Pearson Edexcel

Mark Scheme (Results)

January 2022

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

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) x 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