Mark Scheme (Results)

January 2023

Pearson Edexcel International GCSE
In Biology (4BI1)
Paper 2B

Question Number	Answer	Additional guidance	Mark
1(a)	9.5×10^8 (2)	**Allow** 9.48×10^8 **Allow** 950 000 000 **or** 948 000 000 **or** 9.50 / 9.48 with wrong power for standard form for **one mark** e.g. 95×10^7 correct answer gains full credit	**2**

Question Number	Answer	Additional guidance	Mark
1 (b)	carbon dioxide / CO_2 / water (vapour) / H_2O (1)		**1**

Question Number	Answer	Additional guidance	Mark
1 (c)	An explanation that makes reference to four from: • 40 °C (temperature) (1) • more particle movement / more (kinetic) energy / faster diffusion / eq (1) **OR** • long tubing / coiled tubing / eq (1) • to increase / large surface area / eq (1) **OR** • thin wall / thin membrane / eq (1) • to decrease diffusion path / short diffusion distance / eq (1) **OR** • circulating / moving dialysis fluid / eq (1) • to maintain diffusion gradient / concentration gradient / eq (1) **OR** • no urea (in dialysis fluid) (1) • (so there is a) concentration / diffusion gradient / eq (1)	**mark in pairs** **Allow** warm / body temperature **Allow** large surface area (1) for (fast) diffusion (1) **Allow** short distance through membrane for diffusion = two marks **Allow** fluid is pumped **Allow** high to low concentration	**4**

Question Number	Answer	Additional guidance	Mark
1 (d)(i)	A (Bowman's capsule) is the only correct answer *B is incorrect as ultrafiltration does not occur at the collecting duct* *C is incorrect as ultrafiltration does not occur at the distal convoluted tubule* *D is incorrect as ultrafiltration does not occur at the loop of Henle*		**1**

Question Number	Answer	Additional guidance	Mark
1(d)(ii)	A description that makes reference to two of the following: • selective reabsorption (1) • in proximal (convoluted) tubule / PCT (1) • active transport / uses energy / uses ATP (1) • against (concentration) gradient (1)		**2**

Question Number	Answer	Additional guidance	Mark
1(d) (iii)	A (renal artery / ureter) is the only correct answer *B is incorrect because the urethra does not exit the kidney* *C is incorrect because the renal vein does not bring blood into the kidney* *D is incorrect because the renal vein does not bring blood into the kidney*		**1**

Question Number	Answer	Additional guidance	Mark
1 (e)	An explanation that makes reference to three of the following: • osmoreceptors / hypothalamus, detects high salt concentration in blood / lower water potential in blood / eq (1) • (pituitary) releases (more) ADH (1) • (nephron) cells / collecting duct more permeable (1) • (more) water is reabsorbed / (more) water absorbed into blood /eq (1) • urine becomes more concentrated / lower volume of urine / eq (1)	**Allow** lower water concentration	**3**

Total 14 marks

Question Number	Answer	Additional guidance	Mark
2(a)(i)	C is the only correct answer *A is incorrect because it is the retina* *B is incorrect because it is the conjunctiva* *D is incorrect because it is the lens*		**1**

Question Number	Answer	Additional guidance	Mark
2 (a)(ii)	An explanation that makes reference to two of the following: • circular muscles <u>contract</u> (1) • radial muscles relax (1) • (so) pupil narrows / gets smaller / constricts / iris widens / eq (1)	**Ignore** ciliary	**2**

Question Number	Answer	Additional guidance	Mark
2 (b)(i)	• using one eye or both eyes / amount of eyes / number of eyes / eq (1)		**1**

Question Number	Answer	Additional guidance	Mark
2 (b)(ii)	An answer that makes reference one of: • light intensity / lighting / eq (1) • distance (from block) / eq (1) • size of pins / shape of pins / colour of pins / sideways distance between pins / number of pins / eq (1) • size of block / shape of block / angle of the block / size of grid / eq (1)		**1**

Question Number	Answer			Additional guidance	Mark
2 (b)(iii)		**Number of correctly identified pins**		**two marks** for all four correct **Allow one mark** for any **two** correct	**2**
		Using one eye	**Using both eyes**		
	Mode	3	6		
	Median	2	6		

Question Number	Answer	Additional guidance	Mark
2 (b)(iv)	An explanation that makes reference to three of: • better distance judgement (with two eyes) / better depth perception / poorer distance judgement with one eye / eq (1) • large area seen by <u>both eyes</u> / large overlapping visual field / eq (1) • to locate prey / catch prey / chase prey / see prey / eq (1) • do not need wide field of view as not preyed upon / do not need to see behind as not preyed on / eq (1)	**Allow** more pins were correct when using two eyes / higher mode / median when using two eyes / eq **Allow** converse for one eye **Ignore** larger field of view unqualified **Ignore** food **Allow** animal for prey	**3**

Total 10 marks

Question Number	Answer	Additional guidance	Mark
3 (a)	• a section / length of DNA that codes for a protein / polypeptide / chain of amino acids / eq (1)		**1**

Question Number	Answer		Additional guidance	Mark
3 (b)(i)	Cattle colour	Genotype	**Allow** RR, WW, WR **Allow** rr, ww, rw	**1**
	red	C^RC^R		
	white	C^WC^W		
	roan	C^WC^R / C^RC^W		

Question Number	Answer	Additional guidance	Mark
3 (b)(ii)	An answer that includes the following: • parental genotypes of C^WC^R and C^WC^R (1) • parental gametes of C^W or C^R (and C^W or C^R) (1) • offspring as 1 C^RC^R 2 C^WC^R 1 C^WC^W (1) • probability calculated as 0.25 / ¼ / 25% (1)	**Allow** WR and WR **Allow** Cc and Cc **Allow** W or R **Allow** C or c **Allow** 1 RR, 2 WR, 1 WW **Allow** 1 CC (red) and 1 cc (white) 2 Cc (roan) **Allow** different letters **ECF** for wrong parental genotypes for MP2 and MP3 only	**4**

Question Number	Answer	Additional guidance	Mark
3 (c)(i)	An answer that makes reference to two of the following: • height is <u>polygenic</u> (1) • so multiple / many / more than one gene / different genes control height / eq (1) • animals may get a mixture of dominant and recessive <u>alleles</u> for <u>different</u> genes / eq (1) • environment / nutrition may affect height / eq (1)	**Allow** hair colour is <u>monogenic</u> **Allow** only one gene for hair colour **Ignore** multiple alleles **Allow** coat colour has no environmental effect / is entirely genetic	**2**

Question Number	Answer	Additional guidance	Mark
3 (c)(ii)	A description that makes reference to two of the following: • select cattle that are taller and mate them / eq (1) • select offspring (that are taller) and mate them / eq (1) • repeat (through generations) / eq (1)		**2**

Total 10 marks

Question Number	Answer	Additional guidance	Mark
4 (a)	An explanation that makes reference to two of the following: • plants will be <u>genetically</u> identical / same <u>genes</u> / will all have the <u>gene</u> / same DNA / eq (1) • <u>all</u> have same (saturated) fat / <u>all</u> have less (saturated) fat / eq (1) • (only one plant was made) and there were no others to breed with / eq (1) • no need to repeat genetic modification / eq (1) • fast method (to produce many) / can be produced any time of year / eq (1)	**Allow** no genetic variation **Allow** they are clones	**2**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	A description that makes reference to four of the following: • weigh beans / same mass of beans / (calculate) per gram of food / eq (1) • same volume of water / measure volume / same mass of water / stated volume of water / eq (1) • ignite bean / set fire, <u>and</u> hold under test tube / water / heat water / eq (1) • keep igniting until will no longer burn / burnt completely / eq (1) • measure temperature rise / start and end temp / start and highest temp / change in temp / eq (1) • repeats (1)	**Ignore** amount **Ignore** amount **Allow** hold bean at same distance from test tube If formula given, **allow** mp1, mp2 and mp5	**4**

Question Number	Answer	Additional guidance	Mark
4 (b)(ii)	An explanation that makes reference to one of the following: • wear eye protection / gloves / eq (1) • wear lab coat / tie back long hair / eq (1) • use a heat proof tile / place on safety flame when not using / use tongs / clamp test tube in stand / eq (1)		**1**

Question Number	Answer	Additional guidance	Mark
4 (b)(iii)	An explanation that makes reference to four of the following: • oxygen supply / oxygen gas inlet (1) • to ensure complete combustion / so burns fully / eq (1) **OR** • insulated coat / lid / insulation / eq (1) • to prevent heat loss / keep heat in / not affected by outside temp / eq (1) **OR** • stirrer / eq (1) • to provide even temperature / spreads heat around / eq (1) **OR** • large(r) volume of water / smaller surface area : volume ratio of water (1) • so less heat loss / eq (1) **OR** • burnt using ignition coil / ignition in the equipment / no need to move the burning bean / no need to relight / eq (1) • so less heat is lost / eq (1) **OR** • placed inside a steel container (1) • conducts / transfers heat to water / eq (1) **OR** • sample is surrounded by the water (1) • so more heat transferred to water / less heat lost / eq (1)	**Mark in pairs** **Allow** energy loss for heat loss throughout insulated coat and ignition coil in equipment reduces heat loss = 4 marks **Allow** lit inside the container	**4**

Total 11 marks

Question Number	Answer	Additional guidance	Mark
5 (a)(i)	• 48 (2)	**One mark** for division by 25 **or** 41200 – 40000 **or** 1200 correct answer gains full credit	**2**

Question Number	Answer	Additional guidance	Mark
5 (a)(ii)	An explanation that makes reference to three of the following: • carbon dioxide is a greenhouse gas / causes greenhouse effect / increased reflection of radiation / global warming / increased temperature / heat trapped / eq (1) • ice cap melting / glacier melting / sea level rise / flooding / habitat loss / eq (1) • climate change / weather pattern changes / droughts / storms / extreme weather / desertification / eq (1) • extinctions / change in distribution of organisms / migration / pest spread / food chains affected / ecosystem loss / eq (1) • ocean acidification / coral reef bleaching / eq (1)		**3**

Question Number	Answer	Additional guidance	Mark
5 (b)(i)	An explanation that makes reference to three of the following: • decomposition / decomposers / eq (1) • (decomposer) bacteria / fungi (1) • (organic waste) to ammonia / ammonification (1) • ammonium to nitrite / nitrite converted to nitrate (1) • nitrification / nitrifying bacteria (convert ammonium to nitrite / nitrite to nitrate / ammonium to nitrate) (1)	**Ignore** breakdown **Allow** decomposer bacteria for 2 marks **Allow** ammonia **Ignore** ammonium to nitrate	**3**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An explanation that makes reference to one of the following: • does not consider plants / bacteria / fungi / protoctists / eq (1) • does not take into account the population sizes / numbers of organisms / abundance / some species may have different numbers / eq (1) • some species may be seasonal / migrate (1)		**1**

Question Number	Answer	Additional guidance	Mark
5 (b) (iii)	An explanation that makes reference to four of the following: • as nitrate increases, diversity decreases / deforestation reduces biodiversity /eq (1) • soil erosion / run off / leaching of minerals / leaching of nitrates / release of organic waste into river / eq (1) • eutrophication occurs / algae grow / (river) plants grow / eq (1) • less light penetration / eq (1) • death of plants / less photosynthesis (1) • (dead algae / organic waste) decomposes (1) • less oxygen / eq (1) • due to (bacterial) respiration (1) • fish / animal species die (1) • loss of food / disruption of food chains / loss of nesting sites / habitat / eq (1)	**Allow** converse **Allow** leaching occurs **Ignore** nutrients	**4**

Total 13 marks

Question Number	Answer	Additional guidance	Mark
6 (a)	B (bacteria, fungi, and protoctists) is the only correct answer *A is incorrect because protoctists also has pathogens* *C is incorrect because fungi also has pathogens* *D is incorrect because bacteria also has pathogens*		**1**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	An explanation that makes reference to three of the following: • weak(er) / inactivated virus / inactive pathogen / microbe / eq (1) • antigens (in vaccine) (1) • lymphocytes (recognise antigens) (1) • memory cells (1) • faster / sooner / larger number of antibodies made (when virus encountered again) / secondary immune response occurs (if virus encountered again) (1)	**Ignore** small amount / dead virus **Allow** wbc **Ignore** phagocyte	**3**

Question Number	Answer	Additional guidance	Mark
6 (b)(ii)	An answer that makes reference to four of the following: • rabies cases are high <u>before vaccination</u> / before 1947 / eq (1) • (continuous) fall in cases <u>after vaccination</u> / after 1940s / after 1950s (1) • cases of rabies, plateau / level off (from 1950s / 1960s) (1) • correlation between rabies cases in dogs and humans / rabies cases in dogs and humans fall at same times / eq (1) • human rabies cases fluctuate / there are still some cases of human rabies / human rabies has not been eradicated / eq (1) • (most) human rabies must have been from dogs / vaccinated dogs do not pass rabies on to humans / eq (1) • some human rabies cases from other animal species / wild dogs / wild animals / eq (1) • data is reliable as it is for a long time / large area / whole country / eq (1)	**Allow** for human or dog **Allow** for human or dog **Allow** for human or dog **Allow** cases in dogs and humans both fall <u>after vaccination</u> **= 2 marks** **Allow** fewer dogs can pass on rabies to humans / vaccination means fewer hosts for virus / virus can't reproduce in vaccinated dogs	**4**

Question Number	Answer	Additional guidance	Mark
6 (b)(iii)	A description that makes reference to four of the following points: • ribosomes (bind to RNA) (1) • translation occurs (1) • triplet / codon on RNA codes for an amino acid / eq (1) • tRNA binds to RNA / anticodon binds to codon / eq (1) • tRNA brings amino acids / eq (1) • amino acids are joined together (to make protein) / forms a chain of amino acids / peptide bonds form / polypeptide forms / eq (1)	**Allow** mRNA for the vaccine RNA **Ignore** to make protein unqualified	**4**

Total 12 marks