



Mark Scheme (Results)

November 2021

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

Question Number	Answer	additional guidance	Mark
1(a)	<p>A description that makes reference to the following points:</p> <ul style="list-style-type: none"> • iodine (1) • blue black / blue / black /eq (1) 	allow purple	2

Question Number	Answer	Mark
1(b)(i)	<p>The only correct answer is B fungus</p> <p>A is not correct because it is not a bacterium</p> <p>C is not correct because it is not a protocist</p> <p>D is not correct because it is not a virus</p>	1

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

Total 4 marks

Question Number	Answer	Mark
2(a)(i)	<u>6.0×10^3</u>	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: <ul style="list-style-type: none"> • (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: <ul style="list-style-type: none"> • (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

Total 6 marks

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

Question Number	Answer	additional guidance	Mark
3(b)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • <u>cellulose</u> (1) • (produces / release) glucose / energy (1) • respiration (1) 	<p>allow produce <u>cellulase</u></p> <p>no credit for microorganisms being digested for glucose</p>	2

Question Number	Answer	additional guidance	Mark
3(c)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • 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 	<p>allow converse</p> <p>ignore climate change</p>	4

Total 8 marks

Question Number	Answer	Additional guidance	Mark								
4(a)	<table border="1"> <thead> <tr> <th>Function of vitamin</th> <th>Vitamin</th> </tr> </thead> <tbody> <tr> <td>prevent scurvy</td> <td>C</td> </tr> <tr> <td>improve vision</td> <td>(vitamin) A (1)</td> </tr> <tr> <td>help bone growth</td> <td>(vitamin) D (1)</td> </tr> </tbody> </table>	Function of vitamin	Vitamin	prevent scurvy	C	improve vision	(vitamin) A (1)	help bone growth	(vitamin) D (1)	<p>allow retinoid / carotene</p> <p>allow calciferol</p>	2
Function of vitamin	Vitamin										
prevent scurvy	C										
improve vision	(vitamin) A (1)										
help bone growth	(vitamin) D (1)										

Question Number	Answer	Additional guidance	Mark
4(b)(i)	<p>rate without vitamin C: $6.5 - 0.5 = 6.0$</p> <p>$\div 30$</p> <p>$= 0.20$ (2)</p>	<p>award full marks for correct numerical answer without working</p> <p>allow 1 mark for 6.0 or $\div 30$</p>	2

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • pour contents onto filter paper (in funnel) (1) • heat / warm in oven (1) • weigh the residue /eq (using balance) (1) 	<p>allow filter ignore sieve</p> <p>allow to dry/ evaporate</p>	2

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

Question Number	Answer	Additional guidance	Mark
4(b)(iv)	<p>An explanation that makes reference to four of the following points:</p> <ul style="list-style-type: none"> • temperature (1) • because it affects enzymes / enzymes have optimum temperature / rate of reaction / kinetic energy of molecules /eq (1) <p>Or</p> <ul style="list-style-type: none"> • pH (1) • because it affects / denatures enzymes /eq (1) <p>Or</p> <ul style="list-style-type: none"> • oxygen / aerobic /anaerobic conditions /eq(1) • because it affects respiration (1) <p>Or</p> <ul style="list-style-type: none"> • species / strain / type of yeast (1) • because they may grow at different rates / eq (1) <p>Or</p> <ul style="list-style-type: none"> • <u>concentration</u> of glucose solution (1) • used in respiration by yeast (1) 	<p>ignore volume of glucose</p> <p>ignore mass of yeast</p> <p>ignore time</p> <p>ignore mass / conc of Vitamin C</p>	4

Total 11 marks

Question Number	Answer	Additional guidance	Mark
5(a)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • plasmid / virus / bacteriophage / phage / gene gun / eq (1) • transfer (recombinant) / DNA / gene / into organism) eq (1) 	<p>allow carry DNA /gene</p> <p>introduce / insert DNA / gene</p>	2

Question Number	Answer	additional guidance	Mark
5(b)(i)	<p>Magnesium / Mg</p> <p>Iron / Fe</p> <p>Nitrate / NO₃</p>	<p>Mg²⁺</p> <p>Fe²⁺ / Fe³⁺ / NO₃⁻</p>	1

Question Number	Answer	additional guidance	Mark
5(b)(ii)	<p>An answer that makes reference to six of the following points:</p> <ul style="list-style-type: none"> • 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 m² / 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) 	<p>not amount not yield</p> <p>allow idea of in same region / climate for S2</p>	6

Total 9 marks

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 = $3.14 \times 4 = 12.56$ $0.55 \times 12.56 =$ $6.9 / 6.91 / 6.908 \text{ mm}^2$ (2)	award full marks for correct numerical answer without working allow 1 mark for 12.56 or allow 1 mark for $\times 0.55$	2

Question Number	Answer		Mark
6(c)(i)	An answer that makes reference to the following points: <ul style="list-style-type: none"> • 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

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

Question Number	Answer	Additional guidance	Mark
6(c)(iii)	$115 + 34 + 9 + 5 = 163$ total men in sample = 1067 $163 \div 1067 \times 100$ 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

Question Number	Answer	additional guidance	Mark
6(d)	<p>An answer that makes reference to four of the following points:</p> <ul style="list-style-type: none"> • 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) 	<p>converse</p> <p>ignore ref to repeated</p> <p>ignore healthier ignore lifestyle</p>	4

Total 15 marks

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)	<p>An answer that includes the following four points:</p> <ul style="list-style-type: none"> • Gg and Gg (1) • G or g G or g (1) • GG Gg Gg gg (1) • 3 grey : 1 white (1) 	<p>allow other symbols eg W and w or even G and w if cross works</p> <p>gametes separated or in circles</p> <p>allow full marks from a correct Punnet square</p> <p>ratio must be stated with phenotype or</p> <p>clearly 3 labelled grey and 1 labelled white in offspring</p> <p>allow 75% and 25% or $\frac{3}{4}$ and $\frac{1}{4}$</p> <p>allow ECF/ TE for correct gametes and offspring from incorrect parents to 2 max</p>	4

Question Number	Answer	additional guidance	Mark
7(c)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • 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)	<p>An answer that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • 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

Question Number	Answer	Additional Guidance	Mark
8(a)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • no gametes formed / no meiosis / eq (1) • no <u>fertilisation</u> / <u>fusion</u> of gametes / zygote formed (1) • no <u>genetic</u> variation / offspring are clones / have same alleles as parents / have same alleles (as each other) / eq (1) • only one parent <u>cell</u> required (1) 	<p>Allow converse for sexual reproduction</p> <p>allow sperm and egg / reproductive cells</p> <p>allow same genes</p> <p>ignore only one parent</p>	3

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

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

Question Number	Answer	Additional Guidance	Mark
8(b)(iii)	<p>An answer that makes reference to four of the following points:</p> <ul style="list-style-type: none"> • oestrogen (1) • thickens uterus lining (1) • development of secondary sexual characteristics / eq (1) • progesterone (1) • maintains uterus lining / eq (1) 	<p>stimulates LH / inhibits FSH</p> <p>allow example of secondary sexual characteristics eg breast development</p> <p>ignore thickens here</p> <p>inhibits LH / stimulates FSH</p> <p>allow maximum one mark for an effect not linked to a hormone</p>	4

Question Number	Answer	additional guidance	Mark
8(c)(i)	<p>= 3.22×62.1</p> <p>= 200 (million) (1)</p>	<p>allow 199 /199.96/ 199.962</p>	1

Question Number	Answer	additional guidance	Mark
8(c)(ii)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • 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) 	<p>conc does not tell us how many sperm are there</p> <p>semen volume does not tell us how many sperm there are</p>	2

Question Number	Answer	Additional Guidance	Mark
8(c)(iii)	$202 - 142 \div 202 \times 100$ $= 29.7 \% (2)$	<p>Allow 1 mark for 202 - 142 or 60</p> <p>or 1 mark for 0.297 / eq</p> <p>allow 29.703 / 29.70297 etc</p>	2

Total = 14 marks

Question Number	Answer	additional guidance	Mark
9(a)(i)	<ul style="list-style-type: none"> algae (1) bladder wrack (1) 	minus 1 mark for each extra incorrect organism	2

Question Number	Answer	additional guidance	Mark
9(a)(ii)	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> (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)	<p>Allow 1 mark for order without arrows or arrows in wrong direction</p> <p>no credit for pyramids</p>	2

Question Number	Answer	Additional Guidance	Mark
9(b)(i)	<ul style="list-style-type: none"> • order correct (1) • shape correct (1) 	<p>Require names for order</p> <p>Allow 1 mark for order of names but wrong shape (of pyramid)</p> <p>Allow 1 mark for correct pyramid shape without names</p> <p>no credit for food chain</p>	2

Question Number	Answer	Mark
9(b)(ii)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • 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

Question Number	Answer	additional guidance	Mark
10(a) (i)	A description that makes reference to the following points: <ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • (heat ethanol) using water bath / eq (1) 	extinguish Bunsen flame	1

Question Number	Answer	Mark
10(c)	<ul style="list-style-type: none"> • keep leaf in dark / mask leaf / cover with foil / eq (1) 	1

Question Number	Answer	additional guidance	Mark
10(d)	<p>An explanation that makes reference to five of the following points:</p> <ul style="list-style-type: none"> • 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) 	<p>for each mp must have structure and description of how adapted</p> <p>allow spongy for gas exchange</p>	5

Total = 10 marks

Question Number	Answer	Mark
11(a)(i)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> • 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) 	<p>4</p> <p>allow ciliary body</p>

Question Number	Answer	Mark
11(a)(ii)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> • 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)	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> • (breaks down / digests cell walls of / kill / prevent growth of / remove / protect from) <u>bacteria</u> / <u>fungi</u> / <u>pathogens</u> / <u>microorganisms</u> / eq (1) • prevent infection / disease (1) 	prevent bacterial infection = 2 marks	2

Question Number	Answer	additional guidance	Mark
11(b)(ii)	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> • <u>optimum</u> pH (for lysozyme) (1) • prevent enzyme being denatured / change in active site /eq (1) • break down cell walls / kill bacteria / work at <u>fastest</u> / <u>fast rate</u> / eq (1) • (too) acidic / (too) alkaline may damage eye / eq (1) 	neutral won't damage eye	2

Total = 11 marks