

Mark Scheme (Results)

Summer 2024

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)	**C (absent, present, absent)** *A is incorrect because red blood cells have cytoplasm* *B is incorrect because human red blood cells do not have a nucleus* *D is incorrect because red blood cells do not have a cell wall*	**1**

Question Number	Answer	Mark
1(a)(ii)	**D (tissue)** *A is incorrect because organs have more than one cell type* *B is incorrect because organisms have more than one cell type* *C is incorrect systems have more than one cell type*	**1**

Question Number	Answer	Additional guidance	Mark
1(b)(i)	A description that makes reference to the following: • use a syringe / pipette / beaker / (measuring) cylinder / eq (1) • mix 5 (cm^3) of (10%) sucrose solution with 5 (cm^3) water / eq (1)	 **Accept** other correct measuring apparatus **Accept** take 5 (cm^3) sucrose and make up to 10 (cm^3) with water / add equal volumes of water and sucrose and use 10 (cm^3) / eq	**2**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	An explanation that makes reference to three of the following: • water leaves (the cells) / eq (1) • by <u>osmosis</u> (1) • from a high(er) water potential to a lower water potential / from higher water concentration to lower water concentration / from dilute solution to concentrated solution / eq (1) • membrane detaches from cell wall / cell is flaccid / cytoplasm shrinks / cytoplasm volume decreases / cells are plasmolysed / eq (1)	**Accept** lose water **Accept** water moves from a high concentration to a low concentration **Ignore** cell shrinks	**3**

Total 7 marks

Question Number	Answer	Mark
2(a)(i)	**C (Y)** *A is incorrect because V is the ovary* *B is incorrect because X is the stigma* *D is incorrect because Z is the filament*	**1**

Question Number	Answer	Mark
2(a)(ii)	**A (V)** *B is incorrect because W does not become a fruit* *C is incorrect because X does not become a fruit* *D is incorrect because Y does not become a fruit*	**1**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	96 (X) (3) Stages of calculation: • conversion of mm to μm (30 000) • division of measured length by actual • given to whole number	96 = **3 marks** 95.8466…. = **2 marks** **1 mark** for 30 000 **or** 0.313 **or** division by 313 **or** division by 0.313 **or** division by other combinations of 313 (e.g. 0.000313) Correct answer gains all three marks	**3**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	• spikes / hooks / sticky / eq (1)		**1**

Question Number	Answer	Additional guidance	Mark
2(c)	An answer that makes reference to two of the following: • asexual reproduction (1) • cuttings are genetically identical / have same alleles / same genes / are clones / eq (1) • faster / can be produced at any time of year / can be done from only one plant / no need to have insects / eq (1)		**2**

Total 8 marks

Question Number	Answer	Additional guidance	Mark
3(a)(i)	• diaphragm (1)		**1**

Question Number	Answer	Mark
3(a)(ii)	**C (increases decreases)** *A is incorrect because the volume increases* *B is incorrect because the volume increases* *D is incorrect because the pressure decreases*	**1**

Question Number	Answer	Additional guidance	Mark
3(a)(iii)	A description that makes reference to two of the following: • jar cannot expand / cannot change shape / jar is rigid / ribcage can move / thorax can move / eq (1) • no intercostal muscles / no ribs / eq (1) • no pleural membrane / no pleural fluid / balloons do not touch the sides of jar / eq (1)	**Accept** only shows diaphragm action no ribs to move = **2 marks**	**2**

Question Number	Answer	Mark
3(b)(i)	**D (trachea bronchus bronchiole alveolus)** *A is incorrect because bronchiole is not first* *B is incorrect because bronchus is not first* *C is incorrect because bronchiole is not second*	**1**

Question Number	Answer	Additional Guidance	Mark
3(b)(ii)	• 1.9×10^6 (2)	1 900 000 = **one mark** **or** 1 920 000 = **one mark** **or** **one mark** for correct answer with wrong standard form e.g. 19×10^5 **Accept** 1.92×10^6 Correct answer gains two marks	**2**

Question Number	Answer	Additional guidance	Mark
3(b)(iii)	An explanation that makes reference to four of the following: (**Mark in pairs)** • one cell thick layer (for alveoli or capillaries) / thin layer / thin membrane / eq (1) • short <u>diffusion</u> path / rapid <u>diffusion</u> / easy <u>diffusion</u> / eq (1) • blood supply / capillaries / blood vessels / blood / eq (1) • maintains concentration gradient / maintains diffusion gradient / steep gradient / eq (1) • moisture / fluid / eq (1) • dissolves gases / allows gases to pass through (alveolar) wall / eq (1)	**Do not award** function mark without correct structure **Accept** maintains gradient **Ignore** surface area	**4**

Question Number	Answer	Additional guidance	Mark
3(b)(iv)	A description that makes reference to three of the following: • use of limewater / hydrogen carbonate indicator (1) • measure time taken (for limewater) to go cloudy / measure time taken (for indicator) to change / eq (1) • measure with and without exercise / measure before and after exercise / have one person exercising and one resting / eq (1) • same volume of limewater / same volume of indicator / same temperature of room / same age / sex / fitness of person / eq (1) • repeats / calculate mean / eq (1)	**Accept** calcium hydroxide (solution) **Accept** measure cloudiness after time / / see how much colour changes after time / eq	**3**

Total 14 marks

Question Number	Answer	Mark
4 (a)(i)	**C (maltose)** *A is incorrect because amino acids are not produced* *B is incorrect because glycerol is not produced* *D is incorrect because sucrose is not produced*	**1**

Question Number	Answer	Mark
4 (a)(ii)	**C (2 and 3 only)** *A is incorrect because the colon does not produce amylase* *B is incorrect because the colon does not produce amylase* *D is incorrect because the pancreas also produces amylase*	**1**

Question Number	Answer		Mark
4 (b)(i)	• to reach temperature / bring to temperature / make sure at 10 °C / equilibrate / warm up / eq (1)	**Accept** to make them same temperature **Accept** make sure tubes are at the temperature **Accept** to make correct temperature **Accept** so solutions adjust to temperature	**1**

Question Number	Answer	Additional guidance	Mark
4 (b)(ii)	• add iodine (solution) (1) • black / (dark) blue (colour) (1)	**Ignore** purple	**2**

Question Number	Answer	Additional guidance	Mark
4 (c) (i)	• 23 (2)	**one mark** for 23.3333……. correct answer gains both marks	**2**

Question Number	Answer	Additional guidance	Mark
4(c)(ii)	An explanation that makes reference to two of the following: • increased (kinetic) energy (1) • faster movement (of enzyme and substrate) / eq (1) • more collisions / greater rate of collisions / more E/S complexes / eq (1) • reaches <u>optimum temperature</u> for <u>enzymes</u> (1)		**2**

Question Number	Answer	Additional guidance	Mark
4(c)(iii)	An explanation that makes reference to two of the following: • enzyme denatures / amylase denatures (1) • active site changes shape / enzyme is not complementary to substrate / enzyme changes shape / eq (1) • substrate / starch no longer binds / fits / eq (1)		**2**

Question Number	Answer	Additional guidance	Mark
4(c)(iv)	An explanation that makes reference to two of the following: 1. use smaller temperature intervals / / use 5 °C intervals / use 1 °C intervals / eq (1) 2. between 30 and 40 / between 30 and 50 / between 40 and 50 / the rate may be faster at temperatures above or below 40 / optimal may not be at 40 / eq 3. use smaller time intervals / eq (1) 4. as similar recorded times may actually be different / eq (1)	**Accept** more temperature intervals **Accept** more temperatures between 30 and 40 / 30 and 50 / 40 and 50 for **two marks** **Accept** more temperatures around 40 °C for **two marks**	**2**

Total 13 marks

Question Number	Answer	Mark
5(a)(i)	**C (2 and 3 only)** *A is incorrect because chitin is not present in either* *B is incorrect because chitin is not present in either* *D is incorrect because both have chloroplasts*	**1**

Question Number	Answer	Mark
5(a)(ii)	*any two of* : (polar) bear / seal / (grey) whale / predatory fish (1)	**1**

Question Number	Answer	Additional guidance	Mark
5(a)(iii)	phytoplankton → zooplankton → plankton-eating fish → predatory fish → seal → (polar) bear (2)	**one mark** for correct organisms in order **one mark** for correct arrow direction **no marks** for pyramids **no marks** for food chain not linked to question	**2**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	• 950% (2) Example of calculation: correct increase (12.6 – 1.2 = 11.4) correct percentage calculation	**one mark** for 12.6 – 1.2 **or** 11.4 **or** division by 1.2 Correct answer with no working gains both marks	**2**

Question Number	Answer	Additional guidance	Mark
5(b)(ii)	An answer that makes reference to five of the following points: 1. phytoplankton / zooplankton (biomass) is low in winter / eq (1) 2. phytoplankton mass increases in (mid) spring / as light increases, phytoplankton (biomass) increases / eq (1) 3. (phytoplankton increase in late spring) due to <u>photosynthesis</u> / eq (1) 4. (photosynthesis) produces glucose / sugar / carbohydrates / eq (1) 5. zooplankton increase (when phytoplankton is high) as more food / more phytoplankton to eat / eq (1) 6. phytoplankton decreases when consumed by (many) zooplankton / increases when few zooplankton eating them / eq (1) 7. (when phytoplankton increase) nitrates decrease as phytoplankton absorb them / use them / eq (1) 8. nitrates used to make amino acids / protein / chlorophyll / eq (1) 9. phytoplankton biomass <u>limited by</u> nitrates / light / zooplankton population / eq (1)	**Accept** phytoplankton decreases in (late) autumn **Accept** less photosynthesis in winter / less photosynthesis in late autumn / less photosynthesis in low light / less photosynthesis in low temperature **Accept** zooplankton decrease when there is less food **Accept** phytoplankton population falls if not enough nitrate to take in	**5**

Total 11 marks

Question Number	Answer	Additional guidance	Mark
6(a)	A description that makes reference to four of the following points: 1. receptor (generates impulse) / eq (1) 2. (impulse) passes along sensory neurone (to relay / motor neurone / to CNS / spinal cord) (1) 3. (sensory / relay / CNS / spinal cord) to motor neurone (1) 4. to muscle / effector (1) 5. crosses synapses (1) 6. (using) neurotransmitters (1)		**4**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	S: linear scales for both axes (1) L: straight line joining points (1) A: axes correct way round (1) A: axes both labelled, and with units on y axis (1) P: points plotted correctly (1)	must use at least half grid no extrapolation stimulus number on horizontal axis time / seconds and stimulus number +/- half square bar chart loses L	**5**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	A description that makes reference to the following points: • (time) decreases / eq (1) • falls (more steeply) after 5 / from 6 touches / small decrease until 5 or 6 / eq (1)	**Accept** increase at 4 touches	**2**

Question Number	Answer	Additional guidance	Mark
6(b)(iii)	An explanation that makes reference to two of the following points: • (few stimuli) could represent danger / allow escape / escapes predator / snail not eaten / helps snail survive / eq (1) • (repeated stimuli) suggests no danger / no longer represents danger / snail recognises there is no threat / has learnt that there is no danger / eq (1) • (when not staying in shell) snail can eat for longer / can continue moving / does not waste energy / eq (1)	**Accept** could be rain / plant / obstacle / snail has habituated	**2**

Total 13 marks

Question Number	Answer	Additional guidance	Mark
7(a)(i)	An explanation that makes reference to four of the following points: **(mark in pairs)** • thick layer of elastic / (more) elastic / eq (1) • as blood pressure is higher / for wall to recoil / to expand / wall can stretch / smooths blood flow / eq (1) • thick layer of muscle / (more) muscle / eq (1) • control blood flow / eq (1) • no valves (1) • as blood pressure is sufficient to prevent backflow / no need to prevent backflow / eq (1)	 **Accept** converse for veins **Accept** converse for veins **Accept** thick wall due to high pressure (two marks) if no mp1 or mp3 **Accept** converse for veins	**4**

Question Number	Answer	Additional guidance	Mark
7(a)(ii)	An explanation that makes reference to three of the following points: • artery has blockage / less blood can flow / artery is narrow / artery has narrow lumen / eq (1) • less oxygen (to heart muscle) / eq (1) • less (aerobic) respiration / more anaerobic respiration / eq (1) • less energy / less ATP / eq (1) • so heart unable to beat faster during exercise / eq (1)		**3**

Question Number	Answer	Additional guidance	Mark
7(b)(i)	An answer that makes reference to one of the following points: • high cholesterol / high fat diet / eq (1) • lack of exercise / eq (1) • stress / eq (1) • high salt (diet) (1) • high BMI / obesity / eq (1) • diabetes (1) • age / eq (1) • sex (1) • high blood pressure (1)	**Ignore** diet / bad diet unbalanced diet	**1**

Question Number	Answer		Mark
7 (b)(ii)	An answer that makes reference to five of the following points: 1. smoking increases risk of CHD (in all groups) / eq (1) 2. more alleles (always) increases risk (of CHD) / eq (1) 3. highest risk is for smokers with high number of alleles / lowest risk is for non-smokers with few alleles / eq (1) 4. biggest increase from smoking is for those with few risk alleles / lower increase from smoking with medium or high allele group / eq (1) 5. smokers with few alleles have same risk of CHD than non-smokers with many alleles / eq (1) 6. credit manipulated data, e.g. smoking increases risk by 1 for low allele group (1) 7. carbon monoxide (in cigarette smoke) (causes CHD) (1) 8. smoking causes plaques / cholesterol build up / blocks coronary artery / eq (1) 9. no mention of group size in data / may be low sample size / eq (1) 10. no mention of age / sex / diet / other health issues / frequency of smoking / eq (1)	**Accept** same increase in risk from smoking in medium and high allele groups / eq **Accept** no repeats	**5**

Total 13 marks

Question Number	Answer	Additional guidance	Mark
8(a)(i)	An answer that makes reference to the following points: • correct genotypes of parents (Dd, dd) (1) • correct gametes (D or d, d (or d)) (1) • correct genotypes of offspring (Dd, dd) • correct probability of 0.5 / 50 % ½ / eq (1)	**ECF for mp2 and 3 only** **Accept** mp1 – 3 from Punnet square **Accept** other letters but must be capital and lower case of same letter **only award mp4 from attempt at correct cross**	**4**

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	An answer that makes reference to two of the following points: • less water absorbed (into blood) (1) • by colon / intestine (1) • as sugar / lactose is not absorbed (1) • (as lactose) affects osmosis / lowers water potential / eq (1) • (lactose could cause) bacteria to grow / bacteria break down lactose / eq (1)	**Accept** small or large intestine **Allow** microorganisms	**2**

Question Number	Answer	Additional guidance	Mark
8(a)(iii)	An explanation that makes reference to four of the following points: • mutation (occurred) (1) • creating (genetic) variation (1) • people with lactose tolerance (DD or Dd) can drink milk / did not get diarrhoea / can gain extra nutrients / were able to compete better / survived / had a selective advantage / eq (1) • reproduced (more) / produced offspring / eq (1) • pass on allele / gene / mutation / eq (1)	Pass on allele to next generation / offspring = **mp4 and mp5**	**4**

Question Number	Answer	Additional guidance	Mark
8(b)(i)	An explanation that makes reference to the following points: • mixes the contents / spreads nutrients / maintains even consistency / prevent settling / eq (1) • maintain even temperature / prevent hot spots / maintain an even pH / eq (1)	**Accept** moves contents **Accept** keep bacteria and milk in contact **Ignore** stir **Accept** distributes heat (energy) **Ignore** maintain optimal temperature	**2**

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	An explanation that makes reference to two of the following points: • removes heat / cools the fermenter / eq (1) • to maintain <u>optimal temperature</u> (1) • prevent enzymes denaturing / prevent death of bacteria / eq (1)	 **Ignore** warms up **Allow** microorganisms	**2**

Total 14 marks

Question Number	Answer	Additional guidance	Mark
9(a)	A description that makes reference to the following points: • plasmid (used) (1) • restriction enzyme used to cut out gene / cut plasmid / cut DNA / eq (1) • ligase used to insert gene into plasmid / stick DNA / glue DNA / stick gene with DNA / eq (1)	**Accept** alternatives for cut out e.g. remove / extract	**3**

Question Number	Answer	Additional guidance	Mark
9(b)	An explanation that makes reference to three of the following points: • increasing temperature increases the rate of photosynthesis / eq (1) • because particles have more (kinetic) energy / more frequent collisions / there is more enzyme activity / eq (1) • (at low light intensity rate levels off) so light is limiting / eq (1) • (at high light intensity) carbon dioxide limits rate / not enough carbon dioxide / eq (1)	**Accept** temperature is limiting factor at low temperatures **Accept** at high light intensity rate increases more as light is not limiting / eq **Accept** rate levels off because temperature not limiting / eq **Accept** at high light intensity rate is limited by other factors	**3**

Question Number	Answer	Additional guidance	Mark
9(c)	An answer that makes reference to five of the following points: 1. light, carbon dioxide and (warm) temperature supplied / eq (1) 2. so no factors for <u>photosynthesis</u> are limiting / all factors present for <u>photosynthesis</u> / there is more <u>photosynthesis</u> / eq (1) 3. so high yield / fast production / (to give high profit) / more tomatoes / eq (1) 4. no need to buy carbon dioxide / no need to buy electricity / wood is cheaper than fossil fuel / wood cheaper than buying electricity / eq (1) 5. tomatoes protected from pests / disease / frost / cold / bad weather / eq (1) 6. wood is renewable (energy) / eq (1) 7. less use of fossil fuel / eq (1) 8. carbon dioxide not released into atmosphere / eq (1) 9. less greenhouse effect / less climate change / less ice cap melting / eq (1) 10. less release of sulfur dioxide / less acid rain / eq (1)	**Accept** crop for tomatoes **Ignore** oxygen for photosynthesis **Accept** higher productivity **Ignore** better quality **Accept** other examples of greenhouse effects / fewer food miles / less need to import tomatoes / eq	**5**

Total 11 marks

Question Number	Answer		Mark
10	An answer that makes reference to six of the following points: • C change colour / eq (1) • O type of scarecrow / size of scarecrow / use same scarecrow / type of fabric / size of clothing / eq (1) • R repeat / eq (1) • M1 count number of birds / mass of crop / amount of birds / number of plants eaten / yield of crop / eq (1) • M2 stated period of time / eq (1) • S1 same time of year / season / area of field / position (of scarecrow) in field / weather / time of day / wind speed / light / water / humidity / temperature / eq (1) • S2 same crop / quality of crop / (starting) number of crops / fertiliser / pesticides / soil quality / soil pH / eq (1)	**Accept** different coloured scarecrows / named colours **Accept** ref to averages **Accept** time taken to eat crops for M1 and M2 **Ignore** amount of crops **Accept** same bird species **Accept** named crop as same crop	**6**

Total 6 marks

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