Mark Scheme (Results)

Summer 2023

Pearson Edexcel International GCSE In Biology (4BI1) Paper 1BR

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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)	The only correct answer is B (protein synthesis) *A is incorrect as chloroplasts perform photosynthesis* *C is incorrect as mitochondria perform respiration* *D is incorrect as vacuoles store cell sap*	1

Question Number	Answer	Mark
1(a)(ii)	The only correct answer is B *A is incorrect as animal cells do not have cell walls* *C is incorrect as eukaryotic cells have cytoplasm* *D is incorrect as animal cells do not have cell walls*	1

Question Number	Answer	Additional Guidance	Mark
1(a)(iii)	An explanation that makes reference to three of the following. • *Lactobacillus* / they, have cell walls / red blood cells do not have a cell wall / eq (1) • water enters (cells) / eq (1) • by osmosis (1) • (because) water potential inside the cells is low(er) / eq (1)	Ignore refs to water not entering *Lactobacillus* Allow from a high concentration (of water) to a low concentration (of water) / from a dilute to a concentrated solution / eq	3

Question Number	Answer		Mark
1(b)	A description that makes reference to three of the following. • respiration / fermentation / ferment (1) • lactose (1) • lactic acid / lactate, produced (1) • (protein) clots / milk thickens / milk coagulates / goes solid / eq (1)	Ignore aerobic / anaerobic Allow milk becomes acid(ic) / low pH occurs Allow protein denatures	3

(Total for Question 1 = 8 marks)

Question Number	Answer	Mark
2 (a)	A description that makes reference to two of the following. • peristalsis (1) • muscle contraction (1) • along oesophagus (1)	2

Question Number	Answer		Mark
2 (b)(i)	An answer that makes reference to one of the following. • fibre (1) • water (1) • other named vitamin / mineral (1)	e.g. vitamin A / iron Ignore vitamin C and calcium	1

Question Number	Answer		Mark
2(b)(ii)	An answer that makes reference to the following. • (vitamin C) scurvy / skin does not heal / blood vessels are weak / cartilage is weak / wounds do not heal / eq (1) • (calcium) rickets / weak bones / osteoporosis / eq (1)	 Allow vitamin C needed for healthy skin / cartilage / connective tissue / eq Allow calcium needed for strong teeth / bones / eq	2

Question Number	Answer		Mark
2(b)(iii)	• RDA = 230 (g) (2)	One mark for 227.2727 OR 227 OR 2.3 OR other answer to correct decimal places with correct rounding	2

Question Number	Answer	Additional guidance	Mark
2(b)(iv)	A description that makes reference to three of the following. • protease / peptidase (1) • pepsin (in stomach) (1) • (digestion) in small intestine / duodenum / stomach / (protease) released by pancreas / stomach (1) • (produces) amino acids / (di)peptides (1)	 Allow trypsin (in duodenum / from pancreas) Ignore <u>absorbed</u> in small intestine	3

(Total for Question 2 = 10 marks)

Question Number	Answer	Mark
3(a)(i)	The only correct answer is C (3) *A is incorrect as there are more than 1 secondary consumers* *B is incorrect as there are more than 2 secondary consumers* *D is incorrect as there are fewer than 4 secondary consumers*	1

Question Number	Answer	Mark
3 (a)(ii)	The only correct answer is B (ecosystem) *A is incorrect as the community does not include the environment* *C is incorrect as the habitat does not include the organisms* *D is incorrect as population is the number of one species*	1

Question Number	Answer	Additional guidance	Mark
3 (a)(iii)	An explanation that makes reference to three of the following. • shorter food chain to oak tree / one species between fox and oak tree / eq (1) AND two from (energy lost from) • excretion / urine / eq (1) • inedible parts / parts not eaten / eq (1) • indigestible parts / faeces / egestion / eq (1) • death / decomposition / decay / some organisms not eaten / eq (1) • respiration / heat loss / eq (1) • movement /eq (1)	Allow converse for grass Allow fox is a secondary consumer from oak tree / tertiary consumer from grass / eq Allow fewer / 3, levels in oak tree food chain / eq Allow only rabbit / squirrel between tree and fox / eq Do not award two marks for excrete faeces	3

Question Number	Answer		Mark
3 (b)(i)	An answer that makes reference to the following. • avoid bias / make sample representative / more accurate (result) / makes (survey) fair / eq (1)	Allow fair test / valid Ignore reliable	1

Question Number	Answer	Additional guidance	Mark
3 (b)(ii)	An explanation that makes reference to two of the following. • grid area / eq (1) • repeats / more quadrats / eq (1) • identify anomalies / calculate mean / average / to see if they are similar / eq (1)	Ignore larger quadrat	2

Question Number	Answer	Additional guidance	Mark
3 (b)(iii)	• 2925 (3)	Correct answer gains all three marks two marks for 4500 If answer incorrect then up to max 2 of: one mark for 4000 or 50 x 80 one mark for 500 or (20 x 50) / 2 one mark for 0.65 x OR 65/100 x	3

(Total for Question 3 = 11 marks)

Question Number	Answer	Mark
4 (a)(i)	The only correct answer is B (chitin) *A is incorrect as fungal cell walls do not contain cellulose* *C is incorrect as fungal cell walls do not contain glycogen* *D is incorrect as fungal cell walls do not contain starch*	1

Question Number	Answer	Mark
4 (a)(ii)	The only correct answer is A (ethanol and carbon dioxide) *B is incorrect as yeast anaerobic respiration also produces carbon dioxide* *C is incorrect as yeast anaerobic respiration does not produce lactic acid* *D is incorrect as yeast anaerobic respiration does not produce lactic acid*	1

Question Number	Answer	Additional guidance	Mark
4 (b)(i)	An answer that makes reference to the following. • stops oxygen getting in / prevents <u>aerobic</u> respiration / eq (1)	Ignore ensures anaerobic respiration	1

Question Number	Answer		Mark
4 (b)(ii)	A description that makes reference to the following. • water bath (1) • (monitor with) thermometer / (use of) thermostat / eq (1)		2

Question Number	Answer	Additional guidance	Mark
4 (b)(iii)	• 4 (2)	one mark for 32 OR ÷ 8 Correct answer gains both marks	2

Question Number	Answer		Mark
4 (b)(iv)	An explanation that makes reference to two of the following. • increases up to 16 (min) / 17 (min) / 18 (min) and then levels off / slows / (bubble production) stops / eq • (when bubbles increase / initially) glucose is not limiting / eq (1) • (levels off because) glucose runs out / is limiting / yeast is poisoned by ethanol / eq (1)	Allow times between 16 and 18 for turning point Allow constant rate (or respiration) until 16 /18 then (respiration) stops / levels off / slows Allow glucose is not limiting when bubbles are increasing Allow substrate for glucose throughout	2

Question Number	Answer		Mark
4 (b)(v)	An explanation that makes reference to three of the following. • faster / more, respiration (1) • (at 37 °C) more (kinetic) energy / faster (particle) movement /eq (1) • more / faster, collisions / more E/S complexes / eq (1) • at 37°C glucose runs out (sooner) / glucose starts to limit / eq (1)	Allow 37^0C / it, is (closer to) optimum	3

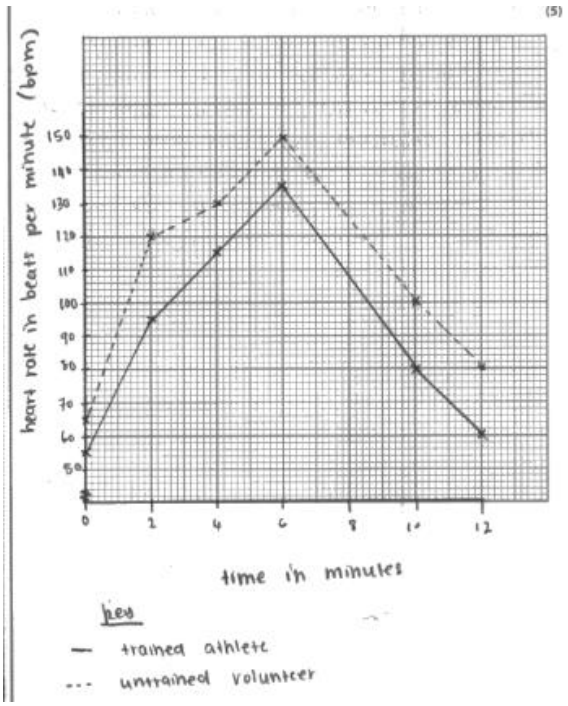
Question Number	Answer	Mark
4 (b)(vi)	A description that makes reference to the following. • collect <u>volume</u> (of gas) (1) • using a measuring cylinder / syringe / burette / eq (1)	2

(Total for Question 4 = 14 marks)

Question Number	Answer	Mark
5 (a)(i)	The only correct answer is C *A is incorrect as W is not the left atrium* *B is incorrect as W is not a ventricle* *D is incorrect as W is not a ventricle*	1

Question Number	Answer		Mark
5 (a)(ii)	A description that makes reference to the following. • X / pulmonary artery, has lower oxygen / is deoxygenated / eq (1) • X / pulmonary artery has higher carbon dioxide / eq (1)	Allow Y / aorta, has higher oxygen / is oxygenated Allow Y / aorta, has lower carbon dioxide	2

Question Number	Answer	Additional guidance	Mark
5(b)(i)	• 89 (2)	Allow any number of correct decimal places e.g. 89.0909, 89.1 Allow 90 One mark for 55 OR One mark for 75, 75.4, 75.38 etc. Correct answer gains both marks	2

Question Number	Answer	Additional guidance	Mark
5 (b)(ii)	An answer that makes reference to the following. S – linear scales for both axes and at least half grid (1) L – ruled, straight lines (1) A – both axes fully labelled (1) P – correct plots (1) K – key / eq (1)  	time must be on x axis Minimum label: heart rate / bpm and time / min Allow plots if non-linear scales Plots +/- half square Bar chart: S, A, P, K (max 4) One data set plotted: S, L, A **Time in minutes** / **Heart rate in beats per minute (bpm)**: **untrained volunteer** / **trained athlete** 0 (rest): 65 / 55 2: 120 / 95 4: 130 / 115 6: 150 / 135 10: 100 / 80 12: 80 / 60	5

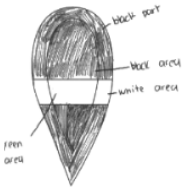
Question Number	Answer		Mark
5 (b)(iii)	An explanation that makes reference to four of the following. • (trained athlete) has lower heart rate / heart rate returns to normal quicker / eq (1) • (trained athlete) has larger heart / larger stroke volume / pumps more blood / eq (1) • more / faster transport of, oxygen / glucose pumped / more removal of carbon dioxide / heat / eq (1) • (more) (aerobic) respiration / ATP production / energy / eq (1) • (more) muscle <u>contraction</u> (1) • less anaerobic respiration / lactic acid / less <u>oxygen debt</u> / eq (1)	Allow converse for untrained Allow stronger heart Allow untrained has to pump faster to move same amount of blood / eq Allow untrained has to pump faster to move same amount of oxygen / eq	4

(Total for Question 5 = 14 marks)

Question Number	Answer	Mark
6 (a)	An answer that makes reference to the following. $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ (2) one mark if correct equation but incorrectly balanced	2

Question Number	Answer		Mark
6(b)(i)	An answer that makes reference to the following. • destarch the leaves / remove starch eq (1)	Allow so no starch present (in leaves) / so starch is used up / starch respired	1

Question Number	Answer		Mark
6 (b)(ii)	An answer that makes reference to the following. • both green areas shaded and area with no green with no shading / eq (1) • no shading in strip under paper / eq (1)	Allow labelled areas if not shaded (black / orange / starch / no starch) No mp2 if rest of leaf is blank	2

	2 marks
	1 mark
	1 mark
	1 mark
 Diagram 2	0 marks

Question Number	Answer		Mark
6 (c)	An answer that makes reference to six of the following. • C − (plant ivy in) shaded and unshaded area / different exposure to light / eq (1) • O − same species / type / age / starting size of leaf / same plant / eq (1) • R − repeat with multiple leaves / repeat / eq (1) • M1 − measure length / width / height / surface area / eq (of leaves) (1) • M2 − grow ivy for same <u>stated</u> time (1) • S1 - temperature / pests / humidity / plant density / carbon dioxide / weather / time of year / wind / eq (1) • S2 − same water / minerals / soil / nutrients / fertiliser / pH / eq (1)	Allow different light intensities / distances of lamp Allow groups Ignore size of leaves Allow measure size with a ruler / in mm / eq Allow volume Minimum time of one day	6

(Total for Question 6 = 11 marks)

Question Number	Answer	Mark
7 (a) (i)	The only correct answer is A *B is incorrect as fertilisation does not occur in the ovary* *C is incorrect as fertilisation does not occur in the uterus* *D is incorrect as fertilisation does not occur in the vagina*	1

Question Number	Answer		Mark
7(a)(ii)	A description that makes reference to the following. • (oestrogen) repairs / thickens lining / thickens wall / eq (1) • (progesterone) retains / maintains lining / vascularises endometrium / prevents menstruation / eq (1)	 Allow builds up lining Allow fall in progesterone causes lining to shed / causes menstruation Allow increase blood flow in lining	2

Question Number	Answer	Additional guidance	Mark
7(b)(i)	A description that makes reference to the following. • fusion of nuclei / fusion of egg and sperm / zygote (forms) / eq (1) • mitosis / <u>cell division</u> / (to form an embryo) / eq (1)	 Reject meiosis	2

Question Number	Answer	Additional guidance	Mark
7 (b) (ii)	An answer that makes reference to five of the following. • number of (multiple births) has decreased / eq (1) • constant / steady /eq, decrease, (in multiple births) until 2007 / 2008 / 2009 / before recommendations / eq (1) • (steep) decrease / since 2007 / 2008 / 2009 / since recommendations / eq (1) • (so) less risk to health / multiple births increase health risks / eq (1) • (repeated IVF) is expensive / stressful / eq (1) • IVF success rate / fertility decreases with age / eq (1) • (older women have lower success rate) so better to use more than one embryo / eq (1) • no information on sample sizes / only one country / only UK data / eq (1) • reliable as data is for a long period of time / eq (1) • (could be affected by) other health issues / diet / genetics / sperm / eq (1)	Allow age references for any ages of >=37 for older women MP3 also gets MP1 Allow recommendations have made it safer / multiple births are dangerous Allow older women have low(er) success rate / young(er) women have high success rate Allow restricting number of embryos for younger women has less effect on success / eq Allow cannot be generalised / needs to be researched in other countries / eq Allow no information about health issues / eq	5

(Total for Question 7 = 10 marks)

Question Number	Answer	Mark
8(a)(i)	The only correct answer is C (Y) *A is incorrect as T is combustion* *B is incorrect as X is consumption* *D is incorrect as Z is death*	1

Question Number	Answer	Mark
8 (a)(ii)	• photosynthesis (1)	1

Question Number	Answer	Additional guidance	Mark
8 (b) (i)	• CFCs / water (vapour) / eq (1)	Allow fluorinated gases e.g. hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulphur hexafluoride	1

Question Number	Answer	Additional guidance	Mark
8 (b)(ii)	An answer that makes reference to five of the following. • carbon dioxide (poses the greatest risk) (1) • carbon dioxide is released in high(est) amounts / eq (1) • carbon dioxide is produced by many human activities / fossil fuel use / eq (1) • carbon dioxide stays for long(est) time / eq (1) • carbon dioxide has low(est) global warming potential / GWP / eq (1) • methane has a high(er) GWP than carbon dioxide / has middle GWP <u>BUT</u> low(er) amount / second highest amount, released / more released than nitrous oxide / eq (1) • methane has a high(er) GWP than carbon dioxide / has middle GWP <u>BUT</u> methane does not last long / stays least time / eq (1) • nitrous oxide has high(est) GWP <u>BUT</u> has low(est) percentage released / eq (1) • nitrous oxide has high(est) GWP <u>BUT</u> stays less time than carbon dioxide / stays for a medium amount of time / eq (1)	Allow traps / absorbs heat for GWP If just quoting numbers, they need to be qualified e.g. ONLY 1 (GWP) Allow cement / vehicles / deforestation / eq Allow highest GWP <u>BUT</u> stays longer than methane	5

(Total for Question 8 = 8 marks)

Question Number	Answer		Mark
9(a)(i)	An answer that makes reference to the following. • (transfer of) genes / alleles / DNA between different <u>species</u> (1)	Allow (organism) with gene / allele / DNA from different <u>species</u> Ignore genetic modification alone Ignore organism	1

Question Number	Answer	Additional guidance	Mark
9 (a)(ii)	An answer that makes reference to two of the following. • (herbicides) kills / removes, weeds but not crops / eq (1) • less competition / eq (1) • so increased yield / more (crop) growth / eq (1) • no need to remove weeds by hand / eq (1)	Allow (herbicide) <u>only</u> affects / kills, weeds / unwanted plants	2

Question Number	Answer	Additional guidance	Mark
9 (b) (i)	• RR, Rr, (rR) (1)	Reject if rr included Allow other letters but not two different letters Allow 'homozygous dominant and heterozygous'	1

Question Number	Answer		Mark
9 (b)(ii)	An answer that makes reference to the following. • parents as Rr and rr (1) • gametes as R or r and r (or r) (1) • genotypes and stated phenotypes of Rr and rr AND non-resistant and resistant (1)	Allow other letters but not two different letters ECF for one mark only for gametes Allow all marks from Punnett square	3

Question Number	Answer	Additional guidance	Mark
9 (b)(iii)	• 0.5 / ½ / 50 % (1)	Allow 2/4	1

Question Number	Answer		Mark
9 (b)(iv)	An explanation that makes reference to four of the following. • mutation (produces resistance) / eq (1) • (produces) variation (1) • (weeds with gene) survive / eq (1) • reproduce / pollinate / eq (1) • pass on the allele / gene / mutation / eq (1)	Allow converse Allow correct ref to selection pressure / selective advantage Allow pass on allele to next generation for mp4 and mp5	4

Question Number	Answer	Additional guidance	Mark
9 (b)(v)	An explanation that makes reference to two of the following. • dominant alleles always expressed / expressed in heterozygotes OR recessive alleles only expressed when homozygous / not expressed in heterozygotes / eq (1) • if resistance is recessive, only homozygous (recessive) plants survive / no heterozygous plants survive / eq (1) • if resistance is dominant, heterozygous plants survive / eq (1) • (when resistance is dominant) if two heterozygotes breed, non-resistant weeds produced / some homozygous recessive plants produced / eq (1)	Allow recessive alleles are not always shown (in phenotype) Allow no plants with dominant alleles survive Allow some plants carrying recessive alleles will survive / carriers survive Allow carriers for heterozygotes Allow both parents can pass on a recessive allele	2

(Total for Question 9 = 14 marks)

Question Number	Answer	Mark
10 (a)(i)	• iris (1)	1

Question Number	Answer		Mark
10 (a)(ii)	A description that makes reference to three of the following. • X / ciliary muscle, contracts (1) • Y / suspensory ligaments go slack / loosen / eq (1) • lens becomes thicker / more spherical / more convex / eq (1) • so (lens) refracts light more / bends light more / eq (1)	Ignore relax Ignore suspensory muscle Allow fatter / more rounded / bulges	3

Question Number	Answer		Mark
10 (b)(i)	A description that makes reference to two of the following. • less light can pass through / refraction affected / eq (1) • to retina / fovea / rods / cones / photoreceptors (1) • so fewer <u>impulses</u> (to brain) (1)	Allow cannot focus well / bend light Allow stops light getting into eye	2

<table>
<tr><th>Question Number</th><th>Answer</th><th></th><th>Mark</th></tr>
<tr><td>10 (b)(ii)</td><td>An answer that makes reference to four of the following.

• numbers increase as exposure to sunlight increases / eq (1)

• groups sizes are different / eq (1)

• credit calculation of proportions / percentages (1)

• the <u>proportion / percentage</u> of cases fluctuates / does not change (much) between 7 and 10 (hrs) / eq (1)

• <u>proportion / percentage</u>, rises after 10 (hrs) / 11 (hrs) / 12 (hrs) (1)

• the large number of people makes it reliable OR (less reliable as) only one country / no information on location / climate / eq (1)

• age / sex / health status / genetics / diet / clothing / sunglasses / could affect the results / eq (1)</td><td>Allow more sunlight increases chance of cataracts
Allow percentage of cases increases

Allow number of people vary / increase

<table><tr><th>Sunlight</th><th>Percentage</th></tr><tr><td>7</td><td>2.0</td></tr><tr><td>8</td><td>1.9</td></tr><tr><td>9</td><td>2.0</td></tr><tr><td>10</td><td>1.6</td></tr><tr><td>11</td><td>3.2</td></tr><tr><td>12</td><td>6.5</td></tr></table>
Allow no / little effect between 7 – 10 (hrs) / 10 (hrs) is lower than 7 / 8 / 9 (hrs)

Allow (proportion of) cases only increases after 10 / 11 (hrs)

Allow reliable / valid as it is a long survey / lasts 25 years
Allow other countries / regions should be investigated

Allow other correct, relevant factors</td><td>4</td></tr>
</table>

(Total for Question 10 = 10 marks)

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