

Mark Scheme (Results)

January 2022

Pearson Edexcel International GCSE
In Biology (4BI1) Paper 1BR and Science (Double Award) (4SD0) 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)	A - 2 *B is incorrect as there are not 3 secondary consumers* *C is incorrect as there are not 4 secondary consumers* *D is incorrect as there are not 5 secondary consumers*	**1**

Question Number	Answer	Mark
1 (a)(ii)	Acacia / plant → (desert) rat → fennec / fox → monitor / lizard → hawk (1)	**1**

Question Number	Answer	Additional guidance	Mark
1 (a)(iii)	An explanation that makes reference to three of the following: • (energy is lost due to) indigestible parts / faeces / not absorbed / eq (1) • (energy is lost due to) excretion / metabolic waste / urine / eq (1) • (energy is lost due to) organisms / parts of organisms that are not consumed /eq (1) • (energy is released) in respiration / by heat loss / in active transport / due to metabolism (1) • (energy is lost due to) movement (1)	**Accept** some organisms / food not eaten Accept loss to death / decay	**3**

Question Number	Answer	Mark
1 (b)	An explanation that makes reference to four of the following: • mutation / genetic variation (1) • (the fox has / ears have) large surface area to lose heat / keep body cool (1) • (which) enables survival (1) • breeding occurs / (fox) produces offspring (1) • passes on alleles / genes (for ear shape) (to next generation) (1)	**4**

Total for Question 1 = 9 marks

Question Number	Answer	Mark
2(a)(i)	B – cornea *A is incorrect as X is not the conjunctive* *C is incorrect as X is not the lens* *D is incorrect as X is not the retina*	**1**

Question Number	Answer	Mark
2(a)(ii)	A – contracted loose B is incorrect as the ligaments would be loose C in incorrect as the muscles would be contracted D in incorrect as the muscles would be contracted	**1**

Question Number	Answer	Additional guidance	Mark
2(a)(iii)	An explanation that makes reference to 3 of the following: • pupil widens / dilates / gets bigger (1) • radial muscles contract (1) • circular muscles relax (1)	**Ignore** it / Y	**2**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	27 m/s (3)	**One Mark:** 2.5 ÷ 0.005 or 25 ÷ 0.005 or 0.25 (m) or 5000 **Two marks:** 50 (m/s) **Award full marks for correct answer**	**3**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that makes reference to two of the following: • (more) synapses are present / eq (1) • which transmit by (chemical) diffusion (1) • of neurotransmitters (1)	**A** gaps / clefts present	**2**

Total for Question 2 = 9 marks

Question Number	Answer	Mark
3(a)(i)	A mitochondrion *B is incorrect because the nucleus does not carry out photosynthesis* *C is incorrect because ribosomes carry out protein synthesis* *D is incorrect because the vacuole sores sap*	**1**

Question Number	Answer	Mark
3(a)(ii)	B chitin A is incorrect because fungal cell walls are not made of cellulose C is incorrect because fungal cell walls are not made of glycogen D is incorrect because fungal cell walls are not made of starch	**1**

Question Number	Answer	Mark
3 (a)(iii)	A cell membrane B is incorrect because prokaryotes do not contain mitochondria C is incorrect because prokaryotes do not contain nuclei D is incorrect because prokaryotes do not have vacuoles	**1**

Question Number	Answer	Additional guidance	Mark
3 (b)(i)	80 % (2)	one mark for 20 **Award full marks for correct answer**	**2**

Question Number	Answer	Additional guidance	Mark
3 (b)(ii)	An explanation that makes reference to two of the following: • (yeast) respires / fermentation / respiration (1) • producing / carbon dioxide (1) • (carbon dioxide) bubbles become trapped / stuck / inflate in dough (1)	**Reject** oxygen produced	**2**

Question Number	Answer	Additional guidance	Mark
3 (b)(iii)	An explanation that makes reference to two of the following: at 25 °C: • (kinetic) energy lower / molecules move slower / eq (1) • fewer collisions / fewer enzyme substrate complexes / further away from **<u>enzyme</u>** optimum / eq (1) • less carbon dioxide / gas released / eq (1)	**Accept** converse for 35 °C for all MPs	**2**

Question Number	Answer	Additional guidance	Mark
3 (b)(iv)	An explanation that makes reference to two of the following: at 35 °C • <u>enzymes</u> not denatured (1) • substrate fits into active site / active site shape not changed / eq (1) • so respiration continues / more carbon dioxide produced / yeast cells are alive / eq (1)	**Accept** converse for 65 °C for all MPs	**2**

Total for Question 3 = 11 marks

Question Number	Answer	Mark
4(a)(i)	An explanation that makes reference to the following: • peristalsis (1) • (waves of) muscular <u>contractions</u> (1)	**2**

Question Number	Answer	Mark
4 (a)(ii)	C liver A is incorrect because bile is not made in the stomach B is incorrect because bile is not made in the pancreas D is incorrect because bile is not made in the gall bladder	**1**

Question Number	Answer	Mark
4 (a)(iii)	An explanation that makes reference to three of the following: • bile neutralises stomach acid / food / chyme / eq (1) • to set the optimum pH for <u>enzymes</u> (1) • bile emulsifies fats / breaks up fats into smaller droplets / eq (1) • to increase the surface area (for digestion) (1)	**3**

Question Number	Answer	Additional guidance	Mark
4 (b)(i)	0.11 (2)	One mark for 2.2 or 8 - 5.8 One mark for dividing by 20 **Award full marks for correct answer**	**2**

Question Number	Answer	Additional guidance	Mark
4 (b)(ii)	An explanation that makes reference to two of the following: • (without inhibitor) pH falls faster / falls more / becomes more acidic (without inhibitor) / bigger change in pH / eq (1) • because fats are broken down into fatty acids (and glycerol) (1) • inhibitor causes less acid to be produced (1)	**Accept** converse **Accept** converse	**2**

Question Number	Answer	Additional guidance	Mark
4 (b) (iii)	A discussion that makes reference to five of the following: 1. lower blood lipid / fat when taking inhibitor / eq (1) 2. (because) less fat is absorbed (when taking inhibitor) (1) 3. fat needs to be broken down into fatty acids (to be absorbed) (1) 4. less fat would be stored / deposited around the body (1) 5. one person who did not take inhibitor did not have increase in lipid / fat in blood / eq (1) 6. two / more / some suffered side effects when taking the drug / eq (1) 7. side effects may be due to the olive oil / may not be caused by the drug (1) 8. sample size is only very small / eq (1) 9. there is no information about diet / other food / activity / eq (1) 10. no information on age / sex / health / diabetes / eq (1) 11. no information on change of mass of people / experiment does not actually assess obesity / / eq (1) 12. starting levels of blood lipid were equal (so were controlled) (1)	**Accept** drug causes side effects / abdominal pains **Accept** one person had side effects without drug **Accept** other factors may affect obesity	**5**

Total for Question 4 = 15 marks

Question Number	Answer	Mark
5 (a)(i)	An explanation that makes reference to two of the following: • <u>oxygen</u> is required (1) • for respiration (1)	**2**

Question Number	Answer	Additional guidance	Mark
5 (a)(ii)	An explanation that makes reference to two of the following: • to kill pathogens / other microorganisms / sterilises the fermenter / eq (1) • to prevent contamination (of the product) / competition (1) • steam condenses to water so does not affect product / taste/ flavour / eq (1)	**Accept** remove bacteria / eq Prevent bacterial contamination = 2 marks	**2**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	A graph that includes: • S scales linear and at least half page and axes the correct way around (1) • A both axes labelled with units (1) • L straight lines joining points (1) • P points correctly plotted (1) • K key / labelled GM and non-GM (1)	Lose line mark for bar chart Units: time in days and mass in kg **Ignore** extrapolation to zero Plots +/- half square	**5**

Question Number	Answer	Additional guidance	Mark
5 (b)(ii)	An answer that makes reference to two of the following: • GM fungus grows faster up to 20 days / before day 30 / eq (1) • (but) over 30 days, the non-GM fungus produces a higher final yield / GM fungus starts to level off after 20 days / non-GM fungus produces more over longer time (1) • GM fungus is better if product is required in a shorter time / non-GM fungus is better is product is required after longer time period (1)	**Accept** converse for all MPs **Accept** GM produces more mass over first 20 days / produces more product in short time **Accept** at 30 days GM fungus produces less yield than non-GM / grows slower / non-GM has higher yield over last new days	**2**

Question Number	Answer	Additional guidance	Mark
5 (b)(iii)	An answer that makes reference to five of the following: *Yes because:* 1. there is less fat in mycoprotein (1) 2. there is less cholesterol in mycoprotein (1) 3. less risk of heart disease / obesity / eq (1) 4. there is more fibre in mycoprotein so less risk of constipation / moves through gut / gut / eq (1) 5. mycoprotein has more calcium for bones / teeth / eq (1) *No because:* 6. mycoprotein has less protein (1) 7. for growth / muscle growth / eq (1) 8. mycoprotein has less iron so may be a risk of anaemia / less haemoglobin / fewer red blood cells / eq (1)	**Accept** other protein functions	**5**

Total for Question 5 = 16 marks

Question Number	Answer	Mark
6 (a)(i)	B is the only correct answer A is incorrect as ovulation does not occur in the oviduct C is incorrect as ovulation does not occur in the uterus D is incorrect as ovulation does not occur in the vagina	**1**

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

Question Number	Answer	Additional guidance	Mark
6 (b)(i)	X: oestrogen / estrogen (1) Y: progesterone (1)	**Accept** other correct names	**2**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An description that makes reference to two of the following: • repairs / thickens the uterus lining / endometrium / eq (1) • for implantation / eq (1)	**Accept** reduces FSH levels / eq (1) **Accept** stimulates release of LH / eq (1)	**2**

Question Number	Answer	Mark
6 (c)	An explanation that makes reference to three of the following: • villi providing a large surface area (1) • for diffusion / active transport (1) • capillaries bring / blood supply brings nutrients / remove(s) waste products / eq (1) • blood supply / capillaries / blood vessel to maintain a diffusion gradient (1) • close distance between mother's and fetal blood for short diffusion pathway (1)	**3**

Total for Question 6 = 9 marks

Question Number	Answer	Additional guidance	Mark
7(a)(i)	An explanation that makes reference to two of the following: • less pressure / reduced heart volume / less blood pumped (each beat) (1) • less oxygen pumped to <u>muscles</u> (1) • less respiration (1)	**Accept** lower stroke volume Less oxygenated blood to muscles = 2 marks	**2**

Question Number	Answer	Mark
7(a)(ii)	only one copy of an allele is needed to affect the phenotype / an allele that is always expressed (1)	**1**

Question Number	Answer	Additional guidance	Mark
7(a)(iii)	A genetic diagram that shows: • parent genotypes of Hh and hh (1) • gametes as H or h and h (or h) (1) • offspring as Hh, hh (1) • offspring in correct ratios (of 1:1) and phenotypes correctly identified (1)	**Accept** other letters Ecf maybe for mp2 and 3	**4**

Question Number	Answer	Mark
7(a)(iv)	0.25 / ¼ / 25%	**1**

Question Number	Answer	Additional guidance	Mark
7 (b)	An answer that makes reference to two of the following: • recessive alleles are not always expressed (in the phenotype) / recessive alleles are not expressed in heterozygous individuals / only expressed when homozygous / eq (1) • dominant alleles are always expressed (in the phenotype) / are expressed when one is present / eq (1) • cats with a dominant allele can be prevented from breeding / cats with a recessive allele cannot always stopped from breeding / eq (1)	**Accept** recessive alleles are hidden when a dominant allele is present / recessive alleles are only expressed when homozygous **Accept** possession of one dominant allele means that the phenotype is identified / dominant alleles are always identified in phenotype	**2**

Total for Question 7 = 10 marks

Question Number	Answer	Additional guidance	Mark
8(a)	$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$ (2)	one mark for incorrectly balanced equation	**2**

Question Number	Answer	Mark
8 (b)(i)	• repeats / find means / eq (1)	**1**

Question Number	Answer	Mark
8 (b)(ii)	• time taken (for leaf to rise) (1)	**1**

Question Number	Answer	Additional guidance	Mark
8 (c)	An explanation that makes reference to four of the following: • as distance increases, light intensity / energy decreases (1) • (as distance increases / as light intensity decreases) rate of photosynthesis decreases / is slower / eq (1) • so less oxygen is produced / eq (1) • oxygen is trapped in leaf and causes leaf discs to rise / eq (1) • when close to lamp another factor is limiting / light intensity is not limiting / eq (1) • limiting factor could be temperature / carbon dioxide concentration (1)	**Accept** converse for decreasing distance	**4**

Question Number	Answer	Mark
8 (d)	An explanation that makes reference to three of the following: • place leaf disc in boiling water (1) • heat / boil leaf in ethanol (1) • stain with iodine (1) • iodine stain will turn blue black with starch (1)	**3**

Total for Question 8 = 11 marks

Question Number	Answer	Additional guidance	Mark
9 (a)	4.6 (2)	one mark for 4.625 / 4.63 **Award full marks for correct answer**	**2**

Question Number	Answer	Additional guidance	Mark
9(b)	A discussion that makes reference to five of the following: *Agreement:* 1. (anaerobic digesters) release less CO_2 / methane (1) 2. release less CO (1) 3. (because less CO_2 / less methane) there is less greenhouse effect / global warming / eq (1) 4. so less ice caps melting / habitat loss / climate change / other effects / flooding / coral reef damage / eq (1) 5. (because less carbon monoxide) less damage to haemoglobin / carboxyhaemoglobin / eq (1) 6. so less effect on oxygen transport / eq (1) *Disagreement:* 7. (however) anaerobic digesters release more sulfur dioxide (1) 8. (causing) acid rain (1) 9. which causes deforestation / kills fish in lakes / eq (1)	**Accept** less ocean acidification / extreme weather / desertification **Accept** other correct biological consequences of acid rain	**5**

Total for Question 9 = 7 marks

Question Number	Answer	Mark
10 (a)(i)	The correct answer is: D trachea bronchus A is incorrect as Q is not a bronchiole B is incorrect as Q is not a bronchus C is incorrect as R is not a bronchiole	**1**

Question Number	Answer	Mark
10 (a)(ii)	An explanation that makes reference to three of the following: • S / diaphragm / it / muscle relaxes (1) • S / diaphragm moves up / becomes dome shaped (1) • volume decreases (1) • pressure increases (1)	**3**

Question Number	Answer	Additional guidance	Mark
10 (b)	An answer that makes reference to four of the following: • the (maximum) lung volume of people with lung disease is lower / less volume can be exhaled / less air exhaled (1) • people with lung disease cannot exhale as rapidly / eq (1) • less carbon dioxide removed / less oxygen taken in (1) • diffusion gradient (into blood) is less steep / eq (1) • less respiration (in cells) / more anaerobic respiration / more lactic acid accumulation / eq (1)	**Accept** converse for healthy lungs	**3**

Total for Question 10 = 7 marks

Question Number	Answer	Additional guidance	Mark
11	An answer that makes reference to six of the following: C: range of different light intensities / dark and light (1) O: same species / age of wood lice / eq (1) R: repeats / groups of woodlice (1) M1: measure distance moved (1) M2: over a set / stated time (1) S1 and S2: same humidity / temperature / oxygen / carbon dioxide / food / size of container / wood types / eq (2)	**Accept** for M1 and M2, time how long takes to move set distance	**6**

Total for Question 11 = 6 marks

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