Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCSE

In Biology (5BI2H) Paper 01

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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	Acceptable answers	Marks
1 (a)	red blood cells accept any reasonable spelling	accept red accept red blood accept erythrocytes	(1)

Question number	Answer	Acceptable answers	Marks
1 (b) (i)	Any two from the following: • number of white blood cells **increase** (1) • white blood cells / phagocytes / lymphocytes defend against disease (1) • (by) producing antibodies / engulfing bacteria / pathogens (1)	accept: white blood cells are part of the immune system ignore: refs to other blood cells	(2)

Question number	Answer	Marks
1 (b) (ii)	**A** problems clotting blood if they are cut **The only correct answer is A** ***B*** *is not correct because platelets play no role in the transport of carbon dioxide* ***C*** *is not correct because this is opposite to the fact that more platelets increase blood clotting* ***D*** *is not correct because platelets play no role in the transport of oxygen or anaerobic respiration/EPOC*	(1)

Question number	Answer	Acceptable answers	Marks
1 (b) (iii)	A description including two of the following: • transport (1) • named substance / **blood** cell (1) • (which is transported) to or from named cell / tissue /organ (1)	accept: carries accept: heat MP2 is dependent on MP1	(2)

Question number	Answer	Acceptable answers	Marks
1 (c) (i)	A description of one similarity: both can keep dividing / have no Hayflick limit / produce cells that differentiate / develop into specialised cells	accept are unspecialised / make other **types** of cell ignore: references to cell structures	(1)

Question number	Answer	Acceptable answers	Marks
1 (c) (ii)	A description of one difference: Difference Embryonic stem cells are totipotent / pluripotent / produce cells that can develop into any type of body cell AND adult stem cells are multipotent / unipotent / can develop into one / few types of cells.	accept: embryonic stem cells can differentiate into all types of cell, adult stem cells can't	(1)

Total for question 1 = 8 marks

Question number	Answer	Marks
2 (a)	**A** aorta **The only correct answer is A** ***B*** *is not correct because the pulmonary artery carries deoxygenated blood to the lungs* ***C*** *is not correct because the pulmonary vein carries oxygenated blood to the heart* ***D*** *is not correct because the vena cava carry deoxygenated blood to the heart*	(1)

Question number	Answer	Acceptable answers	Marks
2 (b) (i)	A explanation including following: • cells use oxygen (keeping concentration of oxygen in cells low) (1) • concentration of oxygen in blood kept high by blood flow / blood flow replaces blood with (fully) oxygenated blood (1)	accept: cells respire aerobically ignore: definitions of diffusion	(2)

Question number	Answer	Acceptable answers	Marks
2 (b) (ii)	GLUCOSE + (oxygen) ⟶ (carbon dioxide) + WATER	accept any spelling ignore $C_6H_{12}O_6$ / H_2O ignore references to energy or ATP as a product. answers must be in correct order	(1)

Question number	Answer	Acceptable answers	Marks
2 (c) (i)	A description including two of the following • as running speed increases, cardiac output increases (1) • linear increase up to 12 / 16 km per hr / increases more slowly after 12 / 16 km per hr (1) • credit any manipulated data that compares two aspects of the graph (1)	accept any figure between 12 and 16 accept cardiac output data for speeds	(2)

Question number	Answer	Acceptable answers	Marks
2 (c) (ii)	A suggestion linking **two** of the following: • cardiac output / blood cannot supply enough oxygen / not enough oxygen is received by cells / muscles tissues / body • cells respire anaerobically / increase anaerobic respiration (1) • lactic acid produced / increases (1)	accept: cells cannot get enough energy reject: stops respiring aerobic ignore: references to EPOC	(2)

Total for question 2 = 8 marks

Question number	Answer	Marks
3 (a)	**A** statement 1 only **The only correct answer is A** Bacterial cells and plants cells do have cell walls and so statement 1 is correct. Bacterial cells do not have a nucleus and so statement 2 is incorrect. Therefore, as statements B, C and D are mutually exclusive to A, they are all incorrect. ***B** is not correct because statement 2 is incorrect* ***C** is incorrect as statement 2 is incorrect* ***D** is incorrect as statement 1 is correct*	(1)

Question number	Answer	Acceptable answers	Marks
3 (b) (i)	A comparison including: • more A than B (in all food / named food) (1) • detail of difference of any food eg. onions have only a little more A than B / **similar** amounts of A and B / manipulation of data e.g. garlic is the only food to have over twice as much A than B / dandelions have 4g (per 100g of carbohydrates) more A than B (1)	ignore: speculation about which food is better for you Ignore adding A to B Ignore just numbers eg 7.5 written by table.	(2)

Question number	Answer	Marks
3 (b) (ii)	onions (1) accept any reasonable spelling	(1)

Question number	Answer	Acceptable answers	Marks
3 (b) (iii)	10 (x2) to 20 (X2) to 40 (X2) (=80) (1) 3 (hours)	accept an answer / diagram showing that after 1 hour there are 20 cells, after 2 there are 40 and after 3 there are 80 Award full marks for correct bald answer	(2)

Question number	Answer	Marks
3 (b) (iv)	**C** oligosaccharides **The only correct answer is C** ***A*** *is not correct because hormones are not oligosaccharides, they are chemical messengers carried in the blood. They are either peptide based or steroid based not saccharides* ***B*** *is not correct because Beta carotenes are linked to vitamin A which is an isoprenoid with beta rings at both ends of the chain, not an oligosaccharide* ***D*** *is not correct because stanol esters are not oligosaccharides. They are a saturated ester usually formed from a carboxylic acid an alcohol, not from saccharides*	(1)

Question number	Answer	Acceptable answers	Marks
3 (c)	A description including any **three** from the following: • select two groups of people (1) • one detail to make the investigation valid / reliable e.g. composition of group /number in each group (10+)/ repeat investigation / blind testing / same time period (1) • give **probiotic** (yoghurt) to one of the groups (and ref to what second group get) (1) • measurement of health of the groups, e.g. record how many infections each group has (during / after the test)(1)	accept: one in each group accept: test the same people with probiotic yoghurt for a month and then with normal yoghurt for a month for 2 marks accept: measure number of probiotic / beneficial bacteria (in L intestine) accept how many times they get sick	(3)

Total for question 3 = 10 marks

Question number	Answer	Acceptable answers	Marks
4 (a)	A suggestion linking: • change the light intensity for each piece of celery / detail of how to change light intensity eg. change distance of lamp (1) with **two** of the following: • keep at least one other named factors constant eg. amount of foliage / temperature (1) • measure how far up the stem the dye has risen (1) • in set time (1)	accept: measure time taken to reach a set distance / point on celery (2 marks) accept: measure how much dye is left in the beakers	(3)

Question number	Answer	Acceptable answers	Marks
4 (b) (i)	A explanation including **two** of the following: • water exits leaves through stomata (1) • guard cells close / stomata close (1) • so less water can leave the leaf / less diffusion of water occurs / plant is becoming dehydrated (1) • plants wilt (1)	accept: plant is losing too much water / to prevent water loss	(2)

Question number	Answer	Acceptable answers	Marks
4 (b) (ii)	**C** 100% **The only correct answer is C** This is a mathematical question with only one correct answer. The questions asks for the % increase from 4 to 8 which have to be extracted from the table. The increase is therefore 4 so (4÷4) x 100 = 100% therefore the other answers are incorrect ***A** is not correct because 25% is not 100%* ***B** is not correct because 50% is not 100%* ***D** is not correct because 200% is not 100%*		(1)

Question number	Answer	Acceptable answers	Marks
4 (c)	An explanation including **two** of the following: • active uptake / active transport (1) • using energy / ATP (1) • to move (mineral ions) against concentration gradient (1) **OR** • when (mineral ions) concentration is higher in the soil) (1) • by diffusion / from an area of high concentration to an area of low concentration) (1)	accept: if excess fertiliser has been added to the soil second mark point can only be given linked to first	(2)

Question number	Answer	Acceptable answers	Marks
4 (d)	An explanation to include **two** of the following: • by osmosis (1) • from low **solute** concentration to high **solute** concentration / from higher **water** concentration to lower **water** concentration (through a partially permeable membrane)(1) • across root as 'next' cell has higher solute concentration / equivalent (1) • in to the xylem (1)	accept: from higher concentration to lower concentration	(2)

Total for question 4 = 10 marks

Question number	Answer	Acceptable answers	Marks
5 (a) (i)	any number between 2130 to 2140		(1)

Question number	Answer	Acceptable answers	Marks
5 (a) (ii)	improvements to techniques / better equipment / more equipment / more people working on the project / more collaboration	Ignore: references to cost alone	(1)

Question number	Answer	Acceptable answers	Marks
5 (a) (iii)	Any **two** of the following: • to research / have a better understanding of genetic disorders / locating where faulty alleles are (on chromosomes) (1) • to find cures / medicines for **genetic** disease / Gene therapy (1) • to develop personalised genomic / specialised medicines (1) • predict risk of (genetic) disorder / genetic counselling (1)	accept: faulty gene for faulty allele accept: detect genetic disorders accept: cancer for genetic disease throughout	(2)

Question Number		Indicative Content	Mark
QWC	***5b**	A description which includes some of the following points • transcription occurs in the nucleus • a gene is a sequence of bases on DNA • one gene codes for one polypeptide / protein • DNA strands split • H bonds between bases broken • by enzyme • the gene / section of DNA / section of chromosome is copied • mRNA bases / nucleotides are complementary to (DNA) bases • mRNA bases are ACG and U • U replaces T in mRNA • enzyme / RNA polymerase makes mRNA / joins bases together • mRNA is a small molecule / single strand (so can fit through nuclear pore) • mRNA leaves nucleus • through nuclear pore	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited description that includes at least **one** piece of indicative content • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple description of transcription that includes references to DNA being copied and mRNA • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5**	• A detailed description linking the stages of transcription including references to DNA being copied and mRNA and a reference to uracil / U. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Question number	Answer	Marks
5 (c)	An explanation linking: • (the mutation results in) a change in the shape of the enzyme / active site (1) with any **one** of: • mutation is a change in the DNA (base sequence) (1) • enzyme – substrate complex can't form / {amino acids / substrate} will not fit into / bind to the {active site / enzyme} (as well) (1)	(2)

Total for question 5 = 12 marks

Question number	Answer	Marks
6 (a) (i)	**B** small intestine **The only correct answer is B** **Organ X is the pancreas that secretes enzymes into small intestine.** ***A** is not correct because the pancreas does not secrete enzymes into the stomach* ***C** is not correct because the pancreas does not secrete enzymes into the large intestine* ***D** is not correct because the pancreas does not secrete enzymes into the liver*	(1)

Question number	Answer	Acceptable answers	Marks
6 (a) (ii)	Description including two of the following • amylase is an enzyme / carbohydrase (1) • amylase breaks down starch / carbohydrate (1) • into (simple) sugar / maltose / glucose (1)	accept: amylose for starch ignore: digests	(2)

Question number	Answer	Acceptable answers	Marks
6 (b)	A suggestion to include **three** of the following: • gall bladder stores bile / less bile (added to small intestine) (1) • bile emulsifies fats / neutralises acids / increases pH / (without gall bladder) less emulsification of lipids / fats (1) • (so) {lipases / enzymes} **less effective** (1) • a consequence described eg fewer fatty acids / less glycerol absorbed / less energy released in body / (have to) eat a low fat diet (1)	accept: no bile released. Ignore: bile not produced accept surface area not increased lipids not made into smaller drops ignore: no lipase action accept: causes diarrhoea / heartburn / indigestion / weight loss	(3)

Question Number		Indicative Content	Mark
QWC	***6c**	An explanation to include some of the following points: **structures** • villi • microvilli • capillaries / blood supply • lacteal • thin intestinal lining • muscles in intestinal walls • small intestine is long **description** • (molecules) absorbed by diffusion / active uptake • (villi) finger like projections increase surface area • (long small intestine) increase surface area • (microvilli) are more folds on the villi / increased surface area • (intestinal lining) one cell thick / permeable • good blood supply / capillary network /increases surface area • muscles contract / peristalsis **how structures increase absorption** • thin surface / layer of cells reduces distance for diffusion / digested foods are absorbed quicker • (increased surface area) means **more** food can be absorbed • (lacteal) absorbs fatty acids / glycerol • blood flow maintains concentration gradients / maintain rate of diffusion / takes nutrients away • (muscles) keeps moves food closer to villi / maintains concentration gradient	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation that includes **one** piece of indicative content • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple explanation stating at least **three** structures **OR** describing the features of **one** structure • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed explanation describing at least **two** structures linking **one** of them to how they allow the effective absorption of molecules • the answer communicates ideas clearly two and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Total for question 6 = 12 marks

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