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Mark Scheme (Results)

January 2023

Pearson Edexcel International GCSE
In Human Biology (4HB1)
Paper 02

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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.

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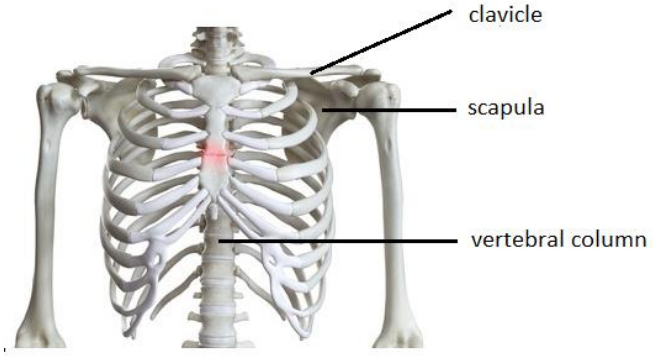
Question number	Answer	Notes	Marks
1 (a) (i)			3
(ii)	• support the body; • protection (of the brain and vital organs);		2
(b)	Three from: • decrease in bone mass/bones less dense/more spongy/porous; • bone strength weakens/brittle bones/bones break more easily/fractures occur; • height decreases/stoop/poor posture; • pain;		3

Total 8 marks

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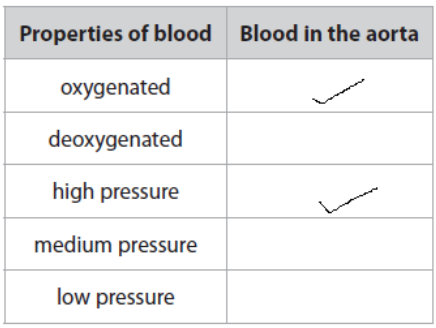
Question number	Answer	Notes	Marks
2 (a) (i)	left ventricle;		1
(ii)	Two from: • valve; • prevents the backflow of blood; • so the blood flows the correct way around the heart/in one direction;	Ignore names of valves	2
(iii)	 Properties of blood / Blood in the aorta oxygenated ✓ deoxygenated high pressure ✓ medium pressure low pressure	One mark removed for every additional incorrect tick.	2
(iv)	the lungs/pulmonary vein;		1
(b)	Two from: • it could be diseased/damaged/fatty deposits/blocked arteries; • the tissue/blood type doesn't match; • it has been removed from person for too long; • wrong size;	accept named diseases allow risk of rejection	2
(c) (i)	**C** platelets;		1
(ii)	• fibrinogen is not converted to fibrin/fibrin not produced; • so factor XIII has no substrate/fibrin cannot form the clot/mesh not formed;		2

Total 11 marks

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Question number	Answer	Notes	Marks

3 (a) (i)	surface area = 24 (mm^2);
	volume = 8 (mm^3);
	3:1;
		Full marks for correct final answer	3

(ii)	**C** 92;		1
(iii)	movement from a high concentration to a low concentration;		1
(iv)	• reduces the time taken to become colourless/rate of diffusion/reaction is faster; • the diffusion distance is shorter/greater area over which diffusion/collisions can occur;		2
(b) (i)	• use acid heated to different temperatures/idea of different temperatures; • compare/measure the time taken to become colourless/compare rate of diffusion;		2
(ii)	Any two from: • the side length of the cube/size of the cube/surface area/volume of cube; • acid concentration; • concentration of alkali/indicator in the cube;	accept volume of acid Allow volume of indicator	2

Total 11 marks

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Question number	Answer	Notes	Marks
4 (a) (i)	Two from: • no red blood cells; • no plasma/large proteins; • higher oxygen concentration in the blood; • lower carbon dioxide concentration in the blood;	ORA	2
(ii)	• artery end has a higher pressure; • capillaries have holes/pores/are permeable to small molecules/are leaky; • water forced/passes out; • small molecules are forced out/filtered/larger molecules/named larger molecule remain in the blood;	Allow blood enters capillaries under high pressure	4
(iii)	• excess tissue fluid drains through the lymph; • muscle contraction moves fluid in the lymphatic system;		2
(b)	Three from: • antibodies have a variable region/contain receptors; • variable region/receptors have a specific shape/all antibodies are different; • variable region/receptors are a complementary shape to antigen; • antibodies bind to an antigen;		3

Total 11 marks

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Question number	Answer	Notes	Marks
5 (a) (i)	$C_6H_{12}O_6$; $6H_2O$;		2
(ii)	ATP breaks down/hydrolysed; to ADP and Pi;	Allow phosphate/P	2
(b) (i)	• suitable axis labels with units; • time on x axis; • suitable scale; • correct plots;		4
(ii)	• suitable curve;		1
(iii)	Five from; • mass of haemoglobin increases (with time/training at altitude); • increased number of red blood cells/more haemoglobin in the blood; • haemoglobin binds oxygen/red blood cells carry oxygen; • more oxygen transported around the body/in the blood; • to muscle (cells/tissue); • for aerobic respiration; • to release energy;		5

Total 14 marks

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Question number	Answer	Notes	Marks
6 (a) (i)	Three from: • the use of embryonic stem cells is not needed/embryos not destroyed; • easily available source of cells/easy to obtain/no need to find a donor; • same cell/tissue/blood type of the patient/same antigens; • reduced chance of rejection/not recognised as foreign;		3
(ii)	Two from: • unlicensed clinics could be used; • stem cells could develop into tumours/cancer; • risk of rejection (if the cells are not the recipients); • increased risk of infection;		2
(b) (i)	860 000 and 480 000; 380 000;	Ecf allow one mark for incorrectly derived figures from graph but correct answer from these figures	2
(ii)	**D** structure Z;		1
(c)	Three from: • cut out desired/beta-carotene/gene/gene for vitamin A; • using/cut with restriction enzymes; • insert into plasmid; • insert into/infect rice genome; • to produce golden rice;		3

Total 11 marks

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Question number	Answer	Notes	Marks
7 (a) (i)	Hypothalamus/osmoregulatory centre;		1
(ii)	<table><tr><th></th><th colspan="3">Structure</th></tr><tr><th>Function</th><th>glomerulus</th><th>proximal tubule</th><th>renal vein</th></tr><tr><td>regulation of water level</td><td></td><td></td><td></td></tr><tr><td>ultrafiltration</td><td>✓</td><td></td><td></td></tr><tr><td>reabsorption of glucose</td><td></td><td>✓</td><td></td></tr><tr><td>removal of blood from kidney</td><td></td><td></td><td>✓</td></tr><tr><td>supply of blood to kidney</td><td></td><td></td><td></td></tr><tr><td>removal of urine from collecting duct</td><td></td><td></td><td></td></tr></table>	Reject more than one tick in any column	3
(b) (i)	• breakdown of proteins/amino acids/deamination/removal of NH_2/amine group; • in the liver;		2
(ii)	Five from: • second sample has less water/more urea/other components; • urine is more concentrated/less urine produced; • person is less hydrated/less water/lower water potential in the blood; • ADH has been produced; • increased the permeability of the collecting duct; • more water has been reabsorbed (by the blood);		5

Total 11 marks

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Question number	Answer	Notes	Marks
8 (a) (i)	triggers ovulation/causes release of the egg;		1
(ii)	Three from: • FSH stimulates growth/production of follicles in the ovary; • more eggs mature/produced; • increases the chances of more than one egg being released; • each egg is fertilised by a sperm;		3
(b) (i)	Three from: • placenta supplies glucose/oxygen from the mother; • twins have to share the supply of glucose/receive less glucose/oxygen; • less aerobic respiration; • less energy is released in the foetus and less growth occurs;	Allow nutrients for mp's 1 and 2	3
(ii)	Two from • same egg and sperm used; • zygote splits/divides • forming 2 embryos;		2
(c) (i)	75th		1
(ii)	• baby is weighed regularly; • growth should follow a percentile/graph/compare with (growth) chart/graph/compare mass to others of the same age; • detect if the baby gains or loses too much mass;		3

Total 13 marks

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