Pearson Edexcel

Mark Scheme (Results)

January 2023

Pearson Edexcel International GCSE Biology (4BI1) Paper 1B and Science (Double Award) (4SD0) Paper 1B

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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 **C** V to P as V is anther and P is stigma A is not the answer as P is not anther and Q is not stigma B is not the answer as P is not anther and T is not stigma D is not the answer as it S not stigma	**1**

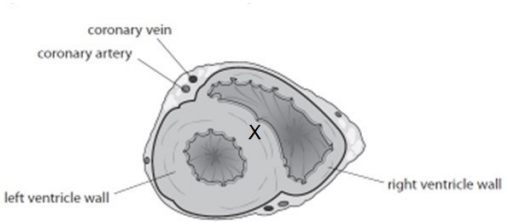
Question Number	Answer	Mark
1(a)(ii)	The only correct answer is **A** as Q is the style B is not correct as U is the filament C is not correct as V is the anther D is not correct as R is the petal	**1**

Question Number	Answer	Mark
1(a)(iii)	The only correct answer is **C** as T is the ovule A is not correct as P is the stigma B is not correct as S is the ovary D is not correct as V is the anther	**1**

Question Number	Answer	Additional guidance	Mark
1 (b)	An answer that makes reference to three of the following: • large <u>petals</u> /eq (1) • coloured <u>petals</u> / bright <u>petals</u> / scented <u>petals</u> (1) • stigma / style within flower / stigma sticky / eq (1) • stamen / anther within flower / eq(1) • nectary (1) • pollen large / sticky /eq (1)	allow converse ignore flower no / small petals green petals ignore coloured stigma / style outside flower / stigma feathery / hairy stamen outside flower / hinged / long filament no nectary ignore nectar small / dust / like	**3**

Question Number	Answer	Additional guidance	Mark
1 (c)	An explanation that refers to two of the following: • eaten by birds / animals / people / insects / eq (1) • disperse / taken / moved / carried to new area / elsewhere / eq (1) • egested / deposited / waste / defecate / thrown away / discarded / in faeces / eq (1)	 allow consume /consumers ignore excreted allow excrement	**2**

Total 8 marks

Question Number	Answer	Mark
2(a)(i)		**1**

Question Number	Answer	additional guidance	Mark
2(a)(ii)	An answer that makes reference to the following • coronary artery contains (more) oxygen / oxygenated (1) • coronary artery contains less carbon dioxide / no carbon dioxide (1)	No credit for pressure vein no / less oxygen / deoxygenated vein (more) CO_2	**2**

Question Number	Answer	additional guidance	Mark
2(a)(iii)	An explanation that makes reference to three of the following • (left wall) much thicker / eq (1) • more muscle / muscular (tissue) / eq (1) • (generates) more pressure / more force / eq (1) • pumps blood (all) around body / eq (1)	allow converse for each mp thinner less muscle less pressure /force ignore withstands pressure to lungs thicker muscle = mp1 and mp 2	**3**

Question Number	Answer	additional guidance	Mark
2(b)	An explanation that makes reference to four of the following 1. genetics / inheritance / some people inherit increased risk from parents eq (1) 2. high blood pressure (puts more strain on heart) / eq (1) 3. high fat diet / lipid / cholesterol / (blocks coronary artery walls) / eq (1) 4. smoking (raises blood pressure and increase chances of clots) / eq (1) 5. stress (raises blood pressure) / eq (1) 6. lack of exercise , (exercise reduces blood pressure and strengthens heart) / eq (1) 7. obesity / being overweight / diabetes (increase strain on heart) / eq (1)	allow converse for each mp Ign bad diet unqalified	**4**

Total 10 marks

Question Number	Answer	additional guidance	Mark
3(a)(i)	An answer that makes reference to five of the following 1. oat milk provides more energy kJ / calories / (per 225 g) / eq (1) 2. more energy less weight loss / idea of carbohydrate / fats not used so stored / so more weight gain/ eq (1) 3. oat provides more (saturated) fat / eq (1) 4. oat provides more carbohydrate / eq (1) 5. oat provides similar sugar / same sugar/eq (1) 6. oat provides more protein (required for growth) / eq (1) 7. oat milk provides more fibre (1) 8. for peristalsis /prevent constipation / eq 9. but balance diet required / depends upon other foods consumed / eq (1) 10. weight loss depends upon activity age / eq (1)	allow converse Idea of energy balance more consumed than used	**5**

Question Number	Answer	Mark
3(a)(ii)	An answer that makes reference to the following • allergy / allergic / lacks enzyme / lactase / lactose intolerant / wants reduced (saturated) fat diet / cow's milk contains more fat / are vegan / wants to avoid constipation as cow's milk has no fibre / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
3(b)	A description that makes reference to two of the following • Benedict's added / eq (1) • heated / eq (1) • red / green / yellow / orange / eq (1)	allow alternative test Fehlings or $CuSO_4$ and Na_2CO_3 allow Benedict's test for mp 1 allow clinistix / ursitix / glucose testing strip for mp 1 and correct colour change for mp 3 / brown	**2**

Question Number	Answer	Mark
3(c)	An explanation that makes reference to three of the following • <u>antibodies</u> (1) • (specific to / against / for) antigen / virus / bacterium / pathogen / eq (1) • <u>stick / clump / burst / label</u> bacteria / virus/ pathogen /eq (1) • <u>destroy / kill</u> bacteria / virus / pathogen / eq (1)	**3**

Total 11 marks

Question Number	Answer	Additional guidance	Mark
4(a)	calculation % dark-coloured moths in 1992 27÷ 36 × 100 = 75% % dark-coloured moths in 1998 9÷ 22 × 100 = 41% 75 - 41 = 34(%) (3) allow 34.1 or 34.09 etc	 allow 1 mark for 75 allow one mark for 41 or 40.9 full marks for correct answer no working	**3**

Question Number	Answer	Mark
4 (b)(i)	• Scale half grid and linear (1) • Lines straight and through all points (1) • Axis correct way round and labelled with number of moths (and year) (1) • Points correctly plotted within half a small square (1) • Key light-coloured and dark-coloured moths or lines labelled (1)	**5** No L if extrapolation (to 0) No L if bar chart

Question Number	Answer	additional guidance	Mark
4(b)(ii)	An answer that makes reference to five of the following 1. numbers of light increases / (decrease then) increase (1) 2. numbers of dark decrease (then increase) / eq (1) 3. overall total numbers of moths decrease (then increase)/ eq (1) 4. due to disease predation lack of food / eq (1) 5. at start / up until 1994 more dark than light moths / eq (1) 6. at end (from 1994) more light than dark moths (apart from 1996) / eq (1) 7. as less coal (used) / burning / pollution in city decreased / eq (1) 8. dark less camouflaged / cannot hide / light more/ better camouflaged / better adapted in unpolluted areas **OR** dark better adapted in polluted areas / eq (1) 9. easily seen by birds / predators / eq (1) 10. (better adapted) pass on allele / gene to offspring / eq(1)		**5**

Total 13 marks

Question Number	Answer	Mark
5(a)(i)	An explanation that makes reference to the following • no nucleus (1) • (so) no chromosomes (1)	**2**

Question Number	Answer	Mark
5(a)(ii)	• mitosis / mitotic (1)	**1**

Question Number	Answer	Mark
5(a)(iii)	An answer that includes • contains a Y chromosome / has X and Y chromosomes / only one X chromosome / 23 rd pair are different / 23 one big one small / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
5(b)(i)	An answer that makes reference to four of the following 1. karyotype 2 45 chromosomes / karyotype 1 46 chromosomes / only one in 23 rd pair / one less chromosome /eq (1) 2. karyotype 2 only 1 X / one sex chromosome / lacks an X or lacks a Y / eq (1) 3. so female karyotype as it lacks Y / eq (1) 4. does not undergo normal puberty/ delayed puberty eq (1) 5. does not develop secondary sexual characteristics / eq (1) 6. cannot release oestrogen / less oestrogen / eq (1) 7. cannot produce gametes / eggs / is infertile / cannot reproduce / eq (1) 8. slower repair of inner uterus lining/lining not being maintained (1) 9. may produce gametes that contain only 22 chromosomes / lack a sex chromosome / eq (1)	Fewer chromes Ignore 23 alone **Lacks a sex chromosome scores mp 1 and mp 2** allow examples breast development / height / growth spurt / body hair less fertile	**4**

Question Number	Answer	Mark
5(b)(ii)	• mutation / failure of chromosomes to separate / failure in meiosis / one of the sex chromosomes did not replicate (just prior to cell division) / eq (1)	**1**

Total 9 marks

Question Number	Answer	Additional guidance	Mark
6(a)(i)	A description that makes reference to the following • diffusion / movement of solvent / water through partially permeable membrane / eq (1) • from dilute to concentrated solution / high to low water potential / eq (1)	 allow semi-permeable/ selectively permeable allow from high concentration (of water)to low(er) concentration (of water) **allow** movement of water from high to low concentration across partially permeable membrane for mp 1 and mp 2	**2**

Question Number	Answer	Mark
6(a)(ii)	• tube contents / the liquid / the solution / the concentration / what is in the tube / eq (1)	**1**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	calculation = (2 × 3.14 x 0.25 x 5) + (2 × 3.14 × $(0.25)^2$) = 7.85 + 0.3925 = 8.2425 = **8.2 (cm^2) to 8.25** (2)	 allow 1 mark for 7.85 7.855 7.86 Or 0.39 0.393 0.3925 or 0.39275	**2**

		full marks for correct answer with no working	

Question Number	Answer	Mark
6(b)(ii)	An explanation that makes reference to the following • increases rate of osmosis / eq (1) • as more contact (between potato and water / solution) / more space / eq (1)	**2**

Question Number	Answer	Additional guidance	Mark
6(b)(iii)	• temperature / type of potato / eq (1)	ignore time / volume of solution mass of potato	**1**

Question Number	Answer	Mark
6(c)(i)	An explanation that makes reference to three of the following • **distilled water** (increases in mass) water enters potato from distilled water (1) • **air** (little change in mass) no movement of water / no osmosis / water evaporates / eq (1) • **sucrose solution** (decrease in mass) water leaves potato into sucrose solution / eq (1) • Correct ref to water potential gradient or from dilute solution to concentrated solution / down water potential	**3**

	gradient / from higher concentration of water to lower concentration of water / eq (1)	

Question Number	Answer	Additional guidance	Mark
6(c)(ii)	calculation percentage change in mass in sucrose solution = (1.8- 2.1)÷ 2.1 = -0.3 -0.3 ÷2.1 = -0.143 × 100 = - 14.3 % 14.3 % of 5.0 cm = 0.143 ×5 = -0.71cm 5-0.71 = 4.3(4.29) allow **4.28 to 4.3** cm (3)	full marks for correct answer with no working allow 1 mark for 14.3 or 14.29 or 14.286 or 0.143 or 0.14286 etc **and** allow 1 mark for 0.71 to 0.72 etc	**3**

Total 14 marks

Question Number	Answer	Mark
7(a)(i)	The only correct answer is D zebra A is not correct as acacia is a producer B is not correct as lion is a secondary consumer C is not correct as star grass is a producer	**1**

Question Number	Answer	Mark
7(a)(ii)	The only correct answer is B star grass to baboon A is not correct as giraffe to cheetah is not least efficient C is not correct as wildebeest to wild dog is not least efficient D is not correct as zebra to lion is not least efficient	**1**

Question Number	Answer	Mark
7(a)(iii)	The only correct answer is B gazelle A is not correct as baboon is affected more C is not correct as wildebeest is affected more D is not correct as zebra is affected more	**1**

Question Number	Answer	Additional guidance	Mark
7(b)(i)	An explanation that makes reference to four of the following • not all organisms consumed /eq (1) • some die / decompose / eq (1) • some parts not eaten / bones / eq (1) • energy lost as heat / respiration / used in movement / muscle contraction / eq (1) • some food not digested / absorbed / egested / faeces /eq (1) • energy lost as excretion / urea / eq (1)	No credit for energy loss alone	**4**

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	A description that makes reference to four of the following • quadrat / eq (1) • (placed) at random / use random number generator / eq (1) • count (number in each quadrat) / eq (1) • repeat / take average / eq (1) • multiply up / scale up to calculate numbers in area / eq (1)	quadrats = mp 1 and mp 4 ignore area coverage	**4**

Question Number	Answer	Additional guidance	Mark
7(c)	An explanation that makes reference to the following • weakest prey killed / faster / stronger survive / eq (1) • (strongest mate) / reproduce / weakest do not reproduce / eq (1) • pass on alleles / genes / genetic material / DNA / eq (1) • (sick animals removed) prevents infection / bacteria / virus / pathogen spreading / eq (1) • weak animals slow down herd / eq (1)	allow survival of fittest not sickness spreading	**3**

Total 14 marks

Question Number	Answer	Mark
8(a)(i)	The only correct answer is **B** fungi A is not correct as yeast is not a bacterium C is not correct as yeast is not a plant D is not correct as yeast is not a protoctist	**1**

Question Number	Answer	Mark
8(a)(ii)	The only correct answer is **B** chitin A is not correct as wall is not made of cellulose C is not correct as wall is not made of sucrose D is not correct as wall is not made of starch	**1**

Question Number	Answer	Mark
8(b)(i)	An explanation that makes reference to the following • water bath / Bunsen / thermostat to vary temperature to heat up water / eq (1) • thermometer to measure temperature / eq (1) • clock watch / timer to measure time period / how long / rate per minute / eq (1)	**2**

Question Number	Answer	Mark
8(b)(ii)	• prevent entry of oxygen / makes conditions anaerobic / eq (1)	**1**

Question Number	Answer	Mark
8(b)(iii)	• limewater / calcium hydroxide solution / hydrogen carbonate indicator / sodium hydrogencarbonate / bicarbonate indicator / sodium bicarbonate (1)	**1**

Question Number	Answer	Additional guidance	Mark
8(b)(iv)	An explanation that makes reference to two the following • originally blue as oxygen present so yeast is respiring (aerobically) / eq (1) • (changes to pink)(all) oxygen **used** up / **taken in** / **consumed in** (aerobic) respiration / eq (1) • (when pink / when no oxygen present) now respiring <u>anaerobically</u> /eq (1)	oxygen used in respiration	**2**

Question Number	Answer	Additional guidance	Mark
8(c)	An explanation that makes reference to four of the following • enzyme / substrate / particles / molecules move faster / increased (kinetic) energy / eq (1) • collide more frequently / form more enzyme substrate complexes / eq (1) • (until) <u>optimum</u> temperature / eq (1) • then <u>active site</u> changes shape / eq (1) • substrate no longer fits / binds with enzyme / enzyme denatures / eq (1)	more kinetic energy not yeast denatures	**4**

Total 12 marks

Question Number	Answer	additional guidance	Mark
9(a)	$6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$ (2)	allow 1 mark for correct formula but incorrect balance no credit for word equation	**2**

Question Number	Answer	additional guidance	Mark
9(b)(i)	Calculation 78 bubbles per minute gives $1 \div d^2$ value from x axis of 0.16 therefore $1 \div d^2 = 0.16$ $d^2 = 6.25$ distance d = 2.5 (cm) (2)	 Graph clearly 0.16 allow 1 mark for 0.16 or 6.25	**2**

Question Number	Answer	Mark
9(b)(ii)	A description that makes reference to the following • more bubbles released / rate of photosynthesis increases / eq (1) • very steeply at low light intensities / at first / eq (1) • number of bubbles levels off / becomes constant / stays same / reaches maximum / rate of increase slows down / eq (1)	**3**

Question Number	Answer	Additional guidance	Mark
9(b)(iii)	An explanation that makes reference to two of the following • rate doesn't change / no change / increasing / changing light / light intensity / has no effect / / eq (1) • as light **no** longer / **not** limiting factor / other factor limiting / eq (1) • need more carbon dioxide / need higher temperature to increase photosynthesis rate / eq (1)	 No credit for light is limiting factor carbon dioxide / chlorophyll is limiting factor / temperature limiting factor **scores mp 2 and mp 3**	**2**

Total 9 marks

10 (a)		Substrate	Enzyme	Products of digestion	**4**
		starch	***amylase (1)***	maltose	
		maltose	maltase	***glucose(1)***	
		proteins / peptides / polypeptides (1)	protease	amino acids	
		lipids	lipase	***fatty acids /glycerol (1)***	

Question number		Additional guidance	
10 (b)	C use different concentrations of vinegar / vinegar and no vinegar / range of pH acids / eq (1) O of same mass of starch / flour / bread /potato / rice / eq (1) R repeat (for each concentration (of vinegar) / eq (1) M1 use iodine to test for (digestion of) starch (1) M2 measure time it takes for all starch to be digested / iodine test to be negative / orange / yellow / or description of negative positive result / eq (1) S1 same temperature / use water bath / eq (1) S2 same time to react / same volume of amylase / same concentration of amylase / same mass of amylase / same volume of vinegar / same volume of iodine / same volume Benedic'ts /eq (1)	allow amount / more or less for C ignore amount Benedict's if starch still present will be blue black allow same volume of vinegar if vary conc in C	**6**

total 10 marks

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