



Mark Scheme (Results)

January 2021

Pearson BTEC Nationals
In Applied Science (31627H1B)
Unit 5: Principles and Applications of Science II -
Biology

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Unit 5: Principles and Applications of Science II

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 the 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 in 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'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.

BTEC Next Generation Mark Scheme Template

Question Number	Answer	Additional Guidance	Mark
1 (a)(i)	C capillary, vein, artery		1
1 (a)(ii)			2
1 (b)	A		1
1 (c)	<p>Any two from:</p> <p>1 carries deoxygenated blood (1)</p> <p>2 (carries blood) from {body/head/veins} (1)</p> <p>3 to {heart/ (right)atrium} (1)</p> <p><i>allow 'right atria'</i></p>	<p>Do not credit 'to lungs and heart' or 'to and from heart'</p> <p>Do not allow <u>left</u> atrium/left atria/atria</p>	2
1 (d)(i)	inverse proportion / negative correlation (1)	<p>accept 'as one increases the other decreases'</p> <p>accept' the higher the cross sectional area the lower/slower the blood flow'</p>	1

<p>1 (d)(ii)</p>	<p>subtraction (1) 5000 - 300</p> <p>division (1) 4700 ÷ 300 (15.67)</p> <p>multiplication (1) X 100 (1567)</p> <p>Alternative method</p> <p>division (1) 5000 ÷ 300 (16.67)</p> <p>multiplication (1) X100 (1667)</p> <p>subtraction (1) 1667 - 100 (1567)</p>	<p>1560 to 1570 without working gets 3 marks</p> <p>ECF to max 2</p>	<p>3</p>
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1 (d) (iii)	<p>Any three from:</p> <ol style="list-style-type: none"> 1. carry {oxygen/oxygenated blood} (to cells/tissues) / absorb oxygen (at lungs) / gas exchange (1) 2. absorb nutrients (in gut) / carry nutrients (to cells) / absorb water (gut/kidney) (1) 3. allow (facilitated) <u>diffusion</u> / <u>osmosis</u> (in correct contest) / slow the blood flow (so time for exchange) (1) 4. (removal of metabolic) waste/ removal of heat (from cells/tissues/organs/skin) (1) 5. link arteries and veins / link arterioles and venules (1) 6. carry deoxygenated blood (at venule end) (1) 7. Supply extremities /supply small, areas / {network/large SA} (so gives close proximity to all cells) (1) 8. (make) tissue fluid / allow plasma to exit / allow filtration (in kidneys/glomerulus) /allow white blood cells to exit (1) 	<p>Do not credit 'carries oxygenated blood around the body'</p> <p>accept named nutrients</p> <p>Allow small diameter so rbc/Hb close to oxygen</p> <p>allow named e.g. of waste</p> <p>Accept links veins and arteries but do not accept 'lets blood flow from veins to arteries'</p> <p>Accept any named type of white blood cell</p>	3
Total			13 marks

Question Number	Answer	Additional Guidance	Mark												
2 (a)	M = water (1) N = osmosis (1)	accept diffusion/ facilitated diffusion/ passive transport	2												
2 (b)	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th></th> <th>diffusion</th> <th>facilitated diffusion</th> <th>active transport</th> </tr> </thead> <tbody> <tr> <td>Are protein carriers involved?</td> <td>Yes <input type="radio"/> No <input checked="" type="radio"/></td> <td><input checked="" type="radio"/> Yes / No</td> <td><input checked="" type="radio"/> Yes / No</td> </tr> <tr> <td>Is ATP needed?</td> <td>Yes <input type="radio"/> No <input checked="" type="radio"/></td> <td>Yes <input type="radio"/> No <input checked="" type="radio"/></td> <td><input checked="" type="radio"/> Yes / No</td> </tr> </tbody> </table> <p>award:</p> <p>one mark for any two correct two marks for any three or four correct three marks for five or six correct</p> <p>both circled in one box apply list rule</p>		diffusion	facilitated diffusion	active transport	Are protein carriers involved?	Yes <input type="radio"/> No <input checked="" type="radio"/>	<input checked="" type="radio"/> Yes / No	<input checked="" type="radio"/> Yes / No	Is ATP needed?	Yes <input type="radio"/> No <input checked="" type="radio"/>	Yes <input type="radio"/> No <input checked="" type="radio"/>	<input checked="" type="radio"/> Yes / No	Allow words underlined or left clear with incorrect words blocked out or ticks by correct words	3
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Total			5 marks												

Question Number	Answer	Additional Guidance	Mark
3 (a)	B 0s, 2s and 4 s		1

<p>3 (b)</p>	<p>Any of the following points can be an identification point or an expansion points depending how the learner shapes their response.</p> <p><i>Four from:</i></p> <p>between 0-1 s:</p> <ul style="list-style-type: none"> • the pressure inside the {lungs/thorax/thoracic cavity} {becomes negative/decreases} (1) • because {volume/space/thoracic cavity/chest} has increased / lungs expand (1) • but air not yet entered (1) <p>between 1-2 s:</p> <ul style="list-style-type: none"> • the pressure inside the {lungs/thoracic cavity/chest} increases (1) • because air {is entering/has entered} (the lungs) (1) • down pressure gradient / begins to equalise with 	<p>It' = pressure in lungs</p> <p>If they just say 'pressure' we assume they are referring to lungs as pressure in lungs is in question stem</p> <p>Allow lungs inflate</p> <p>NB time 1-2 s is not exhalation so do not credit any refs to volume decreasing or lungs deflating</p> <p>accept pressure difference reduces/ going back to 0</p> <p>ignore refs to 'drawing /sucking' as long as direction of air movement is correct</p>	<p>4</p>
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	atmospheric pressure / pressure restabilises / pressure goes back to normal (1)	do not credit descriptions of rib and diaphragm movements – they are in the stem	
3 (c)	division (1) $60 \div 4$ evaluation (1) 15 (breaths per minute)	15 on own with no working = 2 marks ECF if calculate length of a breath incorrectly = 1 mark	2
3 (d)	Award one mark for an identification point and up to two marks for expansion points. Each of the following could be an identification point or an expansion point, depending on how the learner shapes their response. <i>Any three from:</i> <ul style="list-style-type: none"> • oxygen picked up by {<u>red blood cells/erythrocytes/haemoglobin /Hb</u>} (1) • (flow of blood) carries oxygen away (to maintain gradient) (1) • So {low/less} oxygen in blood /more oxygen in {alveoli/lungs} (1) • {ventilation/breathing in} brings more oxygen (to alveoli) (1) 	allow High {concn/ high (partial) pressure} oxygen is breathed in	3

	<ul style="list-style-type: none"> diffusion occurs {<u>down</u> gradient / from higher to lower concentration} (1) 	ignore 'along/across gradient' allow (partial) pressure for concentration	
Total			10 marks

Question Number	Answer	Additional Guidance	Mark
4 (a)	V = hydrogen / H / H ⁺ /protons (1) W = hydrogencarbonate/bicarbonate /HCO ₃ / HCO ₃ ⁻ (1)		2

<p>4 (b)</p>	<p>Award one mark for identification point and up to three marks for expansion points. Any of the following could be an identification point or an expansion point depending on how the learner shapes their response</p> <p><i>Four from:</i></p> <ul style="list-style-type: none"> • maintain {neutral/approximate pH 7/pH 7.4}/prevents (pH) becoming acidic or alkaline / prevents (pH) being too low or too high (1) • prevent {damage/effect on} {cells/tissues/organs} (1) • so metabolism/chemical reactions (can occur) /cells can work (1) • prevent denaturing (proteins/enzymes) / so active site still fits (substrate) (1) • to maintain enzyme action (1) • to maintain {electrolyte/ion/salt} {concentration/balance} (1) • so (electrical) impulses (in heart/muscles/nerves/neurones) can be generated(1) • affects blood clotting • <u>acidosis/alkalosis</u> / organ failure / death (1) 	<p>ORA throughout</p> <p>accept named cells/tissue/organs</p> <p>accept named examples of body processes</p> <p>Accept named ions</p>	<p>4</p>
<p>Total</p>			<p>6 marks</p>

Question number	Indicative content						
<p>5</p> <p>6 marks</p>	<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 of the indicative content but learners should be rewarded for other relevant answers.</p> <p>Accept answers given in converse – how good diets reduce the risk</p> <table border="1" data-bbox="408 521 1374 2029"> <thead> <tr> <th data-bbox="408 521 531 555">Factor</th> <th data-bbox="536 521 1374 555">Some linked ideas</th> </tr> </thead> <tbody> <tr> <td data-bbox="408 555 531 1473">diet</td> <td data-bbox="536 555 1374 1473"> <ul style="list-style-type: none"> • Western diet with high amounts of calories, particularly sugar, leads to obesity, which is a major risk factor for heart attack and strokes. • Obesity also leads to inflammation and type 2 diabetes - both of which are risk factors for CVD. • High levels of saturated fat in the diet may lead to high blood levels of LDL/cholesterol, fatty plaques and atherosclerosis, which can lead to thrombosis in the coronary artery or in arteries in brain. • High salt intake leads to high blood pressure – a risk factor for CVD. • Processed food is high in saturated fat, sugar and salt. • Many diets are low in vitamin D, which has protective effect, and fear of skin cancer prevents some people getting enough UV exposure to make vitamin D. • Lack of fresh fruit and vegetables leads to less diverse range of gut bacteria and reduced ability to regulate appetite. • Maternal nutrition – poor diet during pregnancy, especially when followed by high fat diet in childhood, can increase risk of CVD of the offspring in later life. </td> </tr> <tr> <td data-bbox="408 1473 531 2029">sex</td> <td data-bbox="536 1473 1374 2029"> <ul style="list-style-type: none"> • Until age of menopause men have a slightly higher risk than women. • After menopause the risk is equal or slightly higher in women. • More women than men die rather than recover from heart attack as their symptoms present differently and they are more often misdiagnosed. • Women more likely to visit GP/have medical checks and thus have high blood pressure diagnosed, which may then be treated. • There may be sex differences in other risk factors such as smoking and alcohol consumption, and in diet. • Women store more fat/higher body fat </td> </tr> </tbody> </table>	Factor	Some linked ideas	diet	<ul style="list-style-type: none"> • Western diet with high amounts of calories, particularly sugar, leads to obesity, which is a major risk factor for heart attack and strokes. • Obesity also leads to inflammation and type 2 diabetes - both of which are risk factors for CVD. • High levels of saturated fat in the diet may lead to high blood levels of LDL/cholesterol, fatty plaques and atherosclerosis, which can lead to thrombosis in the coronary artery or in arteries in brain. • High salt intake leads to high blood pressure – a risk factor for CVD. • Processed food is high in saturated fat, sugar and salt. • Many diets are low in vitamin D, which has protective effect, and fear of skin cancer prevents some people getting enough UV exposure to make vitamin D. • Lack of fresh fruit and vegetables leads to less diverse range of gut bacteria and reduced ability to regulate appetite. • Maternal nutrition – poor diet during pregnancy, especially when followed by high fat diet in childhood, can increase risk of CVD of the offspring in later life. 	sex	<ul style="list-style-type: none"> • Until age of menopause men have a slightly higher risk than women. • After menopause the risk is equal or slightly higher in women. • More women than men die rather than recover from heart attack as their symptoms present differently and they are more often misdiagnosed. • Women more likely to visit GP/have medical checks and thus have high blood pressure diagnosed, which may then be treated. • There may be sex differences in other risk factors such as smoking and alcohol consumption, and in diet. • Women store more fat/higher body fat
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Level	Mark	Descriptor
	0	No awardable content
Level 1	1-2	<ul style="list-style-type: none"> • Demonstrates adequate knowledge of scientific facts/concepts with generalised comments made • Generic statements may be presented rather than linkages being made so that lines of reasoning are unsupported or partially supported • The explanation shows some structure and coherence
Level 2	3-4	<ul style="list-style-type: none"> • Demonstrates good knowledge and understanding by selecting and applying some relevant scientific knowledge facts/concepts to provide the discussion being presented. • Lines of argument mostly supported through the application of relevant evidence • The explanation shows a structure which is mostly clear, coherent and logical
Level 3	5-6	<ul style="list-style-type: none"> • Demonstrates comprehensive knowledge and understanding by selecting and applying relevant knowledge of scientific facts/concepts to provide the discussion being presented. • Line(s) of argument consistently supported throughout by sustained application of relevant evidence • The explanation shows a well-developed structure which is clear, coherent and logical



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

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