



Mark Scheme (Results)

January 2019

BTEC Level 3 National in Applied
Science

Unit 5: Principles and Applications of
Science II – Biology (31627H/1B)



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Unit 5: Principles and Applications of Science II – sample 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 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.

Section A – Organs and systems

Question Number	Answer	Additional Guidance	Mark
1 (a)	<p>One from:</p> <p>to prevent {kinking/collapsing} (1)</p> <p>to keep (trachea/airway) open (1)</p> <p>to keep its shape so air can flow in (1)</p>	<p>Ignore: strengthen stability 'maintain shape' unqualified</p>	1
1 (b)	<p>A narrow/shrink/reduce/lessen/decrease/ get smaller/recoil/constrict/close/shorten</p> <p>B get bigger/widen/enlarge/lengthen/ expand/increase/dilate/open</p>	<p>Allow any words with those meanings</p> <p>Ignore contract and relax</p>	2
1 (c)	<p>One from:</p> <p>reduces surface tension (of water) (1)</p> <p>stops alveoli {collapsing/sticking together}/keeps alveoli open (1)</p> <p>{makes it easier to expand the lungs/reduces friction/lubricates/prevents rubbing} (1)</p>	<p>Ignore moisture/wet</p> <p>Ignore protection</p>	1

1 (d)	<p><i>Award one mark for an identification point and up to 2 marks for linked expansion points.</i></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> <p><i>Three of:</i></p> <p>{loss of {alveoli/alveoli walls}/alveoli walls thicker} (1)</p> <p>reduced {surface area/SA} (1)</p> <p>less (efficient) {gas exchange/oxygen absorption/ diffusion of oxygen} (1)</p> <p>longer diffusion pathway (1)</p> <p>reduced (aerobic) respiration (1)</p>	<p>Allow fewer/less alveoli alveoli walls breakdown</p> <p>Allow reduced SA/V</p> <p>Less SA for gas exchange = 2 marks</p> <p>Less oxygen absorbed for respiration = 2 marks</p>	3
1 (e)	<p>Substitution (1) 10/0.2</p> <p>Evaluation (1) 50 (x)</p>	<p>Correct answer without any working gains 2 marks</p> <p>POT error =1</p> <p>Award 1 mark for <u>0.02</u> (0.2/10)</p>	2
Total 9 marks			

Question Number	Answer	Additional Guidance	Mark
2 (a)(i)	B		1
2 (a)(ii)	prevent backflow (of blood) (1) from (left) ventricle to (left) atrium (1) OR allows blood to flow from (left) atrium to (left) ventricle (1) and (then closes to) stop it flowing back (1)	Reject right ventricle/atrium Reject right ventricle/atrium	2
2 (b)	C ◆		1
2 (c)	Any <i>three</i> from: (from) SAN/sinoatrial node/pacemaker (1) (spread) {across/from} the {atria/muscle/tissue/wall} (1) (through/to) {AVN/ ◆} (1) reference to time delay (1) (down) {bundle of His/bundle branch/septum} (1) (up) {Purkinje/Purkyne} fibres (1)	Ignore lumen of atria Ignore refs to chemical signals Reject up Reject down points must be in correct sequence	3
2 (d)	B / 2		1

<p>2 (e)(i)</p>	<p>Any two linked pairs:</p> <p>Blood pressure drops/reduces/falls (1)</p> <p>as it gets {near {arterioles/capillaries/smaller vessels}/further from heart} / (due to) less (peripheral) {resistance/friction} (1)</p> <p>OR</p> <p>when the pressure is increasing/high/120 (1)</p> <p>(it is because the) ventricles are contracting/systole/heart beats/ heart contracts/contraction phase of cardiac cycle/aortic valve is opening/has to overcome (peripheral) resistance (1)</p> <p>OR</p> <p>when the pressure is decreasing/low/80 (1)</p> <p>(it is because the) {ventricles are relaxing/ diastole/relaxing phase of cardiac cycle} (1)</p> <p>OR</p> <p>smaller fluctuations /fluctuations decrease/smaller pulsations/smaller range of highs and lows./smaller range of waves(1)</p> <p>as smoothed out by less powerful recoil of arteries / (due to) less {elastin/elastic tissue} in {arterioles/smaller vessels} (1)</p> <p>Accept any other valid response</p>	<p>Ignore refs to arteries pumping/contracting</p> <p>Do not credit atrial systole</p> <p>Allow: it fluctuates according to the cardiac cycle/heart beating for 2 marks</p> <p>Allow: it fluctuates as walls of arteries dilate and recoil for 2 marks</p>	<p>4</p>
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<p>2 (e)(ii)</p>	<p>Difference (1)</p> <p>(their) reading for Y</p> <p>minus</p> <p>(their) reading for Z</p> <p>Division (1)</p> <p>$\frac{\text{(their) difference}}{\text{(their) value for Y}}$</p> <p>Percentage (1)</p> <p>X100</p> <p>any number within range 40 to 64</p> <p>Alternative method</p> <p>Division (1)</p> <p>$\frac{\text{(their) value at Z}}{\text{(their) value at Y}}$</p> <p>Percentage (1)</p> <p>x 100 (1)</p> <p>Evaluation (1)</p> <p>100 – their answer from steps 1 and 2 (1)</p>	<p>Award 3 marks for any value in the range 40 to 64 with or without working shown</p> <p>Y can be any value between 30 to 38</p> <p>Z can be any value between 14 to 18</p> <p>Difference can be any value between 12 and 24</p> <p>Allow ecf throughout for up to 2 marks</p> <p>POT error = 2 marks</p> <p>Allow 2 marks for any value between 36 to 60, with or without working shown</p> <p>Allow</p> <p>$\frac{100}{Y}$ (1)</p> <p>x Z (1)</p> <p>100 – their answer from steps 1 and 2 (1)</p>	<p>3</p>
<p>Total</p>			<p>15 marks</p>

Question Number	Answer	Additional Guidance	Mark
3 (a)	A active transport		1
3 (b)	Any four from: facilitated (1) diffusion (1) <u>down</u> a concentration gradient/from high to low concentration (1) through a (protein) {channel/carrier/transmembrane protein/chloride gate/Cl ⁻ gate} (1) no {ATP/energy} involved/passive(1)	Allow 'chlorine' for chloride Do not allow Na ⁺ /sodium ion gate	4
3 (c)	<u>osmosis</u>	Ignore: diffusion Reject: osmoregulation Allow phonetic spellings	1
Total			6 marks

Question Number	Answer	Additional Guidance	Mark
4 (a)(i)	<p><i>Award one mark for an identification point and 1 mark for linked expansion</i></p> <p><i>Depending how the learner has approached the question any of the following could be an identification point or an expansion point.</i></p> <p><i>Two of:</i></p> <p>removal of {metabolic/cellular}waste/products (1)</p> <p>(metabolic waste is) toxic/poisonous (1)</p> <p>(metabolic waste) cannot be {broken down/converted} (by body)/must not build up (1)</p> <p>(metabolic waste) is alkaline/acidic/would alter pH/would affect enzyme action (1)</p>	<p>Allow named examples e.g. CO₂ urea</p> <p>Ignore 'waste' unqualified</p> <p>Ignore 'would damage body'</p> <p>Ignore 'harmful'</p>	2
4 (a)(ii)	<p><i>Award one mark for an identification point and 1 mark for linked expansion</i></p> <p><i>Depending how the learner has approached the question any of the following could be an identification point or an expansion point.</i></p> <p><i>Two from:</i></p> <p>regulation of {salt/electrolyte/ion} and water content (of the body/blood/cells) (1)</p> <p>(which) would cause water to enter or leave cells (1)</p> <p>(which would cause) cells (to) swell/burst/haemolyse/shrink/undergo crenation (1)</p> <p>(which would) affect enzyme activity/ would affect cell reactions/would affect metabolic reactions (1)</p> <p>(lack of water leads to) inability to regulate temperature/sweat/remain hydrated (1)</p> <p>(which would) alter blood pressure (1)</p>	<p>Allow named salts</p> <p>Ignore turgid or plasmolysis</p> <p>Allow (Leads to)dehydration</p>	2

Question number	Indicative content	
4 (b)	<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 descriptive. Answers may cover some or all of the indicative content but learners should be rewarded for other relevant answers.</p> <p>Advantages</p> <ul style="list-style-type: none"> • treatment can be given very quickly • urea, which is toxic/alkaline, is removed from the blood • glucose concentration of blood is maintained • salt/electrolyte balance (of blood) regulated • can relax dietary restrictions whilst connected to dialysis machine • no need for surgery/no need to wait for suitable organ donation/no need for immunosuppressants • heparin/anticoagulant used to reduce risk of blood clotting <p>Disadvantages</p> <ul style="list-style-type: none"> • patients have to spend several hours, three times a week attached to the dialysis machine • usually in a hospital/treatment centre • interferes with life/ability to hold down a job/go on holiday • dietary restrictions while not being dialysed • possible shortage of machines • risk of infection from IV lines • damage to blood vessels in arm • risk of blood clotting • expense/not very cost effective • not a cure so need to continue with this treatment <p>Other valid suggestions should be credited</p>	
<p>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*.</p>		
Level	Mark	Descriptor
Level 0	0	No rewardable material.
Level 1	1-2	<p>Adequate interpretation, analysis and/or evaluation of the scientific information with generalised comments being made</p> <p>Generic statements may be presented rather than linkages being made so that lines of reasoning are unsupported or partially supported</p> <p>The discussion shows some structure and coherence</p>
Level 2	3-4	<p>Good analysis, interpretation and/or evaluation of the scientific information</p> <p>Lines of argument mostly supported through the application of relevant evidence</p> <p>The discussion shows a structure which is mostly clear, coherent and logical</p>
Level 3	5-6	<p>Comprehensive analysis, interpretation and/or evaluation of all pieces of scientific information</p> <p>Line(s) of argument consistently supported throughout by sustained application of relevant evidence</p> <p>The discussion shows a well-developed structure which is clear, coherent and logical</p>
Total		10 marks

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