



Mark Scheme (Results)

June 2019

Pearson BTEC Level 3 – Applied Human
Biology

Unit 1: Principles of Applied Human
Biology

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Unit 1: Principles of Applied Human Biology

General marking guidance

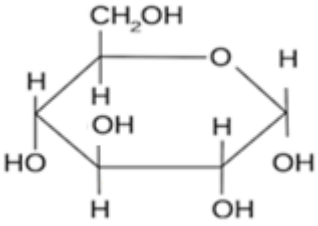
- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Learners must be rewarded for what they have shown they can do rather than be penalised for omissions.
- Examiners should mark according to the mark scheme, not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All 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 be prepared to award zero marks if a learner'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 learner's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the learner has replaced it with an alternative response.

Specific marking guidance for levels-based mark schemes

Levels-based mark schemes (LBMS) have been designed to assess learners' work holistically. They consist of two parts: indicative content and levels-based descriptors. Indicative content reflects specific content-related points that learners might make. Levels-based descriptors articulate the skills that learners are likely to demonstrate in relation to the skills being assessed in the question. The levels represent the progression of these skills.

When using a levels-based mark scheme, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches learners' 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 level descriptor, and will be modified according to how securely all traits are displayed at that band.

Question number	Answer	Additional guidance	Mark
1 (a)(i)	Pancreas	Accept phonetic spelling	(1)
1 (a)(ii)	C insulin		(1)
1 (b)	D 		(1)
1 (c)	Award 1 mark for identification and 1 mark for a linked expansion up to a maximum of 2 marks. <i>Identification</i> <ul style="list-style-type: none"> Type 2 (1) <i>Expansion</i> <ul style="list-style-type: none"> (having a very high BMI) classifies man as obese (1) high BMI increases risk (of developing type 2 diabetes) (1) 	Accept: overweight Accept any other appropriate response.	(2)
Total			5 marks

Question number	Answer	Additional guidance	Mark
2 (a)	Award 1 mark for each logically ordered point up to a maximum of 3 marks. <ul style="list-style-type: none"> Cell A is in anaphase (1) Chromatids being pulled to the poles of the cell (1) Centromeres divide (1) by spindle fibres/microtubules (1) 	Allow phonetic spelling Reject: Chromosome Each point should be in a logical sequence to be awarded a mark.	(3)
2 (b)	D S phase		(1)
2 (c)	A calculation that shows the following: substitution $11 \div 500$ (1) evaluation 0.022 (1) conversion $22 \mu\text{m}$ (1)	Allow ECF at any stage Award full marks for correct answer without workings.	(3)
Total			7 marks

Question number	Answer	Mark								
3 (a)	C innate immunity	(1)								
3 (b)	<p>Award 1 mark for each up to a maximum of 3 marks.</p> <table border="1" data-bbox="336 416 1050 568"> <thead> <tr> <th data-bbox="336 416 695 477">Chemical defence mechanism</th> <th data-bbox="695 416 1050 477">Location</th> </tr> </thead> <tbody> <tr> <td data-bbox="336 477 695 508">Sebum</td> <td data-bbox="695 477 1050 508">Skin</td> </tr> <tr> <td data-bbox="336 508 695 539">Hydrochloric acid</td> <td data-bbox="695 508 1050 539">Stomach</td> </tr> <tr> <td data-bbox="336 539 695 568">Lysozyme</td> <td data-bbox="695 539 1050 568">Tears/saliva (eyes/mouth)</td> </tr> </tbody> </table>	Chemical defence mechanism	Location	Sebum	Skin	Hydrochloric acid	Stomach	Lysozyme	Tears/saliva (eyes/mouth)	(3)
Chemical defence mechanism	Location									
Sebum	Skin									
Hydrochloric acid	Stomach									
Lysozyme	Tears/saliva (eyes/mouth)									
3 (c)	<p>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.</p> <ul style="list-style-type: none"> • HIV reduces the number of T-helper cells in the blood • T-helper cells have receptors complementary to the antigen • Recognise antigen presenting cells and become activated • T-helper cells secrete cytokines to stimulate B-lymphocytes to divide and become plasma cells • Antibodies are not secreted • Antibodies are not able to bind to and neutralise pathogens • T-helpers activate {killer/cytotoxic} T-cells • Cells infected with viruses are not destroyed • The immune system is no longer able to defend the body from infection • Person is susceptible to opportunistic infections 	(6)								
Total		10 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	<ul style="list-style-type: none"> • Demonstrates isolated knowledge and understanding, there may 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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)	A Dd DD		(1)
4 (b)	Healthy/not affected by cystic fibrosis	Accept any other appropriate response.	(1)
4 (c)	<p>Award 1 mark for identification and 2 marks for a linked expansion up to a maximum of 3 marks.</p> <p><i>identification</i></p> <ul style="list-style-type: none"> • Their mother is a carrier of cystic fibrosis allele (1) <p><i>expansion</i></p> <ul style="list-style-type: none"> • They have a 50% chance of inheriting the allele (1) • If they had a child they could pass on the allele (1) • If their partner has the recessive allele, their children could be affected by the condition (1) 	Accept any other appropriate response.	(3)

4 (d)	<p>Award 1 mark for identification of an effect and 1 mark for a linked expansion up to a maximum of 2 marks for respiratory system and 2 marks for digestive system.</p> <p><i>respiratory system</i></p> <p><i>identification</i></p> <ul style="list-style-type: none"> • Excess mucus builds up and blocks/narrows airways in the lungs (1) <p><i>expansion - one from:</i></p> <ul style="list-style-type: none"> • Increased chance of infection (1) • Need to have physiotherapy to remove excess mucus (1) • Reduces oxygen supply (1) • Less gas exchange (1) <p><i>digestive system</i></p> <p><i>identification</i></p> <ul style="list-style-type: none"> • Mucus blocks {pancreatic duct/the release of enzymes from the pancreas} (1) <p><i>expansion - one from:</i></p> <ul style="list-style-type: none"> • So food is not digested (1) • Food cannot be absorbed into the blood (1) 	<p>Allow: Mucus prevents movement of cilia</p> <p>Accept any other appropriate response.</p>	(4)
total			9 marks

Question number	Answer	Additional guidance	Mark
5 (a)(i)	<p>Award a maximum of 2 marks for identification of a feature and a maximum of 2 marks for their linked expansions.</p> <ul style="list-style-type: none"> c-rings of cartilage (1) to maintain flexibility and prevent the tube collapsing (1) Goblet cells (1) to secrete mucus that traps bacteria (1) Ciliated epithelial cells (1) to move mucus up and out of the lungs so that it can be swallowed (1) 	<p>Allow phonetic spelling throughout</p> <p>Accept any other appropriate response.</p>	(4)
5 (a)(ii)	elastic (tissue)		(1)
5 (a)(iii)	<ul style="list-style-type: none"> Squamous epithelium Surfactant Large surface area Thin layers Short diffusion pathway Capillary network 		(1)
5 (b)	<p>Award 1 mark for each of the following, up to a maximum of 2 marks.</p> <ul style="list-style-type: none"> Non-allergic and allergic asthmas cases both increase (1) Smaller increase in cases of non-allergic asthma in women/there is a much bigger increase in the cases of allergic asthma (1) There are more cases of allergic asthma than non-allergic in women (1) Rate of increase in allergic asthma is less in 2006 to 2016 than in 1996 to 2006 (1) 	Accept any other appropriate response.	(2)
5 (c)	<p>Award 1 mark for identification and 1 mark for a linked expansion, up to a maximum of 3 marks.</p> <p><i>Any of the following could be an identification point and any of them could be an expansion point, depending on how the learner shapes their argument.</i></p> <ul style="list-style-type: none"> Triggers the inflammatory response (1) Chemical signals trigger contraction of smooth muscle in bronchioles (1) Causing airways to narrow (1) Excess mucus is secreted (1) Oxygen intake decrease (1) 	Accept any other appropriate response.	(3)
total			11 marks

Question number	Answer	Additional guidance	Mark
6 (a)	Award 1 mark for each logically ordered point, up to a maximum of 2 marks. <ul style="list-style-type: none"> • Introns are removed from mRNA (1) • Exons are joined together (1) • By a spliceosome (1) 	Each point should be in a logical sequence to be awarded a mark. Accept any other appropriate response.	(2)
6 (b)	B mRNA		(1)
6 (c)	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. <ul style="list-style-type: none"> • Mutations change the order of the bases on the DNA • The gene is transcribed into mRNA • Codons on the mRNA strand are different • tRNA molecule brings a different amino acid to the ribosome during translation • Changes the primary structure of the protein • Affects the secondary/tertiary/quaternary structure of the pepsin • Protein is unable to bind to the active site of the enzyme/protein binds more effectively • {less/more} enzyme-substrate complexes formed • Proteins cannot be broken down/proteins are broken down faster • Less amino acids absorbed by the digestive system • Difficulty making proteins in the body 		(9)
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*.

Level	Mark	Descriptor
Level 0	0	No rewardable material.
Level 1	1–3	<ul style="list-style-type: none"> • 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 which contains generic assertions rather than considering different aspects and the relationship between them
Level 2	4–6	<ul style="list-style-type: none"> • 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 which considers some different aspects and some consideration of how they interrelate, but not always in a sustained way
Level 3	7–9	<ul style="list-style-type: none"> • 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.

Question number	Answer	Additional guidance	Mark
7 (a)(i)	A p wave		(1)
7 (a)(ii)	Elevated ST phase/no S wave		(1)
7 (b)	<p>Award 1 mark for identification and 1 mark for linked expansion up to a maximum of 2 marks for blood pressure and 2 marks for temperature</p> <p><i>identification</i></p> <ul style="list-style-type: none"> • High blood pressure/hypertension (1) <p><i>expansion</i></p> <ul style="list-style-type: none"> • Increases stress on the heart/damage blood vessels/increased formation of tissue fluid and swelling (1) <p><i>identification</i></p> <ul style="list-style-type: none"> • Temperature is above normal body temperature (1) <p><i>expansion</i></p> <ul style="list-style-type: none"> • Indicates infection/the inflammatory response/affect the functioning of enzymes in the body/kills microorganisms (1) 	Each point should be in a logical sequence to be awarded a mark. Accept any other appropriate response.	(4)
7 (c)(i)	Haematology		(1)
7 (c)(ii)	<p>Award 1 mark for each point, up to a maximum of 3 marks.</p> <ul style="list-style-type: none"> • The number of cells in the blood (1) • (the number of) red blood cells (1) • (the number of) white blood cells (1) • The level of platelets (1) • The levels of some chemicals in the blood (1) 	Accept any other appropriate response.	(3)

7 (c)(iii)	<p>Award 1 mark for the identification and 1 mark for a linked expansion up to a maximum of 2 marks.</p> <p><i>Any of the following could be an identification point and any of them could be an expansion point, depending on how the learner shapes their argument.</i></p> <ul style="list-style-type: none"> • CRP protein is produced by the liver (1) • In response to inflammation (1) • when T cells release chemicals (1) 	Accept any other appropriate response.	(2)
total			12 marks

Question number	Answer	Additional guidance	Mark
8 (a)	D ultrafiltration		(1)
8 (b)	<p>Award 1 mark for the identification and 1 mark for a linked expansion up to a maximum of 4 marks.</p> <p><i>identification</i></p> <p>Glucose is removed in the proximal convoluted tubule in the kidney (1)</p> <p><i>expansion – any three from:</i></p> <p>Glucose enters the nephron in the filtrate (1) All the glucose is reabsorbed (1) by selective reabsorption (1) using energy (1) against the concentration gradient (1)</p>	Accept any other appropriate response.	(4)
8 (c)	<p>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.</p> <ul style="list-style-type: none"> • Hypertension increases blood pressure • Fluid exits at the arterial end because the hydrostatic pressure gradient is greater than the opposing osmotic/oncotic pressure gradient • Fluid is forced out through leaky capillary walls • Higher hydrostatic pressure at the arterial end of a capillary bed increases the amount of fluid forced out of the capillary • Plasma proteins, cells and some water remain in the blood • Hypertension increases the water potential of the blood • Reduces the water potential gradient between the tissues and the blood • Less water is reabsorbed because the water potential gradient is less • Excess tissue fluid is removed by the lymphatic system • At the venous end, increased osmotic/oncotic pressure normally exceeds falling hydrostatic pressure • Increased tissue volume causes swelling/oedema 	Accept other appropriate responses.	(9)
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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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.
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