Mark Scheme (Results)

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Pearson BTEC Level 3 National Extended Certificate – Applied Human Biology

Unit 1: Principles of Applied Human Biology

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Unit 1: Principles of Applied Human Biology marking grid

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.
- Marking 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 marking grid, not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks if a learner's response is not rewardable, according to the marking grid.
- Where judgement is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

Specific marking guidance

- The marking grids have been designed to assess learner work holistically.
- Rows within the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.
- Examiners should first make a holistic judgement on which band most closely matches the learner 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 poi

Question number	Answer	Additional Guidance	Mark
1 (a)(i)	C node of Ranvier		(1)
1 (a)(ii)	D speed up impulse transmission		(1)
1 (a)(iii)	Award **1** mark for each identification and **1** mark for linked expansion. Up to a maximum of **4** marks. **Sodium potassium pumps** Control sodium and potassium (ion) levels (1) allow for creation of action potential/restore resting potential (1) **Mitochondria** Provide energy/ATP (1) for synthesis of neurotransmitters/active transport (of ions) (1)	Allow reference to ions moving in/out of cell allow description of depolarisation	(4)
1 (b)	brain/spinal cord (1)	allow named part of brain reject "spine"	(1)
		Total	7 marks

Question number	Answer	Additional Guidance	Mark
2 (a)	Award **1** mark for each word. • diaphragm (muscles) (1) • contract (1) • lift/ rise/ move up/increase in volume (1)	allow shorten do not allow just "increase"	(3)
2 (b)(i)	Award **1** mark for identification and **1** mark for linked expansion. Up to a maximum of **2** marks. Identification Increased (respiratory/breathing rate) (1) Expansion To get {more/enough} oxygen (1) To remove {excess} carbon dioxide (1) Due to smaller surface area for gas exchange (1)	allow goes up ORA	(2)

2 (b)(ii)	One from the following: Dizziness/ cough/ tiredness/ wheezing/ breathlessness/ chest infections Accept any other reasonable response.		(1)
2 (b)(iii)	A alveoli		(1)
		Total	7 marks

Question number	Answer	Additional Guidance	Mark
3 (a)	Y golgi (apparatus/ body) Z mitochondrion	Accept lower case letters accept mitochondria	(2)
3 (b)(i)	Award **1** mark for identification and **1** mark for linked expansion. Up to a maximum of **2** marks. Identification Signalling (1) Expansion Bind to {hormones/neurotransmitters} (1) OR Identification (Cell-cell) recognition (1) Expansion Prevents white blood cells from destroying body cells (1) OR Identification Stabilise membrane structure (1) Expansion by forming hydrogen bonds with water molecules (1) Accept any other valid answer		(2)
3 (b)(ii)	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.		(6)

- Cell membranes separate cell contents from the outside - Selective permeability - Bilayer formed of phospholipids with hydrophilic heads and hydrophobic tails **Passive processes** Diffusion - Passive process/requires no ATP - Lipid soluble molecules able to pass across the membrane/dissolve in the lipid layer - Move from high concentration to low concentration Facilitated diffusion - Larger molecules or charged ions travel through protein pores - Move from high concentration to low concentration Osmosis - Movement of water molecules - Across partially-permeable membrane - From high water potential/concentration to low water potential **Active processes** Active transport - Requires {energy/ATP} - Carrier proteins/protein pumps change configuration - Allows substances to move against the concentration gradient Cytosis/bulk transport - Exocytosis – movement out of the cell - Use of vesicles that fuse with the membrane - Endocytosis – movement into the cell - Molecules adhere to membrane causing vesicle formation - Requires energy/ATP	

	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	• 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)	A bone marrow	allow named type/category of stem cell	(1)
4 (a)(ii)	White blood cell/lymphocyte/ (1) Red blood cell/ erythrocyte (1)	accept named examples for white blood cell for one mark each provided answer "white blood cell" not given accept platelet	(2)
4 (b)(i)	totipotent/omnipotent/ embryonic/pluripotent		(1)
4 (b)(ii)	Mitosis		(1)
4 (c)	Award **1** mark for any of the following, up to a maximum of **3** marks.		(3)

	Data show an improvement in {over half/53%/the majority/17} of patients (1) {Most/9 patients} only experience a mild improvement (1) Just as likely to see no improvement as to see a significant improvement (1) Accept any other reasonable response.	ORA	
		Total	8 marks

Question number	Answer	Additional Guidance	Mark
5 (a)(i)	Award **1** mark for identification and **2** marks for linked expansion. Up to a maximum of **3** marks. Identification Cells have antigens (on the cell surface membrane) (1) Expansion (Antigens are) recognised by white blood cell (receptors) (1) (receptors) have complimentary shape to antigens (1) {white blood cells/antibodies} recognise antigens/cells as being "self" (1) (white blood cells) do not attack the cell (1)	ORA throughout	(3)
5 (a)(ii)	Autoimmune Accept any named autoimmune disease, e.g. Type 1 diabetes (mellitus) multiple sclerosis (MS), Crohn's disease, rheumatoid arthritis.		(1)
5 (a)(iii)	Award up to **1** mark for identification and up to **2** marks for linked expansion. Up to a maximum of **3** marks. Identification Rejection rates are higher when the donor is not related to the patient (1) Expansion Relatives are more likely to have {similar/similarly shaped} antigens on the cell surface membrane (1) Organs from relatives are less likely to be recognised attacked by the immune system of the patient (1) Level of rejection in non-related donors kept low due to tissue typing (1)	ORA for all responses Allow: There is always a chance of rejection	(3)
5 (b)	Award **1** mark for identification and **1** mark for linked expansion. Up to a maximum of **4** marks. **Reason** Identification To {prevent/reduce} production of white blood cells (1) Expansion Prevents immune system from attacking/rejecting organ (1) **Effect on health** Identification Immune system cannot respond to/recognise antigens on pathogens (i) Expansion So more likely to develop infections/catch communicable diseases (1)	Ignore "immune system cannot fight off disease"	(4)

Question number	Answer	Additional Guidance	Mark
		Total	11 marks
6 (a)(i)	D recessive		(1)
6 (a)(ii)	heterozygous	Allow "carrier"	(1)
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. Strengths • pedigree diagram shows that the allele for sickle cell is in the family • shows that the allele is recessive • shows that an unaffected person can act as a carrier • carriers can be deduced by looking at phenotypes in the next generation • unknown male has an affected parent so provides information about increased risk Weaknesses • only phenotype shown • diagram does not definitively show which people are carriers • pedigree reporting might not be accurate for previous generations • one family's pedigree diagram does not give information about the second parent • other methods, e.g. genetic testing, would give a definite result Conclusions • it is only possible to use any pedigree diagram to predict probability of inheriting the disease at each pregnancy • if the unaffected mother of unknown male X is homozygous then any child will not inherit the condition • if the unaffected mother of unknown male X is heterozygous/a carrier there is a 50% chance of inheriting the condition		(9)
		Total	11 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 evaluation that contains generic assertions, leading to a conclusion that is superficial or unsupported.
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 evaluation that considers some different competing points, although not always in detail, leading to a conclusion that is partially supported.
Level 3	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)(i)	A cystic fibrosis		(1)
7 (a)(ii)	Award **1** mark for identification and **1** mark for linked expansion. Up to a maximum of **4** marks. nutritional imbalance (1) affects the composition of the plasma membrane (1) OR physical trauma (1) can break the cell membrane (1) OR extremes of temperature (1) cause proteins in the cell membrane to denature (1) OR immune response (1) causes damage to the cell membrane by white blood cells (1) OR damage from pathogens (1) toxins/physical damage disrupt the membrane (1) Accept any other reasonable response.	Allow specific example	(4)
7 (a)(iii)	Award **1** mark for identification and **3** marks for linked expansion. Up to a maximum of **4** marks. Identification There is an imbalance in ion concentration (1) Expansion Sodium (ions) not removed (1) Too many potassium ions pumped in (1) Increased ion concentration inside cell (1) Water moves into the cell through osmosis (1) Increased water causes cell to swell (1)		(4)
7 (b)(i)	change from one differentiated cell type to a different differentiated cell type Accept any other reasonable response.		(1)
7 (b)(ii)	Award **1** mark for identification and **2** marks for linked expansion. Up to a maximum of **3** marks. Identification Damage to DNA may causes mutations (1)	Allow	(3)

		description of mutation	
	Expansion (mutations in) tumour suppressor genes/ protooncogenes/genes which regulate the cell cycle (1) Damaged cells divide uncontrollably/more often (1) Damaged cells do not undergo programmed cell death/ apoptosis (1)	Accept "oncogenes"	
		Total	13 marks

Question number	Answer	Additional Guidance	Mark
8 (a)	B coronary artery		(1)
8 (b)(i)	Award **1** mark for each logically ordered point. Up to a maximum of **3** marks. DNA taken from patient through swab/blood sample (1) DNA is sequenced (1) (DNA sequence is) read in the lab (1) (DNA sequence) checked against alleles for CHD (1)	Accept genes checked for CHD for 1 mark	(3)
8 (b)(ii)	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. Accept other appropriate responses. Prevent CHD from developing - CHD is caused by narrowing of the arteries providing blood to the heart muscle - atherosclerosis is the formation of fatty material in the artery - may cause partial or complete blockage of the arteries - blocking of the artery prevents tissues it supplies from receiving any oxygen - if the blockage is it may cause a section of the heart muscle to die – preventing correct function - reducing saturated fat reduces the chance of narrowing arteries as reduces levels of cholesterol/LDL - smoking increases the risk of atherosclerosis/damage to the arteries/reduces oxygen carrying capacity of red blood cells		(9)

		• quitting smoking reduces the chance of artery wall being damaged		
		Reduce the symptoms of CHD.		
		• Low salt diet reduces blood pressure • increasing exercise will strengthen circulatory system/make heart more efficient/reduces blood pressure • regular exercise may reduce body mass and thus load on cardiovascular system • high blood pressure is a risk factor as it may damage the artery walls • reducing blood pressure means less strain put on arteries • narrowing of blood vessel causes chest pain (angina) • taking blood thinning medication reduces the chance of a blood clot forming/reduces chest pain • blood clots can lead to heart attacks by preventing blood flow through a narrowed coronary artery		
			Total	13 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.