Pearson Edexcel

Mark Scheme (Results)

January 2022

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

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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	Additional guidance	Mark
1(a)	lymphocytes / eq	**Ignore** white blood cells **Reject** phagocytes	**1**

Question Number	Answer	Additional guidance	Mark
1 (b)(i)	An answer that makes reference to one of the following: • both alleles expressed (1) • both alleles affect the phenotype (1) • both alleles show their characteristics / traits (1)	**Accept** both alleles work together / both alleles work together to form a third phenotype / phenotype depends upon both alleles	**1**

Question Number	Answer	Additional guidance	Mark
1 (b)(ii)	**The correct answer is D (A, B, AB and O)** A is incorrect as the cross could also produce AB and O B is incorrect as the cross could produce also AB and O C is incorrect as the cross could also produce A, and B		**1**

Question Number	Answer	Additional guidance	Mark
1 (c)	$4.7(4) \times 10^7$ (2)	**one mark** for 47400000 **or** 47.4 million **or** 47 million **or** other incorrect standard forms using 47(4) **Correct answer gains all marks**	**2**

Question Number	Answer	Additional guidance	Mark
1(d)	An explanation that makes reference to the following: • artificial cells are not (bi)concave / red blood cells are (bi)concave (1) • artificial cells have smaller SA(:vol ratio) / red blood cells have larger SA (:vol ratio) (1) • artificial cells absorb / bind / release less oxygen / red blood cells absorb bind more oxygen / release more oxygen / eq (1) • artificial cells do not pass through capillaries easily / eq / red blood cells pass through capillaries more easily / eq (1)	**Accept** artificial cells carry less oxygen / red blood cells carry **more** oxygen **Accept** artificial cells have slower diffusion (of oxygen) / red blood cells have faster diffusion (of oxygen)	**3**

Question Number	Answer	Additional guidance	Mark
1 (e)	An explanation that makes reference to the following: • no platelets (1)	**Allow** no fibrinogen	**1**

Question Number	Answer	Additional guidance	Mark
1 (f)	An explanation that makes reference to two of the following: • no / less water uptake / eq (1) • by osmosis / due to osmotic effects (1) • so cells do not burst / eq (1)	**Accept** converse **Accept** equal water movement in and out **Accept** correct ref to water potential	**2**

Question Number	Answer	Additional guidance	Mark
1 (g)(i)	An explanation that makes reference to two of the following: • stem cells can divide / perform mitosis (1) • stem cells can differentiate / specialise / stem cells can become any cell / other cell types (1)	**Accept** stem cells are undifferentiated / unspecialised	**2**

Question Number	Answer	Additional guidance	Mark
1 (g)(ii)	An answer that makes reference to two of the following: • (there are) no antigens (present) / eq (1) • so antibodies will not be produced / no rejection / no immune response / eq (1) • any recipient / more people can receive blood group O (1)	**Accept** no surface proteins **Accept** blood group A/ B / AB can receive the blood / O is the universal donor	**2**

Question Number	Answer	Additional guidance	Mark
1 (h)	An answer that makes reference to two of the following: • urea (1) • digested food / named example (1) • carbon dioxide (1) • hormone / named hormone (1) • mineral / ion / (not sodium / sodium chloride / salt) / vitamins (1) • protein / clotting factors / fibrinogen / antibodies / eq (1)	e.g amino acids / glucose / fatty acids / LDLs **Accept** named minerals / vitamins	**2**

Total: 17 marks

Question Number	Answer	Additional guidance	Mark
2 (a)	A description that makes reference to three of the following: • enzymes (1) • (feed on) dead / decaying organisms (1) • for <u>extracellular digestion</u> (1) • absorb the digested food / nutrients (1)	**Accept** named nutrients **Accept** broken down food	**3**

Question Number	Answer	Additional guidance	Mark
2 (b)(i)	A description that makes reference to one of the following: • judgement of cloudiness is subjective / is qualitative / not quantitative / cloudiness cannot be accurately measured / cannot be repeated by other people / eq (1)	**Accept** cloudiness is judged by eye **Accept** cannot see small differences / it is imprecise **Accept** cannot measure difference in cloudiness	**1**

Question Number	Answer	Additional guidance	Mark
2 (b)(ii)	An explanation that makes reference to two of: • less kinetic energy / lower collision frequency / not at optimal temperature for enzymes / eq (1) • less fungal growth / less mould / only slight fungal growth (1) • less respiration (1)	**Accept** fewer E-S complexes formed **Accept** microbes / bacteria for fungi **Accept** less decay / less spoilage / less digestion	**2**

Question Number	Answer	Additional guidance	Mark
2 (b)(iii)	An explanation that makes reference to two of: • enzymes denature (in acid / low pH / vinegar) (1) • active site shape changes / enzymes do not bind with substrate / eq (1) • fungal growth decreases (1)	**Reject** enzymes denature due to **high temperature** **Accept** fungi killed / less spoilage / less decomposition / less respiration **Accept** bacteria / microbes for fungi	**2**

Total: 8 marks

Question Number	Answer	Additional guidance	Mark
3(a)(i)	**B is the correct answer** A is incorrect as there are no palisade cells present C is incorrect as there are no palisade cells present D is incorrect as there are no palisade cells present		**1**

Question Number	Answer	Additional guidance	Mark
3 (a)(ii)	**C is the correct answer (low humidity high temperature)** A is incorrect because high humidity would reduce transpiration B is incorrect because high humidity would reduce transpiration D is incorrect because low temperature would reduce transpiration		**1**

Question Number	Answer	Additional guidance	Mark
3 (b)(i)	(concentration of) carbon dioxide (1)		**1**

Question Number	Answer	Additional guidance	Mark
3 (b)(ii)	An answer that makes reference to two of: • temperature (1) • light (1) • mineral ions / pH / soil / eq (1) • water / humidity (1)	**Accept** light intensity / wavelength / colour	**2**

Question Number	Answer	Additional guidance	Mark
3 (b)(iii)	140 (3)	**Accept** answers between 139 and 140 for 3 marks **one mark** for 70 **AND** **one mark** for area between 0.50 and 0.503 **Correct answer gains all marks**	**3**

Question Number	Answer	Additional guidance	Mark
3 (b)(iv)	A discussion that makes reference to four of the following: 1. carbon dioxide is needed in photosynthesis / eq (1) 2. fewer stomata may reduce uptake of carbon dioxide / less gas exchange (1) 3. fewer stomata needed if carbon dioxide is high / higher diffusion gradient of carbon dioxide (1) 4. (fewer stomata) reduces water loss / transpiration / evaporation / eq (1) 5. (less transpiration) prevents wilting (1) 6. (less transpiration) reduces mineral transport (to leaves) / reduces mineral absorption / eq (1) 7. less magnesium for chlorophyll / less nitrate for amino acids / eq (1) 8. (less transpiration) reduces cooling / eq (1)	**Accept** high carbon dioxide generates high diffusion gradient **Ignore** nutrients **Accept** named minerals **Accept** other correct minerals and functions less uptake of magnesium to make chlorophyll = 2 marks	**4**

Total: 12 marks

Question Number	Answer	Additional guidance	Mark
4 (a)	An explanation that makes reference to two of the following: • (select and) mate fish that grow quickly / have desired characteristics / eq (1) • (select and) mate offspring that grow quickly / repeat breeding over several generations / eq (1) • (so that) genes / alleles for fast growth are passed on / eq (1)	**Accept** fish that do not waste food for grow quickly **Ignore** large fish **Accept** repeat with offspring	**2**

Question Number	Answer	Additional guidance	Mark
4 (b)	A description that makes reference to two of the following: • nitrifying bacteria / nitrification (1) • (ammonium) to nitrite / nitrite to nitrate (1)		**2**

Question Number	Answer	Additional guidance	Mark
4 (c)	An explanation that makes reference to five of the following: 1. waste food / faeces eaten / removed (by lobsters and crabs) / eq (1) 2. less decomposition / fewer decomposers / fewer bacteria (1) 3. less disease / infection (due to fewer bacteria) (1) 4. less (bacterial/ decomposers) respiration (1) 5. more oxygen in the water / less removal of oxygen / seaweed releases oxygen (1) 6. nitrate / minerals / nutrients / carbon dioxide removed by seaweed (1) 7. less algae growth / algal bloom / eutrophication / eq (1) 8. more products to sell (1) 9. no need to buy food for lobsters / crabs / no need to buy minerals for seaweed (1)	**Accept** converse for mps **Accept** (more) fish / animal respiration / eq **Accept** other correct named minerals **Accept** fish provide carbon dioxide for seaweed **Accept** can sell crabs / lobsters / seaweed	**5**

Total: 9 marks

Question Number	Answer	Additional guidance	Mark
5 (a)	An explanation that makes reference to three of the following: • (selective) reabsorption (1) • in proximal convoluted tubule (1) • by active transport (1) • using energy / ATP (1)	**Accept** absorbed into blood **Accept** pct / first convoluted tubule	**3**

Question Number	Answer	Additional guidance	Mark
5 (b)(i)	3.9 (2)	**one mark** for 3.86… **OR** for 1700 ÷ 440 **Correct answer gains all marks**	**2**

Question Number	Answer	Additional guidance	Mark
5 (b)(ii)	An explanation that makes reference to two of the following: • water is absorbed (1) • in collecting duct (1) • by osmosis (1) • ADH was present (1)	**Accept** urea is not absorbed **Accept** (water absorbed) in loop of Henlé / distal convoluted tubule	**2**

Question Number	Answer	Additional guidance	Mark
5 (c)(i)	A description that makes reference to two of the following: • biuret (reagent) / sodium hydroxide + copper sulfate (1) • lilac / purple / pink (1)	**Accept** uristicks / eq (1) colour change to blue or green (1)	**2**

Question Number	Answer	Additional guidance	Mark
5 (c)(ii)	An answer that makes reference to two of the following • protein is a large molecule (1) • high pressure forces protein / eq (1) • out of glomerulus / out of capillaries / through membranes / into (Bowman's) capsule / into glomerular filtrate (1) • the protein is not (re)absorbed (by nephron) (1)	**Accept** pushes / squeezes	**2**

Total: 11 marks

Question Number	Answer	Additional guidance	Mark
6 (a)	**C is the correct answer (UAAGGCUCA)** A is incorrect as T is not present in RNA B is incorrect as T is not present in RNA D is incorrect as the sequence is not complementary		**1**

Question Number	Answer	Additional guidance	Mark
6(b)	**C is the correct answer (translation anticodon)** A is incorrect because it is not transcription B is incorrect because it is not transcription D is incorrect because it is not a codon		**1**

Question Number	Answer	Additional guidance	Mark
6 (c)	An explanation that makes reference to three of the following: • mutation is a <u>rare / random</u> change to DNA / genetic material (1) • change in nucleotides / bases / triplets / eq (of DNA) (1) • change (in sequence of) amino acids (in proteins / polypeptide) (1) • changing enzyme / protein / producing different protein / enzyme / eq (1)	**Accept** codons **Accept** changing active site / changing shape of protein	**3**

Question Number	Answer	Additional guidance	Mark
6 (d)(i)	An description that makes reference to three of the following: • use of quadrat / gridding of area / eq (1) • random (selection of areas) (1) • count butterflies / eq (1) • repeat / means / eq (1)	**Accept** quadrats for two marks (mp1 and mp4)	**3**

Question Number	Answer	Additional guidance	Mark
6 (d)(ii)	A discussion that makes reference to five of the following: 1. increase in abnormal butterflies / more abnormal butterflies after 10 months (1) 2. (due to) longer exposure to radioactivity / eq (1) 3. larger increase in number of abnormal / mutated offspring (compared with adult after 10 months) (1) 4. mutations / genes / eq passed on to offspring (1) 5. recessive mutations may be carried by adults / eq (1) 6. if heterozygotes / carriers mate they may produce abnormal offspring / eq (1) 7. other factors could cause the abnormalities / abnormalities may not be due to mutations /not genes / DNA(1) 8. there is no control experiment / no data before the accident / no idea of normal number of abnormalities / eq (1) 9. radioactivity not measured / monitored / radioactivity may change / decay / eq (1) 10. do not know number of butterflies sampled / eq (1)	**Accept** adult / offspring / both **Accept** longer exposures increases number of mutations **Accept** more abnormal offspring than abnormal adults **Accept** adults increase by 15.7 and %, offspring increase by 41.9 % **Accept** no idea of health of butterflies / disease **Accept** no data from area with no radioactivity **Accept** no idea how long radioactivity lasted / changed **Accept** experiment has not been repeated / small sample size	**5**

Total: 13 marks

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