



# Mark Scheme (Results)

June 2019

Pearson BTEC Level 3 National Diploma

Unit 5: Principles and Applications of  
Science II – Biology  
Section A: Organs and systems



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# Unit 5: Applications of Science II – sample marking grid

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## 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

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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

### Applied Science Unit 5 1906

Question Number	Answer	Additional Guidance	Mark
1 (a)	<p><i>Ureters:</i></p> <p>carry <u>urine</u> (from kidneys) <u>to bladder</u> / connects bladder to kidneys / connects kidneys to bladder (1)</p> <p><i>Bladder:</i></p> <p>stores <u>urine</u>/allows <u>urine</u> to pass {into urethra/out of body} (1)</p>	<p><b>ignore</b> urea</p> <p><b>ignore</b> refs to excretion</p> <p><b>ignore</b> 'carries' for bladder</p> <p><b>ignore</b> urea</p>	2

1 (b)(i)	<ul style="list-style-type: none"> <li>• Any relevant data quote re volumes e.g. starts at 0.4 ml per minute at 2 minutes and rises to 16 ml /decreases from 16 ml per minute to 2 ml per minute (1)</li> <li>• between 2 – 15 minutes it increases slowly (from 0.2 – 1.8 ml per minute) (1)</li> <li>• {between 15 and 45 minutes/over 30 minutes} it increases rapidly (from 1.8 to 16 ml per minute) (1)</li> <li>• from 0-45 minutes it rises to 16 ml /it peaks at 45 minutes at 16 ml (1)</li> <li>• between 45 – 75 minutes it decreases steeply(from 16 – 8 ml per minute) (1)</li> <li>• between 75 – 120 it decreases less sharply (to 2 ml per minute) (1)</li> </ul>	<p><b>allow</b> +/- 1 small square on graph for all mark points</p> <p>From 0-45 minutes it rises from 0.4 – 16 ml = 2 marks</p> <p><i>If no other marks scored :</i> award one mark for 'it rises and then drops' or any valid description but that lacks reference data quotes - neither time nor volumes</p> <p><b>OR</b></p> <p>A data quote with time and volume e.g. 0.4 ml per minute at 2 minutes</p>	3
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<p>1 (b)(ii)</p>	<p><i>Award one mark for an identification point and one mark for a linked expansion point. Any of the following may be an identification or an expansion point, depending how the learner shapes their response.</i></p> <p><i>Identification:</i></p> <ul style="list-style-type: none"> <li>less (urine produced per minute) / reduces /only produces 1 ml per minute (1)</li> </ul> <p><i>Expansion:</i> <i>One from:</i></p> <ul style="list-style-type: none"> <li>as more <u>water</u> (re)absorbed (into blood/from kidney tubules) (1)</li> <li>as walls of collecting duct more permeable (1)</li> <li>because more aquaporins in (walls of) collecting duct (1)</li> </ul>		<p>2</p>
<p>1 (c)</p>	<p><i>Two of:</i></p> <p>more:</p> <ul style="list-style-type: none"> <li>{carbon dioxide/CO<sub>2</sub>} (1)</li> </ul> <p>less/fewer:</p> <ul style="list-style-type: none"> <li>pressure (1)</li> <li>{salts/electrolytes/ions} (1)</li> <li>hormones (1)</li> <li>glucose (1)</li> <li>water (1)</li> </ul> <p><i>no/less/fewer</i></p> <ul style="list-style-type: none"> <li>urea/other named nitrogenous waste (1)</li> <li>toxins/alcohol/drugs (1)</li> </ul>	<p><i>accept both answers on one line/first option</i></p> <p><b>allow ORA</b> throughout e.g. 'less CO<sub>2</sub> in renal artery' or 'more salts etc. in renal artery'</p> <p><b>ignore</b> 'solutes'</p>	<p>2</p>
<p><b>total</b></p>			<p><b>9 marks</b></p>

Question Number	Answer	Additional Guidance	Mark
2 (a)	Division (1) 1032/1440 OR 43/60  Evaluation (1) 0.7 (1)	<b>allow</b> correct answer of 0.7 without working  <b>allow</b> any number above 0.7 that rounds to 0.7	2
2 (b)	<p><i>award 1 mark for identification and an additional one mark for appropriate related expansion point.</i></p> <p><i>identification point:</i></p> <ul style="list-style-type: none"> <li>• {large/high/more} (SA/V / SA/) (1)</li> </ul> <p><i>expansion point:</i></p> <p><i>one from:</i></p> <ul style="list-style-type: none"> <li>• (so) more membrane (compared to volume) for passage of {molecules/substances/named substance}(1)</li> <li>• (so) short {pathway/ distance} (1)</li> <li>• (so) {faster/greater/more efficient} diffusion (1)</li> </ul>	<b>Ignore</b> references to osmosis/ active transport  <b>ORA</b> – accept smaller SA/V for columnar cell  <b>allow:</b> more area for diffusion	2

2 (c)	<b>feature</b>	<b>active transport</b>	<b>endocytosis</b>	Reject: out of cell within cell in cell	3
	<b>direction of movement</b>	out of or into the cell	<u>into</u> (cell) (1)		
	<b>involves protein carriers in the membrane</b>	yes	no (1)		
	<b>uses ATP</b>	yes	yes (1)		
				<b>total</b>	<b>7 marks</b>



Question Number	Answer	Additional Guidance	Mark
3 (a)(i)	trachea	<i>Accept phonetic spelling</i>  <b>ignore</b> windpipe	1
3 (a)(ii)	C to reduce friction		1
3 (b)	intercostal(s)	<b>ignore</b> 'internal/external'  <i>accept phonetic spelling</i>	1

3 (c)	<p>award two marks for identifications and an additional two marks for appropriate related expansion points. Any of the following points may be either identification or expansion depending on how the learner shapes their response.</p> <ul style="list-style-type: none"> <li>• {intercostal/ribcage} muscles contract (1)</li> <li>• {ribs/ribcage} move {up/out} / rib cage expands (1)</li> <li>• diaphragm contracts (1)</li> <li>• lowers/flattens/moves down (1)</li> <li>• (which causes an) increase in volume / more {space/room} (in chest/thorax) (1)</li> <li>• lungs {inflate/expand/get bigger} (1)</li> <li>• (so) pressure (in thoracic cavity/lungs) {reduces/less than atmospheric} / (air enters) down pressure gradient (1)</li> </ul>	<p><b>ignore</b> reference to internal / external for muscles unless statement is contradictory or a list</p> <p><b>allow:</b> 'muscles contract to move the ribs' for mp1</p> <p><b>allow:</b> more room in lungs</p> <p>if no other marks scored :</p> <p>award one for</p> <p><b>EITHER</b></p> <p>'movement of rib cage makes more room'</p> <p><b>OR</b></p> <p>'pressure difference causes air to enter'</p>	4
<b>total</b>			<b>7 marks</b>

Question Number	Answer	Additional Guidance	Mark					
4 (a)	septum	<b>allow</b> phonetic spelling, for example 'septum' <b>ignore</b> 'septic'	1					
4 (b)	<table border="1"> <tr> <td>D</td> <td>oxygenated</td> <td>deoxygenated</td> <td>oxygenated</td> <td>deoxygenated</td> </tr> </table>	D	oxygenated	deoxygenated	oxygenated	deoxygenated		1
D	oxygenated	deoxygenated	oxygenated	deoxygenated				
4 (c)	A cardiac output		1					
4 (d)(i)	C tachycardia		1					
4 (d)(ii)	<p>Subtraction (1)</p> <p>60 - 40 or 20</p> <p>Division (1)</p> <p>20/40</p> <p>Evaluation (1)</p> <p><math>\times 100 = 50 (\%)</math></p> <p><b>OR</b></p> <p>Division (1)</p> <p>(60/40)</p> <p>Multiplication (1)</p> <p><math>\times 100 (= 150)</math></p> <p>Evaluation (1)</p> <p><math>(150) - 100 = 50\%</math></p>	<p>ECF throughout</p> <p><b>allow</b> full marks for correct answer, of 50%, with no working</p> <p><math>66.6/67 = 1</math> mark</p> <p><math>166.6/167 = 1</math> mark</p> <p><math>33.3/33 = 2</math> marks</p> <p><math>-33.3/-33 = 2</math> marks</p> <p><math>150 = 2</math> marks</p> <p>24 or 12 or 25 = 0 marks</p>	3					

4 (d)(iii)	<p><i>award one mark for an identification point and an additional three marks for appropriate related explanations. Any of the following points may be either identification or expansion depending on how the learner shapes their response.</i></p> <p>any four from:</p> <ul style="list-style-type: none"> <li>• more blood pumped (out of the heart at each beat/to body) / increased cardiac output (1)</li> <li>• (so) increased blood to lungs (1)</li> <li>• (so) increased oxygenation (of blood) / increased formation oxyhaemoglobin (1)</li> <li>• (so) more {oxygen/glucose} available <ul style="list-style-type: none"> <li>○ {to cells/muscles/tissues/organs/for respiration} (1)</li> </ul> </li> <li>• (therefore) more <u>aerobic</u> respiration / reference to mitochondria or a stage of aerobic respiration (e.g. link reaction /Krebs cycle/oxidative phosphorylation /electron transport chain) /equation showing oxygen (1)</li> <li>• (therefore) more <u>ATP</u> production (1)</li> <li>• for muscle contraction/description of muscle contraction (1)</li> <li>• less fatigue (in muscles) / {less/no} build up of lactic acid / less strain on heart / heart does not work as hard / heart rate lower / won't become breathless / won't have rapid breathing (1)</li> </ul>	<p><b>ORA</b> throughout</p> <p>more oxygenated blood for cells/ respiration etc. = 2 marks</p> <p><b>allow:</b> does not have to rely on anaerobic (respiration)</p> <p><b>ignore</b> energy <b>reject:</b> more ATP for respiration</p> <p><b>allow</b> mp7 in the context of more energy <b>ignore:</b> more active/for muscles to work</p> <p><b>ignore</b> 'patient not fatigued/tired'</p>	4
<b>total</b>			<b>11 marks</b>

Question number	Indicative content
5	<p data-bbox="459 304 1536 461"><i>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.</i></p> <p data-bbox="459 528 1536 562"><b>Bronchi/bronchioles/bronchial tubes/bronchial tree/airways/trachea:</b></p> <ul data-bbox="507 562 1422 1037" style="list-style-type: none"> <li>• distributes air to lungs/many alveoli</li> <li>• no gaseous exchange from these tubes</li> <li>• air pathway</li> <li>• bronchi walls contain cartilage to keep them open</li> <li>• bronchi and bronchiole walls contain smooth muscle (which can relax/contract) so these airways can dilate/constrict</li> <li>• bronchi lining contains goblet cells and cilia</li> <li>• goblet cells produce mucus that traps pathogens/particles</li> <li>• cilia beat to move mucus up and out of airways</li> <li>• lungs are protected by ribs/ribcage</li> <li>• close proximity to heart enabling fast re-oxygenation of blood</li> <li>• pleural membranes secrete pleural fluid (into cavity) to reduce friction/make breathing easier</li> </ul> <p data-bbox="459 1070 564 1104"><b>Alveoli</b></p> <ul data-bbox="507 1104 1528 1469" style="list-style-type: none"> <li>• primary function is gaseous exchange</li> <li>• many of them</li> <li>• gives large surface area</li> <li>• diffusion of gases</li> <li>• short diffusion distance</li> <li>• faster rate of diffusion of gases</li> <li>• reference to Fick’s law</li> <li>• surfactant/moisture prevents alveoli collapsing (which would reduce SA for gas exchange)</li> <li>• {elastin/elasticity} for stretch and recoil</li> </ul> <p data-bbox="459 1503 839 1536"><b>Capillaries/blood supply:</b></p> <ul data-bbox="507 1536 1098 1603" style="list-style-type: none"> <li>• maintain (steep) concentration gradient</li> <li>• maintains diffusion (of gases).</li> </ul> <p data-bbox="459 1637 1513 1727">Increased air flow enables faster rate of diffusion of oxygen (from alveoli into blood)/carbon dioxide (from blood to alveoli) /more efficient gaseous exchange.</p> <p data-bbox="459 1760 1497 1794">Credit other valid points, e.g. lungs are organs of excretion, removal of CO<sub>2</sub>.</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\*.

<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
<b>Level 0</b>	<b>0</b>	No rewardable material.
<b>Level 1</b>	<b>1-2</b>	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 discussion shows some structure and coherence
<b>Level 2</b>	<b>3-4</b>	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 discussion shows a structure which is mostly clear, coherent and logical.
<b>Level 3</b>	<b>5-6</b>	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 discussion shows a well-developed structure which is clear, coherent and logical.

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Welsh Assembly Government

