is not correct as it is not 5.0×10^{11}	**1**

Question Number	Answer	additional guidance	Mark
2(b)(i)	An explanation that makes reference to two of the following points: • (less) oxygen (transported) (1) • (less) respiration (1) • (less) energy / less ATP (1)	 idea of less once no credit for fewer red cells	**2**

Question Number	Answer	additional guidance	Mark
2(b)(ii)	An explanation that makes reference to two of the following points: • (fewer) phagocytes / (fewer) lymphocytes (1) • (so less) ingestion / phagocytosis / digestion / engulfing /eq (1) • (so fewer) antibodies (1)	must have idea of fewer cells / less response no credit for fewer white cells allow fewer anti-toxins	**2**

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Total 6 marks

Question Number	Answer	additional guidance	Mark
3(a)	P is the ileum / small intestine (1) Q is the <u>oesophagus</u> (1)	allow intestine reject large intestine	**2**

Question Number	Answer	additional guidance	Mark
3(b)	An explanation that makes reference to two of the following points: • <u>cellulose</u> (1) • (produces / release) glucose / energy (1) • respiration (1)	allow produce <u>cellulase</u> no credit for microorganisms being digested for glucose	**2**

Question Number	Answer	additional guidance	Mark
3(c)	An explanation that makes reference to two of the following points: • fewer cows means less methane (into atmosphere) (1) • greenhouse gas (1) • (less) heat trapped / (less) radiation reflected (1) • (less) global warming (1) • farmers may choose to keep same number / more cows (1) • some cows kept for beef / eq (1) • other sources of greenhouse gas / cars / fossil fuels / eq	allow converse ignore climate change	**4**

Total 8 marks

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Question Number	Answer	Additional guidance	Mark
4(a)			**2**

Function of vitamin	**Vitamin**	
prevent scurvy	**C**	
improve vision	(vitamin) A (1)	allow retinoid / carotene
help bone growth	(vitamin) D (1)	allow calciferol

Question Number	Answer	Additional guidance	Mark
4(b)(i)	rate without vitamin C: 6.5 – 0.5 = 6.0 ÷ 30 = 0.20 (2)	award full marks for correct numerical answer without working allow 1 mark for 6.0 or ÷ 30	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	An answer that makes reference to two of the following points: • pour contents onto filter paper (in funnel) (1) • heat / warm in oven (1) • weigh the residue /eq (using balance) (1)	 allow filter ignore sieve allow to dry/ evaporate	**2**

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Question Number	Answer	Mark
4(b)(iii)	(dry) mass of yeast	**1**

Question Number	Answer	Additional guidance	Mark
4(b)(iv)	An explanation that makes reference to four of the following points: • temperature (1) • because it affects enzymes / enzymes have optimum temperature / rate of reaction / kinetic energy of molecules /eq (1) Or • pH (1) • because it affects / denatures enzymes /eq (1) Or • oxygen / aerobic /anaerobic conditions /eq(1) • because it affects respiration (1) Or • species / strain / type of yeast (1) • because they may grow at different rates / eq (1) Or • <u>concentration</u> of glucose solution (1) • used in respiration by yeast (1)	ignore volume of glucose ignore mass of yeast ignore time ignore mass / conc of Vitamin C	**4**

Total 11 marks

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Question Number	Answer	Additional guidance	Mark
5(a)	An explanation that makes reference to two of the following points: • plasmid / virus / bacteriophage / phage / gene gun / eq (1) • transfer (recombinant) / DNA / gene / into organism) eq (1)	 allow carry DNA /gene introduce / insert DNA / gene	**2**

Question Number	Answer	additional guidance	Mark
5(b)(i)	Magnesium / Mg Iron / Fe Nitrate / NO_3	Mg^{2+} Fe^{2+} / Fe^{3+} NO_3^-	**1**

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Question Number	Answer	additional guidance	Mark
5(b)(ii)	An answer that makes reference to six of the following points: • C use pulling / method A and weedicide / method B /eq (1) • O uses same species of crop / same crop / plant (1) • R repeat investigation / uses more than one field (1) • M1 measure crop mass / weigh /eq (1) • M2 use quadrats / use sampling / per m^2 / per unit area / per tray / eq (1) • S1 after **stated** time period / one growing season / eq • S2 (control) temperature / light / carbon dioxide / soil / water / fertiliser / minerals /eq (1)	not amount not yield allow idea of in same region / climate for S2	**6**

Total 9 marks

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Question Number	Answer	Additional guidance	Mark
6(a)	control the movement (of substances) in /out of cell / eq	control what comes into out of cell only allows certain substances to enter cell	**1**

Question Number	Answer	Additional guidance	Mark
6(b)	original area = 3.14 × 4 = 12.56 0.55 × 12.56 = 6.9 / 6.91 / 6.908 mm^2 (2)	award full marks for correct numerical answer without working allow 1 mark for 12.56 or allow 1 mark for x 0.55	**2**

Question Number	Answer		Mark
6(c)(i)	An answer that makes reference to the following points: • S y axis linear and half the grid (1) • L labelled bars drawn for each range (1) • A1 axes labelled number (of men) (1) • A2 axes labelled 'cholesterol concentration in mg /cm^3 or mg per cm^3 or mg cm^{-3}' • P bar heights correct (within half small square) (1)	line graph no L mark	**5**

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Question Number	Answer	Mark
6(c)(ii)	The only correct answer is C 160 to 199 A is not correct as the mode is not 80 to 119 B is not correct as the mode is not 80 to 379 D is not correct as the mode is not 360 to 399	**1**

Question Number	Answer	Additional guidance	Mark
6(c)(iii)	115 + 34 + 9 + 5 = 163 total men in sample = 1067 163 ÷ 1067 × 100 15.276 / 15 .28 /15.3 / 15 (2)	award full marks for correct numerical answer without working allow 1 mark for 163 or 1 mark for dividing by 1067 **and** x 100	**2**

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Question Number	Answer	additional guidance	Mark
6(d)	An answer that makes reference to four of the following points: • statin shows less percentage of / fewer heart attacks (1) • only one statin tested (1) • only tested for four years (1) • difference could be due to chance (1) • groups may have small size / no information on group size /eq (1) • some may have pre-existing heart condition / blood pressure / eq (1) • groups may not have same diet / exercise / stress / smoking / eq (1) • groups may be different ages / masses / obesity / have different genes / family history / sex / ethnicity / eq (1)	converse ignore ref to repeated ignore healthier ignore lifestyle	**4**

Total 15 marks

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Question Number	Answer	Mark
7(a)(i)	a gene is a section / length / part (of a molecule) of DNA that codes for a specific protein / polypeptide (1)	**1**

Question Number	Answer	Mark
7(a)(ii)	grey hair / grey (1)	**1**

Question Number	Answer	additional guidance	Mark
7(b)	An answer that includes the following four points: • Gg and Gg (1) • G or g G or g (1) • GG Gg Gg gg (1) • 3 grey : 1 white (1)	allow other symbols eg W and w or even G and w if cross works gametes separated or in circles allow full marks from a correct Punnet square ratio must be stated with phenotype or clearly 3 labelled grey and 1 labelled white in offspring allow 75% and 25% or ¾ and ¼ allow ECF/ TE for correct gametes and offspring from incorrect parents to 2 max	**4**

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Question Number	Answer	additional guidance	Mark
7(c)	An explanation that makes reference to two of the following points: • cross with mouse with white hair / gg / homozygous recessive / do back cross / test cross /(1) • if all offspring grey – parent is homozygous /GG (1) • if some / any / half offspring white – parent is heterozygous / Gg (1)	allow ww/ dd /rr etc	**2**

Question Number	Answer	Mark
7(d)	An answer that makes reference to three of the following points: • most polygenic (1) • many genes / more than one gene / eq (1) • each of small effect / (1) • show continuous variation / example height / mass/ eq (1) • most single genes / monohybrid inheritance only affect one phenotype / characteristic (1)	**3**

Total = 11 marks

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Question Number	Answer	Additional Guidance	Mark
8(a)	An explanation that makes reference to three of the following points: • no gametes formed / no meiosis / eq (1) • no fertilisation / fusion of gametes / zygote formed (1) • no genetic variation / offspring are clones / have same alleles as parents / have same alleles (as each other) / eq (1) • only one parent cell required (1)	Allow converse for sexual reproduction allow sperm and egg / reproductive cells allow same genes ignore only one parent	**3**

Question Number	Answer	Mark
8(b)(i)	The only correct answer is A (the oviduct) B is not the correct answer as it is not the site of fertilisation C is not the correct answer as it is not the site of fertilisation D is not the correct answer as it is not the site of fertilisation	**1**

Question Number	Answer	Mark
8(b)(ii)	The only correct answer is C (uterus / womb) A is not the correct answer as it is not where foetus develops B is not the correct answer as it is not where foetus develops D is not the correct answer as it is not where foetus develops	**1**

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Question Number	Answer	Additional Guidance	Mark
8(b)(iii)	An answer that makes reference to four of the following points: • oestrogen (1) • thickens uterus lining (1) • development of secondary sexual characteristics / eq (1) • progesterone (1) • maintains uterus lining / eq (1)	stimulates LH / inhibits FSH allow example of secondary sexual characteristics eg breast development ignore thickens here inhibits LH / stimulates FSH **allow maximum one mark for an effect not linked to a hormone**	**4**

Question Number	Answer	additional guidance	Mark
8(c)(i)	= 3.22 x 62.1 = 200 (million) (1)	allow 199 /199.96/ 199.962	**1**

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Question Number	Answer	additional guidance	Mark
8(c)(ii)	An explanation that makes reference to two of the following points: • number amount of sperm depends upon both factors / eq (1) • you could have a high conc but low volume (this would provide few sperm) / eq (1) • or a high volume but low conc (this would provide few sperm) / eq (1)	conc does not tells us how many sperm are there semen volume does not tell us how many sperm there are	**2**

Question Number	Answer	Additional Guidance	Mark
8(c)(iii)	202 - 142 ÷ 202 × 100 = 29.7 % (2)	Allow 1 mark for 202 - 142 or 60 or 1 mark for 0.297 / eq allow 29.703 / 29.70297 etc	**2**

Total = 14 marks

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Question Number	Answer	additional guidance	Mark
9(a)(i)	• algae (1) • bladder wrack (1)	minus 1 mark for each extra incorrect organism	**2**

Question Number	Answer	additional guidance	Mark
9(a)(ii)	An answer that makes reference to two of the following: • (common) seal (1) • crab (1) • lobster (1) • (herring) gull (1)	minus 1 mark for each extra incorrect organism	**2**

Question Number	Answer	Additional Guidance	Mark
9(a)(iii)	bladder wrack → winkle → crab → gull (2)	Allow 1 mark for order without arrows or arrows in wrong direction no credit for pyramids	**2**

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Question Number	Answer	Additional Guidance	Mark
9(b)(i)	• order correct (1) • shape correct (1)	Require names for order Allow 1 mark for order of names but wrong shape (of pyramid) Allow 1 mark for correct pyramid shape without names no credit for food chain	**2**

Question Number	Answer	Mark
9(b)(ii)	An explanation that makes reference to three of the following points: • energy lost (between each stage / level) / eq (1) • as heat / used in respiration / movement (1) • excreted / urine / eq (1) • not eaten / not digested / egested / faeces / eq (1) • decompose / die (1)	**3**

Total = 11 marks

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Question Number	Answer	additional guidance	Mark
10(a) (i)	A description that makes reference to the following points: • keep plant in dark / eq (1) • for 12 hours plus (1)	in cupboard / cover with black paper	**2**

Question Number	Answer	Mark
10(a)(ii)	• starch only made during experiment / produced during experiment / produced in the light / prevent false positive / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
10(b)	• (heat ethanol) using water bath / eq (1)	extinguish Bunsen flame	**1**

Question Number	Answer	Mark
10(c)	• keep leaf in dark / mask leaf / cover with foil / eq (1)	**1**

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Question Number	Answer	additional guidance	Mark
10(d)	An explanation that makes reference to five of the following points: • leaf flat / wide / large SA for diffusion / gas exchange / light absorption (1) • leaf thin so no cells far from surface to absorb light / short diffusion distance (1) • upper epidermis transparent to allow light through (1) • palisade (mesophyll) cells contain many chloroplasts / much chlorophyll (near surface) to absorb light (1) • spongy (mesophyll) / cells have air spaces / not tightly packed / for gas exchange / diffusion (1) • (lower surface) has <u>stomata</u> to absorb carbon dioxide (1) • xylem / vascular bundle bring water for photosynthesis (1)	for each mp must have structure and description of how adapted allow spongy for gas exchange	**5**

Total = 10 marks

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Question Number	Answer	Mark
11(a)(i)	An answer that makes reference to the following points: • cornea / C bends / refracts light (1) • lens / A becomes (more) curved / rounder / convex / thicker / eq (1) • as ciliary muscles / D contract (1) • (ciliary muscles / D) cause suspensory ligaments to relax become less taut / slacken / loosen / eq (1)	**4** allow ciliary body

Question Number	Answer	Mark
11(a)(ii)	An explanation that makes reference to three of the following points: • circular muscles contract (1) • radial muscles relax (1) • pupil constricts / becomes smaller / eq (1) • less light enters eye (1)	**3**

Question Number	Answer	additional guidance	Mark
11(b)(i)	An answer that makes reference to the following points: • (breaks down / digests cell walls of / kill / prevent growth of / remove / protect from) <u>bacteria</u> / <u>fungi</u> / <u>pathogens / microorganisms</u> / eq (1) • prevent infection / disease (1)	prevent bacterial infection = 2 marks	**2**

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Question Number	Answer	additional guidance	Mark
11(b)(ii)	An answer that makes reference to two of the following points: • optimum pH (for lysozyme) (1) • prevent enzyme being denatured / change in active site /eq (1) • break down cell walls / kill bacteria / work at fastest / fast rate / eq (1) • (too) acidic / (too) alkaline may damage eye / eq (1)	neutral won't damage eye	**2**

Total = 11 marks

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