



# Mark Scheme (Results)

Summer 2021

Pearson Edexcel International GCSE  
in Human Biology (4HBI)  
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	Notes	Marks																														
1	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th colspan="4">Component</th> </tr> <tr> <th>Feature</th> <th>Red blood cell</th> <th>Plasma</th> <th>Platelet</th> <th>Phagocyte</th> </tr> </thead> <tbody> <tr> <td>transports oxygen</td> <td>✓;</td> <td></td> <td></td> <td></td> </tr> <tr> <td>has a nucleus</td> <td></td> <td></td> <td></td> <td>✓;</td> </tr> <tr> <td>consists of 90% water</td> <td></td> <td>✓;</td> <td></td> <td></td> </tr> <tr> <td>involved in blood clotting</td> <td></td> <td>✓</td> <td>✓;</td> <td></td> </tr> </tbody> </table>		Component				Feature	Red blood cell	Plasma	Platelet	Phagocyte	transports oxygen	✓;				has a nucleus				✓;	consists of 90% water		✓;			involved in blood clotting		✓	✓;		Mark by row	4
	Component																																
Feature	Red blood cell	Plasma	Platelet	Phagocyte																													
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involved in blood clotting		✓	✓;																														

Total 4 marks

Question number	Answer	Notes	Marks
2 (a)	(i) 1 = humerus; 2 = radius; 3 = ulna; 4 = fingers/phalanges;		4
	(ii) circle at the elbow to include all three bones;	accept a circle around relevant bones in the fingers	1
	(iii) <ul style="list-style-type: none"> <li>• ball and socket;</li> <li>• gliding/sliding;</li> </ul>	reject named examples	2
(b)	<ul style="list-style-type: none"> <li>• assists/allows uptake of calcium (salts from gut);</li> <li>• (calcium) needed for bone growth;</li> <li>• hard bone/compact bone;</li> </ul>		3

Total 10 marks

Question number	Answer	Notes	Marks
3 (a) (i)	A (amino acids);  B and D are components of lipids C is a carbohydrate		1
(ii)	<ul style="list-style-type: none"> <li>• add Biuret solution to test solution;</li> <li>• mauve/lilac, protein present;</li> <li>• remains blue, protein absent;</li> </ul>		3
(b) (i)	<ul style="list-style-type: none"> <li>• suitable axes labels;</li> <li>• suitable scale;</li> <li>• correct plots;</li> <li>• suitable curves;</li> <li>• curves labelled;</li> </ul>	max 3 for bar chart  accept key	5
(ii)	<ul style="list-style-type: none"> <li>• denaturation;</li> <li>• loss of shape of active site/enzyme;</li> <li>• substrate no longer fits/decreases rate of activity;</li> </ul>		3
(iii)	any three from <ul style="list-style-type: none"> <li>• B is much more active/works faster;</li> <li>• over whole temperature range;</li> <li>• higher optimum temperature for B/works fastest at 80°C;</li> <li>• active over a greater range of temperatures;</li> </ul>		3

Total 15 marks

Question number	Answer	Notes	Marks
4 (a) (i)	A (bacterium);  B doesn't cause it C doesn't cause it D doesn't cause it		1
(ii)	<ul style="list-style-type: none"> <li>• no of cases decreases as vaccination rate increases;</li> <li>• lag in effect;</li> <li>• fluctuations in number of cases;</li> <li>• despite percentage of vaccinations remaining constant;</li> </ul>		4
(b)	2.75 per 100 000;  $\frac{2.75 \times 3\,450\,000}{100\,000}$ = 95 people;	correct answer without working = 3 ECF = 2	3
(c)	<ul style="list-style-type: none"> <li>• inject weakened/attenuated organism;</li> <li>• causes antibody production;</li> <li>• antibodies remain in blood;</li> <li>• memory cells formed;</li> <li>• on infection antibodies can respond quickly;</li> </ul>		5

Total 13 marks

Question number	Answer	Notes	Marks
5 (a) (i)	<ul style="list-style-type: none"> <li>• join with ovum;</li> <li>• during fertilisation;</li> </ul>		2
(ii)	any two from <ul style="list-style-type: none"> <li>• ribosomes;</li> <li>• endoplasmic reticulum/ER;</li> <li>• chromosomes;</li> </ul>		2
(b)	<ul style="list-style-type: none"> <li>• site of (aerobic) respiration;</li> <li>• energy released/ATP produced;</li> <li>• sperm motile/active/swim;</li> </ul>		3
(c)	$3\mu\text{m} = 0.003 \text{ mm};$ distance between X and Y = 145 mm; $\frac{145}{0.003}$ $=48333/48000;$	ECF = 2	4

Total 11 marks

Question number	Answer	Notes	Marks
6 (a) (i)	<ul style="list-style-type: none"> <li>separating different sized molecules out of the blood/only allows small molecules to pass;</li> <li>under pressure;</li> </ul>		2
(ii)	<ul style="list-style-type: none"> <li>A has more glucose;</li> <li>A has more urea;</li> <li>A more amino acids;</li> </ul>	ORA vessel B allow references to more oxygen in A and less carbon dioxide in A	3
(iii)	<ul style="list-style-type: none"> <li>Vessel A bring blood to Bowman's capsule/glomerulus;</li> <li>vessel B has narrow(er) lumen/diameter;</li> <li>causes increase/higher blood pressure;</li> <li>to force out molecules;</li> </ul>		4
(b)	<ul style="list-style-type: none"> <li>glucose would pass from blood;</li> <li>respiration affected/reduced;</li> <li>lack of energy/ATP;</li> </ul>		3

Total 12 marks

Question number	Answer	Notes	Marks
7 (a) (i)	<ul style="list-style-type: none"> <li>• safety glasses/goggles;</li> <li>• care using sharp needle;</li> <li>• care to avoid burns;</li> <li>•</li> </ul>		3
(ii)	<ul style="list-style-type: none"> <li>• mass of food;</li> <li>• volume of water;</li> <li>• distance of burning food from tube;</li> </ul>	reject amount	3
(iii)	<p>any five from</p> <ul style="list-style-type: none"> <li>• not all food burns to release energy;</li> <li>• not all heat transferred to water;</li> <li>• some lost to atmosphere;</li> <li>• some heat lost to needle/glass tube;</li> <li>• uneven distribution of temperature in water;</li> <li>• because lack of stirring;</li> </ul>		5
(b)	<p>any four from</p> <ul style="list-style-type: none"> <li>• use of oxygen;</li> <li>• allows complete combustion;</li> <li>• enclosed/lid so no heat escapes;</li> <li>• heat transfer coil so all heat is used to increase temp of water/transferred to water;</li> <li>• stirrer to distribute heat;</li> </ul>		4

Total 15 marks

Question number	Answer	Notes	Marks
8 (a)	any three from <ul style="list-style-type: none"> <li>• rapid response;</li> <li>• automatic;</li> <li>• to protect body;</li> <li>• from harmful effects/named example;</li> </ul>		3
(b)	correct position;		1
(c)	any six from <ul style="list-style-type: none"> <li>• impulse arrives at end of axon;</li> <li>• synapse;</li> <li>• causes release of neurotransmitter;</li> <li>• e.g. acetylcholine;</li> <li>• from vesicles;</li> <li>• diffuses across gap/cleft;</li> <li>• combines with/stimulates (post synaptic) receptors;</li> <li>• triggers impulse;</li> </ul>		6

Total 10 marks