Mark Scheme (Results)

January 2023

Pearson Edexcel International GCSE

In Biology (4BI1) Paper 1BR

Question Number	Answer	Additional guidance	Mark
1(a)(i)	The only correct answer is B (bronchiole) A is incorrect as X is not an alveolus C is incorrect as X is not a bronchus D is incorrect as X is not the trachea		**1**

Question Number	Answer	Additional guidance	Mark
1 (a)(ii)	The only correct answer is A (diaphragm contracts and moves downwards) B is incorrect because the diaphragm does not move upwards C is incorrect because the diaphragm contracts D is incorrect because the diaphragm contracts		**1**

Question Number	Answer	Additional guidance	Mark
1 (b)(i)	An explanation that makes reference to three of the following: • inhaled air contains more oxygen (than exhaled air) / inhaled air contains less carbon dioxide than exhaled air / eq (1) • oxygen has diffused into the blood / carbon dioxide has diffused out of the blood (1) • oxygen is used by respiration / eq (1) • carbon dioxide is produced by respiration / eq (1) • nitrogen is not used / released (by respiration) / eq (1)	**Allow** oxygen has diffused into red blood cells **Allow** used in metabolic processes **Allow** produced by metabolic processes **Allow** not needed	**3**

Question Number	Answer	Additional guidance	Mark
1 (b)(ii)	An explanation that makes reference to two of the following: • exhaled air is a mixture of inhaled air and alveolar air / eq (1) • no gas exchange occurs in the trachea / bronchi / bronchioles / eq (1) • gas exchange (only) occurs at the alveoli (1)	**Allow** some air is breathed straight out / some air does not reach the alveoli / some air remains in bronchi / some air remains in trachea **Allow** diffusion of oxygen / carbon dioxide occurs in alveoli **Allow** movement of oxygen into blood / movement of carbon dioxide out of blood (only) occurs in the alveoli	**2**

(Total for Question 1 = 7 marks)

Question Number	Answer	Additional guidance	Mark
2(a)(i)	The only correct answer is C (protein) A is incorrect because viruses do not contain cellulose B is incorrect because viruses do not contain chitin D is incorrect because viruses do not contain starch		**1**

Question Number	Answer	Additional guidance	Mark
2 (a)(ii)	• x 76, 700 or 77000 (3) **Allow** range between 73 000 up to 80 000 (3 marks)	**One mark** for correct measurement of length (between 22 and 24 mm) OR **One mark** for correct conversion of mm (or cm) to μm / or reverse for 0.3 OR **One mark** for correct division by 0.3 (1) **Two marks** for 23 000 (allow range between 22 000 and 24 000) **Two marks** for 76.667 (and allow range between 73.33 to 80) **Allow two marks** for correct method from wrong initial measurement Correct answer with no working gains full marks	**3**

Question Number	Answer	Additional guidance	Mark
2 (b)	An explanation that makes reference to three of the following: • less / no light (energy) absorbed / taken in / eq (1) • (less) photosynthesis (1) • (less) glucose (1) • (less) starch / cellulose / less energy (for growth) / less ATP made / less active transport / (less glucose so) less respiration / eq (1)	**Allow** chlorophyll / chloroplasts absorb light **Ignore** energy **produced** **Allow** less protein synthesis / fewer amino acids made	**3**

(Total for Question 2 = 7 marks)

Question Number	Answer	Mark
3 (a)(i)	The only correct answer is A (aphid) B is incorrect because blackbirds are secondary / tertiary consumers C is incorrect because foxes are secondary / tertiary / quaternary consumers D is incorrect because oak trees are producers	**1**

Question Number	Answer	Mark
3 (a)(ii)	The only correct answer is D (all of the different species in the area) A is incorrect because it describes an ecosystem B is incorrect because it describes a population C is incorrect because it describes an ecosystem	**1**

Question Number	Answer	Additional guidance	Mark
3 (b) (i)	An answer that makes reference to the following: • symmetrical pyramid with correct shape (1) • pyramid labelled (1) • pyramid bars drawn to scale (1)	Pyramid should be narrow at base, wider in middle and narrow at top **Allow** asymmetric pyramids +/- 1 small square Bar heights should be the same	**3**

Question Number	Answer	Additional guidance	Mark
3 (b)(ii)	100 (kJ) (2)	Allow one mark for 2000 **or** ÷ 20 Correct answer with no working gains full marks	**2**

Question Number	Answer	Additional guidance	Mark
3 (b)(iii)	An explanation that makes reference to three of the following: • not all organisms are eaten / some parts not eaten / eq (1) • energy is lost due to respiration / heat loss / movement / eq (1) • some die / decompose / eq (1) • some is not digested / absorbed / some is egested / some lost as faeces / eq (1) • energy lost as excretion / urea / eq (1)	Excrete faeces alone / excrete undigested food = 1 mark	**3**

(Total for Question 3 = 10 marks)

Question Number	Answer	Mark
4 (a)(i)	The only correct answer is B (carbon, hydrogen, and oxygen only) A is incorrect because carbohydrates also contain oxygen C is incorrect because carbohydrates do not contain nitrogen D is incorrect because carbohydrates do not contain nitrogen	**1**

Question Number	Answer	Additional guidance	Mark
4 (a)(ii)	A description that makes reference to two of: • add biuret solution (1) • lilac / purple / pink colour (1)	**Allow** potassium / sodium hydroxide and copper sulfate other tests for protein **Allow** correct use of clinistix /uristix xanthoproteic test / ninhydrin with correct answer for two marks	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	• 1254(.4) / 1250 / 1300 (g) (2)	One mark for 5.6 **or** × 224 **or** 1400 ÷ 250 Correct answer with no working gains full marks	**2**

Question Number	Answer	Additional guidance	Mark
4 (b)(ii)	An answer that makes reference to five of the following points:		**5**
	• rice has less **protein** (than cow's milk) (1)	**Allow** soy has more protein / same protein (as cow's milk) / eq	
	• lack of protein / rice, could lead to less growth / repair / eq (1)	**Allow** converse for soy **Allow** rice could cause kwashiorkor / marasmus	
	• soy / rice has **less fat** than cow's milk / soy has more fat than rice / eq (1)	**Allow** soy / rice does not have enough fat	
	• soy / rice has **less energy** (than cow's milk) / rice has more energy than soy / soy has less energy than rice / eq (1)	**Allow** soy / rice do not have enough energy	
	• soy has **less carbohydrate** (than cow's milk) / rice has more carbohydrate than soy / rice has more carbohydrate (than cow's milk) / eq (1)	**Allow** rice has too much carbohydrate	
	• (less energy means) children may be less active / respire less / get tired easily / eq (1)		
	• rice has very little / less / not enough calcium (1)	**Allow** converse for soy	
	• lack of calcium / rice, could lead to rickets / weak bones teeth / eq (1)	**Allow** converse for soy	
	• (overall) soy is closer to cow's milk compared with rice / soy is a better substitute than rice / eq (1)	**Allow** soy is a suitable replacement	

(Total for Question 4 = 10 marks)

Question Number	Answer	Additional guidance	Mark
5 (a)	• it is a control (experiment) / to compare the results / check that change is due to the treatments / eq (1)	**Allow** see the difference / to see if any other factors affected the results / to see if there was a change without treatments / eq	**1**

Question Number	Answer	Additional guidance	Mark
5 (b)	• linear scales that use at least half grid (1) • both axes labelled (as **months** and **number of ants)** (1) • points plotted correctly (1) • points joined with straight lines (1) • key / lines labelled (1)	Ignore no treatment line **Allow** graph scales that use half grid with no treatment line +/- half square Bar chart loses line mark No line mark if extrapolated	**5**

Question Number	Answer	Additional guidance	Mark
5 (c)	A description that makes reference to two of the following: • decrease and an increase (1) • increases from 6 months (1)	**Allow** goes up from 12 months **Allow** decreases until 6 months	**2**

Question Number	Answer	Additional guidance	Mark
5 (d)	An answer that makes reference to five of the following: • with no treatment red fire ants increase (1) • both treatments / pesticide and pesticide + phorid flies reduce number of red fire ants (over first 6 months) / eq (1) • when using pesticides (alone) ants increase (later) / when using phorid flies ants do not increase / level off / eq (1) • when population is constant, reproduction rate equals death rate / predation / eq (1) • using (pesticides and) phorid flies / biological control lasts longer / is a long-term solution / only needs to be done once / eq (1) • phorid flies will breed / reproduce (for longer time) / eq (1) • pesticides wear off / wash off / stop working / eq (1) • fire ants mutate / eq (1) • (fire ants) become resistant (to the pesticides) / eq (1) • natural selection occurs / eq (1)	**Allow** refs to biological control for phorid flies and not biological control for pesticides Can piece together **Allow** pesticides reduce number in both treatments **Allow** survive and reproduce / pass allele on to next generation	**5**

(Total for Question 5 = 13 marks)

Question Number	Answer	Additional guidance	Mark
6	• plasma (1) • insulin (1) • pancreas (1) • liver / muscles (1) • glycogen (1) • (positive) phototropism (1) • Auxin/ I.A.A (1)	**Allow** islets of Langerhans / beta cells **Allow** named muscles **Reject** glucagon	**7**

(Total for Question 6 = 7 marks)

Question Number	Answer	Mark
7 (a)	The only correct explanation is B (6 and 12) A is incorrect because the root cell will not have 6 chromosomes C is incorrect because the pollen grain will not have 12 chromosomes D is incorrect because the pollen grain will not have 12 chromosomes	**1**

Question Number	Answer	Additional guidance	Mark
7 (b)	An explanation that makes reference to four of the following: (mark in pairs) • anthers hang outside / long / hinged filament / eq (1) • so blow pollen in the wind / eq (1) • stigma is feathery / hairy / hangs out of flower / eq (1) • to catch pollen / eq (1) • petal is small / not coloured / no nectary in flower (1) • as insects are not attracted to it / eq (1) • pollen is light / dust like / produced in large quantities (1) • so easily carried by wind (1)	**Allow** stamens **Ignore** scents	**4**

Question Number	Answer	Additional guidance	Mark
7 (c)(i)	percentage / % of tubes that grow / number of / how many grow /eq (1)		**1**

Question Number	Answer	Additional guidance	Mark
7 (c)(ii)	An explanation that makes reference to three of the following: • fewer (pollen tubes) grow when self-pollinated / more (pollen tubes) grow when cross pollinated / eq (1) • (cross pollination) produces (more) genetic variation / eq (1) • (so that) natural selection can occur / for natural selection to act on / eq (1) • some plants will have (different) adaptations / will have an advantage / are more adaptable / can survive different weather / eq (1)	**Allow** fewer grow when from same plant / more grow when from different plants / eq **Allow** some will have a selective advantage for 2 marks	**3**

Question Number	Answer	Additional guidance	Mark
7 (d)(i)	• mitosis (1)		**1**

Question Number	Answer	Additional guidance	Mark
7 (d)(ii)	An answer that makes reference to two of the following: • plants will be genetically identical / have same gene / eq (1) • plants will have same characteristics / phenotype / eq (1) • many are produced / quick / eq (1) • can be produced at any time of year / eq (1)	**Allow** favourable characteristics retained **Allow** high yield	**2**

(Total for Question 7 = 12 marks)

Question Number	Answer	Additional guidance	Mark
8 (a)(i)	brain / named part of brain/ spinal cord/ eq (1)	Ignore neurons	**1**

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	A description that makes reference to four of the following points: • receptor receives / senses / detects (object) / eq (1) • impulse (1) • (impulse moves along) sensory neurone to CNS / spinal cord / relay neurone (1) • (chemical diffusion of) neurotransmitters across synapse (1) • motor neurone to effector / muscle (1) • (muscle) <u>contracts</u> (1)	**Ignore** signal / message	**4**

Question Number	Answer	Mark
8 (b)(i)	The only correct answer is B (XY) A is incorrect because XX is female C is incorrect because males have one X chromosome D is incorrect because males have one X chromosome	**1**

Question Number	Answer	Mark
8 (b)(ii)	The only correct answer is D (6) A is incorrect because 6 dogs must be heterozygous B is incorrect because 6 dogs must be heterozygous C is incorrect because 6 dogs must be heterozygous	**1**

Question Number	Answer	Additional guidance	Mark
8 (b)(iii)	An answer that makes reference to the following points: • both parents identified as Nn and Nn (1) • gametes as N or n (for both parents) (1) • offspring identified as NN, Nn, Nn, nn (1) • (probability determined as) 0.125 / 1/8 / 12.5 % (1)	**Allow** other letters **Allow** Punnet square ECF for mp2, 3, 4	**4**

Question Number	Answer	Additional guidance	Mark
8 (b)(iv)	An explanation that makes reference to three of the following points: • do a test cross to identify dogs that are NN / homozygous (dominant) / eq (1) • breed using dogs with no family history of sensory neuropathy / eq (1) • mate dogs that do not have sensory neuropathy / do not breed from dogs with sensory neuropathy / eq (1) • only allow homozygous dominant dogs to breed / breed with homozygous dominant dogs (1) • select / mate / breed from offspring that do not have sensory neuropathy / are homozygous dominant / eq (1) • repeat over several generations / eq (1)	**Allow** mate dogs that did not produce any offspring with sensory neuropathy	**3**

(Total for Question 8 = 14 marks)

Question Number	Answer	Additional guidance	Mark
9 (a)(i)	• hepatic portal vein (1)		**1**

Question Number	Answer	Mark
9 (a)(ii)	The only correct answer is B (X) A is incorrect because W is the pulmonary artery C is incorrect because Y is the aorta D is incorrect because Z is the hepatic portal vein	**1**

Question Number	Answer	Additional guidance	Mark
9 (b)	An answer that makes reference to two of the following points: • (V / vein has) thin(ner) wall (1) • (V / vein has) less / thin muscle (1) • (V / vein has) fewer elastic fibres / less elastic (1) • (V / vein has) valves (present) (1) • (V / vein has) wide(r) lumen / space / hole / eq (1)	**Allow** vena cava for V and aorta for Y **Allow** converse for aorta (Y) Y has thicker wall Y has more muscle Y has more elastic Y does not have valves Y has a narrow lumen	**2**

Question Number	Answer	Additional guidance	Mark
9 (c)(i)	An answer that makes reference to two of the following points: • obesity / eq (1) • diabetes (1) • high (saturated) fat diet / high cholesterol / eq (1) • high salt diet / eq (1) • low exercise / eq (1) • smoking / alcohol (1) • stress / eq (1) • age (1)		**2**

Question Number	Answer	Additional guidance	Mark
9 (c)(ii)	An answer that makes reference to four of the following points: • increasing blood pressure increases deaths / eq (1) • Northern / Eastern Europe have a steep / big increase (as blood pressure increases) / Japan has less / low increase / steady increase (as blood pressure increases) / eq (1) • Japan has lowest number of deaths (at all blood pressures) / Northern / Eastern Europe has highest / Japan has lower death rate / eq (1) • (Northern / Eastern) Europe has more deaths (compared with Japan) when blood pressure is healthy / below 130 / eq (1) • decrease in number of deaths in Eastern Europe from 120 to 130 a.u. / at 130 / eq (1) • Japan may have lower death rates due to genetics / heredity / eq (1) • people in Japan may have better diet / healthy lifestyle / more exercise / less stress / less smoking / less obesity (so reduces deaths or heart disease) / eq (1) • no idea of sample sizes / no record of other factors / age / sex / lifestyle / diet / exercise / smoking / data / eq (1)	**Allow** increased blood pressure has less effect in Japan **Allow** converse for Japan **Allow** anomaly at 130 a.u. **Allow** converse for Europe **Allow** different regions may have different genetic factors **Allow** converse for Europe **Allow** different regions may have different diets / stress / smoking / eq **Allow** data not at same blood pressures for each country	**4**

(Total for Question 9 = 10 marks)

Question Number	Answer	Additional guidance	Mark
10 (a)	• $6CO_2 + 6H_2O$ (1) • $C_6H_{12}O_6$ (1)	**Allow** in either order	**2**

Question Number	Answer	Additional guidance	Mark
10 (b)(i)	An answer that makes reference to two of the following points: (mark in pairs) • temperature (1) • use a water bath / eq (1) OR • pH (1) • use a buffer (1)		**2**

Question Number	Answer	Additional guidance	Mark
10 (b)(ii)	An explanation that makes reference to the following points: • as distance (of lamp) increases, light (intensity) decreases / eq (1) • decreasing light intensity / increasing distance (at either concentration), decreases (rate of) photosynthesis / number of bubbles / eq (1) • as less energy (is absorbed) / eq (1) • with 5% solution there is no change in bubble production (from 5 cm) up to 15 cm / rate levels off between 15 cm and 5 cm / eq (1) • with 5% solution carbon dioxide is the limiting factor (between 5 cm and 15 cm) / carbon dioxide does not limit the rate of photosynthesis in the 10 % solution / eq (1) • light is a limiting factor (at both concentrations) for distances at / over 15 cm (1)	**Allow** converse **Allow** converse **Allow** converse **Allow** rate is constant until 20 cm / rate decreases after 15 cm **Allow** reducing carbon dioxide concentration reduces the rate as carbon dioxide is a limiting factor **Allow** light is the limiting factor for the 10 % solution **Allow** light is not the limiting factor up to 15 cm in the 5 % solution	**4**

Question Number	Answer	Additional guidance	Mark
10 (b)(iii)	An answer that makes reference to the following points: • (collect / measure) volume (1) • using a measuring cylinder / syringe / burette / eq (1)	 **Allow** measure in cm^3 / eq **Allow** graduated test tube / test tube with scale / height of bubble in test tube	**2**

Question Number	Answer	Additional guidance	Mark
10 (b)(iv)	A description that makes reference to two of the following points: • repeat (1) • calculate means / averages (1) • identify / remove anomalies / check that results are concordant / eq (1)		**2**

(Total for Question 10 = 12 marks)

Question Number	Answer	Additional guidance	Mark
11 (a)	A description that makes reference to the following points: • restriction enzymes cut out (protease) gene / cut plasmid / cut DNA (1) • ligase joins / combine / glue (protease) gene plasmid / DNA (1)		**2**

Question Number	Answer	Additional guidance	Mark
11 (b)	An answer that makes reference to the following points: • C: range of at least three temperatures / use a wide range of temperatures (1) • O: same concentration of enzyme / mass of washing powder / type of washing powder / type of enzyme / eq (1) • R: repeats (1) • M1: measure area / size of stain / mass of stain / colour of stain / mass of protein / eq (1) • M2: stated time period (1) • S1 same pH / water volume / washing movements / same type of material / clothing / size of material / eq (1) • S2 same mass of protein / area of protein / type of protein stain / same blood / same named protein / eq (1)	**Allow** amount of washing powder **Ignore** amount of stain **Allow** M1 and M2 for time taken to remove stain (2 marks) **Allow** times between 10 minutes and 24 hours **Allow** same concentration of stain	**6**

(Total for Question 11 = 8 marks)