Pearson BTEC

Mark Scheme (Results)

January 2021

Pearson BTEC Nationals

In Applied Human Biology (21325L)

Unit 1: Principles of Applied Human Biology

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Unit 1: Principles of Applied Human Biology

General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Mark grids should be applied positively. Learners must be rewarded for what they have shown they can do rather than be penalised for omissions.
- Examiners should mark according to the mark grid, not according to their perception of where the grade boundaries may lie.
- All marks on the mark grid should be used appropriately.
- All the marks on the mark grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks, if the learner's response is not rewardable according to the mark grid.
- Where judgement is required, a mark grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the mark grid to a learner's response, a senior examiner should be consulted.

Specific marking guidance

The mark grids have been designed to assess learners' work holistically.

Rows in the grids identify the assessment focus/outcome being targeted. When using a mark grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.

- Marks will be awarded towards the top or bottom of that band depending on how they have evidenced each of the descriptor bullet points.

<table>
<tr><th>Question number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>1 (a)</td><td>Any two from:

(red) blood cells (1)

platelets (1)
fibrin (1)</td><td>Allow: white blood cells

ignore: Plasma</td><td>(2)</td></tr>
<tr><td>1 (b)</td><td>Award one mark for each row completed correctly.
<table>
<tr><td>Defence</td><td>Specific</td><td>Non-specific</td></tr>
<tr><td>skin forming a physical barrier</td><td>No</td><td>Yes</td></tr>
<tr><td>antibody production by lymphocytes</td><td>yes</td><td>no</td></tr>
<tr><td>hydrochloric acid in the stomach</td><td>no</td><td>Yes</td></tr>
<tr><td>phagocytosis by phagocytes</td><td>no</td><td>yes</td></tr>
</table></td><td></td><td>(3)</td></tr>
<tr><td>1 (c)</td><td>Cytotoxic T-cells/ T-killer cell</td><td>accept killer T-cell/ macrophages/ {natural killer/NK} cells/ {cytotoxic/ CD8+} T cell/ Tc cells</td><td>(1)</td></tr>
<tr><td colspan="3">Total</td><td>6 marks</td></tr>
</table>

Question number	Answer	Additional Guidance	Mark
2 (a)(i)	A 16%		(1)
2 (a)(ii)	Uracil	Allow U/u Allow attempt at phonetic spellings eg Uricil/Uricile	(1)
2 (b)	Award **1** mark for identification and **2** marks for linked expansion, up to a maximum of **3** marks. Any marking point may count as an identification or an expansion depending on how learners structure their answers. the allele (for Marfan syndrome) is dominant (1) only need one copy of the allele to be affected (1) child may inherit (Marfan syndrome) allele from father (1)	All MP can be awarded for correctly completed and	(3)

		labelled Punnett square. If no other marks awarded allow one mark for correct Punnett square.	
2 (c)	D intron		(1)
		Total	6 marks

Question number	Answer	Additional Guidance	Mark
3 (a)	Any **two** from the following: benign tumours have slow growth (1) benign tumours are encapsulated (1) benign tumours do not metastasise/spread/are not <u>cancerous</u> (1) benign tumours less likely to recur (1)	ORA throughout allow easier to remove/treat/less dangerous	(2)
3 (b)	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some or all of the indicative content but learners should be rewarded for other relevant answers. • mutations are a change to the DNA sequence • change in DNA may change amino acid sequence • change in amino acid sequence may change protein • cancer is unregulated cell division • proto-oncogenes are involved in cell division • mutations to proto-oncogenes cause them to become oncogenes • mutation in proto-oncogene may lead to unregulated cell division • cancers can be caused by activation of oncogenes • unregulated/more frequent cell division can form tumours • tumour suppressor genes help to regulate cell division • tumour suppressor genes are involved in programmed cell death/apoptosis • mutation to tumour suppressor genes		(6)

	• cancers can be caused by deactivation of tumour suppressor genes		
		Total	8 marks

Mark scheme (award up to 6 marks). Refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.		
Level	**Mark**	**Descriptor**
Level 0	0	No rewardable material.
Level 1	1–2	• Demonstrates isolated knowledge and understanding, there be major gaps or omissions • Generic statements may be presented rather than linkages being made so that lines of reasoning are not present • Limited explanation which is not logically ordered and with significant gaps.
Level 2	3–4	• Demonstrates mostly accurate knowledge and understanding, with few minor omissions/any gaps or omissions are minor • Some linkages are made so that lines of reasoning are partially present • Displays a partially developed explanation that has a structure which is mostly clear, coherent and logical with only minor omissions.
Level 3	5–6	• Demonstrates accurate and thorough/detailed knowledge and understanding • Linkages are consistently made so that lines of reasoning are sustained • Displays a well-developed explanation that has a structure which is clear, coherent and logical.

Question number	**Answer**	**Additional Guidance**	**Mark**
4 (a)(i)	Award **1** mark for identification and **1** mark for linked expansion, for each section, up to a maximum of **2** marks for each. Any marking point may count as an identification or an expansion depending on how learners structure their answers. Hyperplasia cells divide more frequently than usual (1) increase in cell numbers (1)	Allow answers making reference to tumour formation	(4)

	atrophy cells decrease in size/number (1) cell death (1)	Allow (description of) decrease in organ size	
4 (a)(ii)	D necrosis		(1)
4 (b)(i)	Award **1** mark for identification and **2** marks for linked expansion, Up to a maximum of **3** marks. Any marking point may count as an identification or an expansion depending on how learners structure their answers. blood clot blocks {artery/blood vessel} in the brain (1) prevents blood flow (1) prevents/reduces oxygen reaching brain cells/causes hypoxia (1) (brain cells) can't carry out (aerobic) respiration (1) necrosis (of brain cells) (1)	allow build up of waste products allow cell death	(3)
4 (b)(ii)	high blood pressure/diabetes/smoking/ high blood cholesterol/ obesity/age/male Accept any other reasonable response.	allow stress	(1)
		Total	9 marks

Question number	Answer	Additional Guidance	Mark
5 (a)	D rheumatoid arthritis		(1)
5 (b)(i)	Award **1** mark for identification and **2** marks for linked expansion, Up to a maximum of **3** marks. Any marking point may count as an identification or an expansion depending on how learners structure their answers. (histamine) binds to receptors (on blood vessels) (1) blood vessels dilate/expand/widen (1) increased blood flow (1) decreased (blood) pressure (1) leads to increased permeability of blood vessels (1)	Allow references to blood vessels becoming "leaky"	(3)
5 (b)(ii)	Award **1** mark for identification and **1** mark for linked expansion for each section, up to a maximum of **2** marks for each. Any marking point may count as an identification or an expansion depending on how learners structure their answers.		(4)

	cause of loss of consciousness inability to breathe/ constriction of airways (1) (leads to) {rapid/quick/fast} drop in blood oxygen (1) lack of oxygen {to the brain} (1) **treatment of anaphylaxis** injection of adrenaline (1) relaxes (smooth muscle in)/opens the airways (1) {restores/increases} blood oxygen levels(1)	allow swelling of airways Ignore references to blood flow. allow "epinephrine"/"epi-pen" Ignore references to inhalers Reject: antihistamine	
5 (c)(i)	immunosuppression/chemotherapy/radiotherapy Allow any other reasonable response.	Allow organ transplant for immunosuppression allow steroid use	(1)
5 (c)(ii)	Award **1** mark for identification and **1** mark for linked expansion, Up to a maximum of **2** marks. Any marking point may count as an identification or an expansion depending on how learners structure their answers. HIV infects {T-cells/white blood cells} (1) (HIV) decreases {T-cell/white blood cell} function (1) (HIV) destroys/decreases number of {T-cells/ white blood cells} (1)	allow macrophages/monocytes only penalise incorrect/missing cell type once allow kills/attacks	(2)
		Total	11 marks

Question number	Answer	Additional Guidance	Mark
6 (a)(i)	C pulmonary vein		(1)
6 (a)(ii)	P {atrioventricular/tricuspid} valve Q (left) ventricle	Allow AV Reject right ventricle	(2)
6 (b)	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some or all of the indicative content but learners should be rewarded for other relevant answers.		(9)

	R = Veins • blood flows at low pressure • thin walls • no need to withstand high pressure • valves present within veins • to prevent backflow of blood • larger lumen S = Arteries • blood flows through at highest pressures • wall is elastic • allows for recoil between surges in pressure • outer wall is tough/ contains thick collagen • can withstand high pressures without bursting • small lumen • maintain diastolic blood pressure • arterioles able to constrict / vessel walls contain smooth muscle • smooth endothelium reduces friction • can control blood supply in response to stimuli		
		Total	12 marks

Mark scheme (award up to 9 marks). Refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Mark	Descriptor
0	No rewardable material.
1–3	• Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions. • Few of the points made will be relevant to the context in the question. • Limited evaluation that contains generic assertions, leading to a conclusion that is superficial or unsupported.
4–6	• Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions. • Some of the points made will be relevant to the context in the question, but the link will not always be clear. • Displays a partially developed evaluation that considers some different competing points, although not always in detail, leading to a conclusion that is partially supported.
7–9	• Demonstrates mostly accurate and thorough/detailed knowledge and understanding. • Most of the points made will be relevant to the context in the question, and there will be clear links. • Displays a developed and logical evaluation that clearly considers different aspects and competing points in detail, leading to a conclusion that is fully supported.

Question number	Answer	Additional Guidance	Mark
7 (a)	Award **1** mark for each point, Up to a maximum of **2** marks for similarities and **2** marks for differences. **Similarities** both (contain/made from) amino acids (1) both contain {polymer/polypeptide} chains (1) both contain peptide bonds (1) both contain hydrogen bonds (in secondary structure) (1) **Differences** fibrous proteins have an elongated shape (1) fibrous proteins have a larger surface area (1) fibrous proteins have crosslinks (between chains) (1) fibrous proteins have repetitive (amino acid) sequence (1) fibrous proteins do not have quaternary structure (1) Allow any other reasonable response.	ORA throughout allow monomers allow long chains allow amide bonds ORA throughout Allow fibrous proteins do not have tertiary structure Allow fibrous proteins are (generally) insoluble	(4)
7 (b)(i)	C glycosidic		(1)
7 (b)(ii)	haemoglobin	Allow phonetic spelling/ Hb allow: oxyhaemoglobin Do not allow myoglobin	(1)
7 (b)(iii)	carbon dioxide/water	Allow chemical formula	(1)
7 (b)(iv)	W = NAD^+ / nicotinamide adenine dinucleotide X = ATP / adenosine triphosphate Y = pyruvic acid / pyruvate Z = lactic acid / lactate	Accept NAD Allow phonetic spellings throughout	(4)
7 (c)	A calculation that shows the following:	Allow ECF at any stage	(3)

	substitution (1) 66 ÷ 825 evaluation (1) 0.08 conversion (1) 80 (µm)	Allow conversion at any stage Award full marks for 80 2 marks for 80 x any power of ten	
		Total	14 marks

Question number	Answer	Additional Guidance	Mark
8 (a)(i)	C ureter		(1)
8 (a)(ii)	Award **1** mark for identification and **2** marks for linked expansion, up to a maximum of **3** marks. Any marking point may count as an identification or an expansion depending on how learners structure their answers. lack of insulin/glucose does not enter cells/is not converted to glycogen (1) (very) high <u>blood</u> glucose (1) not all the glucose is (selectively) reabsorbed (1) in the proximal convoluted tubule/ nephron (1)	ORA for healthy person allow references to "too much glucose" for MP1	(3)
8 (a)(iii)	B sodium ions		(1)
8 (b)	Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and levels descriptors below. The indicative content that follows is not prescriptive. Answers may cover some or all of the indicative content but learners should be rewarded for other relevant answers. • negative feedback allows for consistent water level to be maintained/homeostasis • baroreceptors in artery walls detect changes in plasma volume • osmoreceptors in the hypothalamus detect changes in blood solute concentration • ADH is synthesised in the hypothalamus • ADH is released from the pituitary gland		(9)

	if water balance is too low: • increased release of ADH from pituitary gland • ADH binds to receptors on tubules • reactions cause vesicles containing water channels/aquaporins to fuse with cell membrane • increases permeability of distal convoluted tubule and collecting duct • water leaves nephron by osmosis • more water is reabsorbed back into the blood *if water balance is too high:* • ADH production is inhibited • when ADH levels drop water channels are removed from membranes and repackaged • distal convoluted tubule and collecting duct become less permeable • less water reabsorbed • volume and concentration of urine changes with water absorption		
		Total	14 marks

Mark scheme (award up to 9 marks) refer to the guidance on the cover of this document for how to apply levels-based mark schemes*.

Level	Mark	Descriptor
Level 0	0	No rewardable material.
Level 1	1–3	• Demonstrates isolated elements of knowledge and understanding, there will be major gaps or omissions. • Few of the points made will be relevant to the context in the question. • Limited discussion that contains generic assertions rather than considering different aspects and the relationship between them.
Level 2	4–6	• Demonstrates some accurate knowledge and understanding, with only minor gaps or omissions. • Some of the points made will be relevant to the context in the question, but the link will not always be clear. • Displays a partially developed discussion that considers some different aspects and some consideration of how they interrelate, but not always in a sustained way.
Level 3	7–9	• Demonstrates mostly accurate and detailed knowledge and understanding. • Most of the points made will be relevant to the context in the question, and there will be clear links. • Displays a well-developed and logical discussion that clearly considers a range of different aspects and how they interrelate, in a sustained way.

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