



# Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE  
In Human Biology (4HB1) Paper 01

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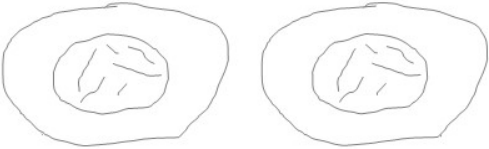
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## General Marking Guidance

- 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	Notes	Marks
1 (a)			
(i)	<b>D</b> sugars  A/B/C are incorrect as amino acids/bases/protein do not form part of backbone		1
(ii)	<b>B</b> bases  A is incorrect as the structures labelled Y are bases C is incorrect as proteins are not incorporated into DNA structure D is incorrect as sugar is found in the backbone		1
(iii)	Any two from the following: <ul style="list-style-type: none"> <li>hydrogen bonds;</li> <li>between complementary bases;</li> </ul>	Allow description of complementary base pairing	2
(iv)	nucleus;		1
(b)	Any two from the following:		
(i)	<ul style="list-style-type: none"> <li>RNA contains ribose sugar and DNA contains deoxyribose;</li> <li>RNA is single-stranded and DNA is double stranded;</li> <li>RNA contains uracil and DNA contains thymine;</li> </ul>		2
(ii)	<b>D</b> mRNA and tRNA  A/B/C are incorrect as pRNA/dRNA/dRNA are not types of RNA		1
(c)	<b>R</b> phosphate; <b>S</b> sugar/deoxyribose; <b>T</b> base;	Allow a named base	3
			Total 11

Question number	Answer	Notes	Marks
2 (a) (i)	156 – 72; 84;	ECF if candidates use incorrect values from the graph with correct answer from for incorrect values = 1 mark	2
(ii)	<b>C</b> 9 minutes;		1
(iii)	In the following order only: <ul style="list-style-type: none"> <li>• oxygen;</li> <li>• diffusion;</li> <li>• aerobic/cellular;</li> <li>• decreases/reduces/goes down;</li> </ul>		4
(b) (i)	 <p>must have 6 chromosomes shape not important</p>	One mark for each correct cell drawn	2
(ii)	<b>B</b> metaphase;  A is incorrect as chromosomes do not align at the equator during anaphase C is incorrect as chromosomes do not align at the equator during prophase D is incorrect as chromosomes do not align at the equator during telophase		1
			Total 10

Question number	Answer	Notes	Marks
3 (a) (i)	Any five from the following: <ul style="list-style-type: none"> <li>place water in the test tube;</li> <li>take the (starting) temperature of the water;</li> <li>attach the test tube to a clamp stand;</li> <li>measure the mass of a piece of food/weigh food;</li> <li>place food on the mounted needle (under the test tube);</li> <li>burn the food; (using a Bunsen burner)</li> <li>take the (final) temperature of the water;</li> </ul>		5
(ii)	Any two from the following: <ul style="list-style-type: none"> <li>volume/mass of water;</li> <li>distance of the food from the test tube;</li> <li>mass of food;</li> </ul>	ignore amount  ignore amount/size	2
(iii)	Any two from the following: <ul style="list-style-type: none"> <li>hold the burning food at arm's length;</li> <li>reference to sharpness of needle;</li> <li>goggles;</li> <li>reference to food allergies/don't taste food;</li> </ul>	any ref to being burnt/hot water	2
(b) (i)	Any two from the following: <ul style="list-style-type: none"> <li>males need more energy than females;</li> <li>the amount of energy required decreases with age;</li> <li>the amount of energy needed by males decreases more (overall) than females;</li> </ul>		2
(ii)	<b>D</b> - Males use more muscle mass than females;		1
(iii)	<ul style="list-style-type: none"> <li><math>(2629 - 2103) = 526</math>;</li> <li><math>526 \div 2103</math>;</li> <li><math>(\times 100) = 25 (\%)</math>;</li> </ul>	if divide by 2629 and give 20% then two marks	3
		Total 15 marks	

Question number	Answer	Notes	Marks																																		
4 (a) (i)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">Africa</th> <th colspan="2" style="text-align: center;">Europe</th> </tr> <tr> <th style="width: 25%;">Blood group</th> <th style="width: 25%;">Percentage of blood group</th> <th style="width: 25%;">Blood group</th> <th style="width: 25%;">Percentage of blood group</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">O</td> <td style="text-align: center;">68</td> <td style="text-align: center;">O</td> <td style="text-align: center;">45</td> </tr> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">17/17.5</td> <td style="text-align: center;">A</td> <td style="text-align: center;">40</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="text-align: center;">10;</td> <td style="text-align: center;">B</td> <td style="text-align: center;">12</td> </tr> <tr> <td style="text-align: center;">AB</td> <td style="text-align: center;">5</td> <td style="text-align: center;">AB</td> <td style="text-align: center;">3;</td> </tr> </tbody> </table> <p>(ii)</p> <ul style="list-style-type: none"> <li>• reference to antigens on red blood cells (group B);</li> <li>• antibodies produced;</li> <li>• causing agglutination/clumping (of red blood cells);</li> </ul> <p>(iii)</p> <div style="text-align: center;"> <table style="border: none; margin: auto;"> <tr> <td style="padding: 0 10px;"><math>I^A I^O</math></td> <td style="padding: 0 10px;"><math>I^B I^O</math>;</td> </tr> <tr> <td style="padding: 0 10px;"><math>I^A</math></td> <td style="padding: 0 10px;"><math>I^O</math></td> </tr> <tr> <td style="padding: 0 10px;"><math>I^B</math></td> <td style="padding: 0 10px;"><math>I^O</math>;</td> </tr> <tr> <td style="padding: 0 10px;"><math>I^A I^B</math></td> <td style="padding: 0 10px;"><math>I^A I^O</math></td> </tr> <tr> <td style="padding: 0 10px;"><math>I^B I^O</math></td> <td style="padding: 0 10px;"><math>I^O I^O</math>;</td> </tr> </table> </div> <p>(iv) 1 in 4: /25%/1/4/0.25;</p>	Africa		Europe		Blood group	Percentage of blood group	Blood group	Percentage of blood group	O	68	O	45	A	17/17.5	A	40	B	10;	B	12	AB	5	AB	3;	$I^A I^O$	$I^B I^O$ ;	$I^A$	$I^O$	$I^B$	$I^O$ ;	$I^A I^B$	$I^A I^O$	$I^B I^O$	$I^O I^O$ ;	<p>Full marks for a Punnett square if parent genotypes are given.</p>	<p style="text-align: center;">2</p> <p style="text-align: center;">3</p> <p style="text-align: center;">3</p> <p style="text-align: center;">1</p>
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(b)	<ul style="list-style-type: none"> <li>• <u>deoxygenated</u> blood moves into the left side/ventricle of the heart;</li> <li>• (deoxygenated blood) mixes with <u>oxygenated</u> blood;</li> <li>• less oxygen travelling around the body/to body/cells/in bloodstream;</li> <li>• breathes faster to get more oxygen into the body;</li> </ul>		<p style="text-align: center;">4</p> <p style="text-align: right;">Total 13</p>																																		

	<b>Answer</b>	<b>Notes</b>	<b>Marks</b>
5			
(a)	<ul style="list-style-type: none"> <li>• collect urine throughout the cold day;</li> <li>• measure the volume produced;</li> <li>• repeat for a hot day;</li> <li>• compare values;</li> </ul>		4
(b)	<p>any three from</p> <ul style="list-style-type: none"> <li>• vasodilation/arteriole widens;</li> <li>• increased flow of blood through skin;</li> <li>• heat lost through the skin's (surface);</li> <li>• by radiation;</li> </ul>	allow artery	3
(c)	<ul style="list-style-type: none"> <li>• (more) ADH released;</li> <li>• from pituitary gland;</li> <li>• makes kidney tubules/collecting ducts (more) permeable;</li> <li>• (more) water reabsorbed into the body/blood/from filtrate/urine;</li> </ul>		4
			Total 11



Question number	Answer	Notes	Marks
6	<p>Any six from the following:</p> <ul style="list-style-type: none"> <li>• remove plasmid from bacteria;</li> <li>• locate the human insulin gene</li> <li>• cut/remove insulin gene (from human);</li> <li>• cut open the plasmid;</li> <li>• using restriction enzymes;</li> <li>• add the human insulin gene to the plasmid;</li> <li>• use of ligase;</li> <li>• ref recombinant DNA;</li> <li>• return the plasmid to a bacterial cell;</li> </ul>	Suitably drawn <b>and</b> annotated diagrams can score full marks.	6
			Total 6

Question number	Answer	Notes	Marks
7	<p>(a) (i) obtain a pure product/enzyme and product not mixed/enzymes are reusable/active over wider range of temperature/pH;</p> <p>(ii) sucrose;</p> <p>(iii) any three from</p> <ul style="list-style-type: none"> <li>• add sodium alginate with distilled water;</li> <li>• mix (with a hand blender);</li> <li>• until all sodium alginate has dissolved;</li> <li>• add calcium chloride;</li> <li>• wash beads;</li> </ul>		1
	<p>(b) <b>B</b> insulin is released from the pancreas and travels to the liver</p> <p><b>A</b> is incorrect as glucagon does not convert glucose to glycogen</p> <p><b>C</b> is incorrect as glucagon is not released from the liver</p> <p><b>D</b> is incorrect as insulin is not released from the liver</p>		1

(c) (i)	<ul style="list-style-type: none"> <li>• <math>(66.65 \div 100) = 0.6665</math>;</li> <li>• <math>(\times 6) = 4.0</math> (million);</li> </ul>	Allow 0.67 Allow 3.999	2
(ii)	<ul style="list-style-type: none"> <li>• 38 49 51 62 65 78 82 91 96;</li> <li>• 65;</li> </ul>		2
			Total 10

Question number	Answer	Notes	Marks
8 (a)	<p><b>Advantages embryonic stem cells:</b></p> <ul style="list-style-type: none"> <li>• generate most cell types;</li> <li>• can maintain and grow for long lengths of time in culture;</li> <li>• useful for drug development studies/Parkinson's disease;</li> </ul> <p><b>Disadvantages of embryonic stem cells:</b></p> <ul style="list-style-type: none"> <li>• can cause tumours/cancer;</li> <li>• many embryos destroyed;</li> <li>• some people think it is unethical/killing/murder;</li> <li>• possibility of rejection if used in transplants</li> </ul> <p><b>Advantages of adult stem cells:</b></p> <ul style="list-style-type: none"> <li>• can be reprogrammed;</li> <li>• less likely rejected if used in transplants;</li> <li>• taken from the patient itself;</li> </ul> <p><b>Disadvantages of adult stem cells:</b></p> <ul style="list-style-type: none"> <li>• limited ability to differentiate/develop into different types of cell;</li> <li>• cannot be grown for long periods of time in culture;</li> <li>• usually a very small number found in body tissues;</li> <li>• can only grow small numbers;</li> </ul>	<p>Three marks from embryonic stem cell section and three marks from adult stem cell section</p> <p>Allow a valid named ethic</p>	6
			Total 6

Question number	Answer	Notes	Marks
9 (a)	<ul style="list-style-type: none"> <li>• beta blockers;</li> <li>• block/bind to receptors;</li> <li>• which prevents the release of adrenaline/noradrenaline;</li> <li>• heart rate decreases;</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• ACE inhibitors;</li> <li>• reduce the activity of enzymes;</li> <li>• less angiotensin;</li> <li>• less narrowing of blood vessels;</li> </ul>		4
(b)(i)	<p>any two from</p> <ul style="list-style-type: none"> <li>• how much pressure blood is exerting;</li> <li>• against artery walls;</li> <li>• when ventricles contract/pump;</li> </ul>		2
(ii)	<ul style="list-style-type: none"> <li>• pressure in the arteries;</li> <li>• when the heart/ventricles at rest/relaxed/between beats;</li> </ul>		2
			Total 8

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