# Mark Scheme (Results)

# January 2020

Pearson BTEC Level 3 Applied Science

Unit 5: Principles and Applications of Science II - Biology (31627H)

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# Unit 5: 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.

# BTEC Next Generation Mark Scheme Template

## <<Applied Science>> <<Unit 5>> <<Biology – organs and systems>> Series 2001>> <<prestand>>

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 1 (a) | A          excretion | | 1 |
| 1 (b) | A = collecting duct (1)<br><br><br><br><br><br><br><br>B = ADH/antidiuretic hormone (1) | allow collecting tube<br>do  not allow CD<br><br>allow plurals for both<br><br>allow vasopressin | 2 |
| 1 (c)(i) | B          7.5 mmol dm$^{-3}$ | | 1 |
| 1 (c)(ii) | *Any one from*:<br><br>• to establish a concentration gradient (1)<br><br><br>• so urea can diffuse into dialysis fluid (1)<br><br><br><br>• to remove urea from the blood (1) | allow diffusion gradient<br><br><br>allow move/filter<br><br><br><br>allow to prevent  it going (back) into (the blood/body) or prevents reabsorption<br><br>do not credit 'to remove toxins from blood' or urea is toxic' unqualified | 1 |
| 1 (c)(iii) | Any number from above  0.0 to less than 34.0 (1) | | 1 |

| | | | |
|---|---|---|---|
| 1 (d) | (X =)<br>angiotensin II/angiotensin two<br><br>(1)<br><br><br>(Y =)<br>ACE/angiotensin converting (enzyme) (1)<br><br><br><br><br>(Z =)   water/$H_2O$ (1) | allow phonetic spelling<br><br><br><br><br>reject 'angiotensinase' | 3 |
| | | **Total** | **9 marks** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 2 (a)(i) | addition (1)<br><br>384 + 393 + 405 + 390 + 405 + 390   or   2367<br><br>division (1)<br><br>(2367)<br>6            or 394.5  or 395<br><br>**OR**<br><br>*If they have excluded 384 as an anomaly then allow*<br><br>addition (1)<br><br>393 + 405 + 390 + 405 + 390      or 1983<br><br>division  (1)<br><br>(1983)          or 396.6<br>  5 | 394.5/395 with no working gets 2 marks<br><br><br>POT error = 1 | 2 |

| 2 (a)(ii) | difference (1)<br>358.0 − 240.5    (= 117.5 or 118)<br><br>division (1)<br> 117.5 ÷ 240.5   or   118 ÷ 240.5<br><br>percentage (1)<br>0.488 X 100 | ECF throughout<br><br>48.86(%) or 48.9(%) or 49(%)  with no working gets 3 marks<br><br>ignore 48 on answer line if no working shown<br>48 with working gets 3 marks<br><br>allow any number that rounds up to 49 | 3 |
| | **OR**<br><br>division<br> 358 ÷ 240.5   (1)<br><br>Multiplication  (1)<br>1.489 X 100<br><br>Subtraction  (1)<br>148.9 - 100 | award 2 marks for 148.86/148.9/ 149<br><br>allow any number that rounds up  to 49. | |

| 2 (b) | *Award one mark for an identification point and up to three marks for linked expansion points.*<br>*Any of the following can be an identification point or an expansion point, depending how the learner shapes their response:* | | 4 |
|---|---|---|---|
| | • (caffeine) increases cardiac output (1) | allow 'CO' or description of cardiac output | |
| | • (because) heart rate is increased/more heartbeats (per minute) (1) | allow HR | |
| | • (caffeine) is a stimulant/it stimulates (1) | | |
| | • {binds/fits/complementary shape} to receptors (1) | | |
| | • {increases electrical activity in/acts on} SAN (1) | | |
| | • increases {strength/force/power) of contraction of {heart/ventricle(s)/heart muscle} (1) | allow 'increases {strength/force/ power) of heartbeat'<br><br>allow 'increases pressure' | |
| | • increases stroke volume (1) | allow 'SV' or description of stroke volume | |
| 2 (c) | (M =) vena cava (1)<br><br><br>(N =) (right) atrium (1) | ignore any refs to superior/inferior/ anterior/posterior<br><br>allow atria<br>reject left atrium<br><br>allow phonetic spellings | 2 |
| 2 (d) | C    thick, small, high | | 1 |
| | | **Total** | **12 marks** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 3 (a) | <table><tr><th>Blood group</th><th>Antigens on erythrocytes</th><th>Antibodies in blood plasma</th></tr><tr><td>A</td><td>A</td><td>anti B</td></tr><tr><td>B</td><td>B</td><td>anti A</td></tr><tr><td>AB</td><td>A  B</td><td>none</td></tr><tr><td>O</td><td>none</td><td>anti A and anti B</td></tr></table> | *1 mark per correct box*<br><br>allow $I^A/I^B$ in place of A and B<br>allow lower case a, b anti b<br><br><br>reject<br>anti A and anti B for antigens<br><br>needs to be A <u>and</u> B/both/A, B/ A  B<br><br>reject AB<br><br>allow 'zero/neither' for 'none'<br><br>reject 'anti O' | 4 |
| 3 (b) | *Award one mark for an identification point and one mark for a linked expansion point.*<br><br>*Any of the following could be an identification point or an expansion point, depending on how the learner shapes their explanation.*<br><br>*Two from:*<br><br>• anti-B (antibodies)/antibodies in {recipient/patient/group O} (1)<br><br><br>• {bind to/react to/fit/have complementary shape to} (B/donor) antigens (1)<br><br><br>• (cause) blood to clot/ (cause rbc to) agglutinate/clump/lyse/split/be destroyed (1) | <br><br><br><br><br><br><br>allow other words that mean or describe antibodies e.g. agglutinins<br><br>allow description of antigens/proteins on cell surface membrane/ agglutinogens<br><br>reject 'fit A and B antigens'<br><br>allow blocks small blood vessels/stops circulation/ less oxygen carried/(named)organ failure (1) | 2 |

| 3 (c) | *Award one mark for an identification point and up to two marks for linked expansion points.* *Any of the following could be an identification point or an expansion point, depending how the learner shapes their explanation.* | | 3 |
|---|---|---|---|
| | • no antigens in (donor/group O/ rbc/ blood) (1) | allow 'proteins on rbc' for antigens<br>allow 'agglutinogens'<br><br>reject 'no antigens in plasma' | |
| | • (so) no {reaction/attack/binding/recognising} with (recipient's /anti-A or anti- B) antibodies (1) | allow 'accepted by antibodies in recipient blood'<br>allow agglutinins for antibodies | |
| | • (so) no clotting/agglutination/clumping/lysing (1) | | |
| | • no D (antigen/protein) (in O –ve blood)/recipient not exposed to D protein / does not produce anti-D antibodies (1) | allow rhesus factor or rhesus protein for D protein | |
| | • donor antibodies not (enough to) react with recipient antigens (as more recipient blood than donor blood) (1) | | |
| | | **Total** | **9 marks** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| 4 (a) | as (more) alveoli are destroyed the total SA decreases/negative correlation/inverse proportion /indirect proportion  (1) | allow converse, e.g. as fewer alveoli destroyed total SA increases<br><br>ignore ' more alveoli =  more SA' or converse | 1 |
| 4 (b) | *Award one mark for an identification point and one mark  for a linked expansion point.*<br>*Any of the following could be an identification point or an expansion point, depending how the learner shapes their explanation.*<br><br>• enables {efficient/more/better/easier} gas(eous) exchange  (1)<br><br><br><br>• (because) stops alveoli {sticking together/adhering/collapsing/closing} (1)<br><br>• (due to) reduction in surface tension (1)<br><br>• (so) gives large surface area / (alveoli sticking) would reduce SA (for gaseous exchange) (1) | <br><br><br><br>allow diffusion for gas exchange<br><br>reject 'gases have to be in solution to diffuse'<br><br><br><br>allow 'enables alveoli to open'<br><br><br>ignore references to friction and breathing | 2 |
| 4 (c) | B   capillary walls consist of one layer of endothelial cells | | 1 |
| | | **Total** | **4 marks** |

| Question number | Indicative content |
|---|---|
| 5 | *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. Content shown on suitable annotated diagrams should be credited.*<br><br>**Similarities**<br>• active transport, osmosis and diffusion/facilitated diffusion all involve molecules passing through (cell surface) membranes<br>• all can transport molecules in and/or out of cells<br>• osmosis and diffusion may be through gaps between phospholipids in the membrane<br>• facilitated diffusion and active transport both use protein {carriers/channels}<br>• all increased by {larger SA/V ratio of the cells/more SA/microvilli}<br>• all increased as temperature (and therefore KE) increases (until too hot and channels/carriers may denature)<br>• bulk transport (exo-and endocytosis) and active transport all use ATP<br><br>**Differences**<br><br>• endo- and exo-cytosis pass large molecules via vesicles/not through the (cell surface) membrane<br>• active transport uses ATP and protein carriers and/or channels<br>• osmosis and diffusion are passive – do not use ATP (but use KE of molecules)<br>• active transport moves molecules against the concentration gradient<br>• diffusion/osmosis/facilitated diffusion allows molecules to move <u>down</u> the concentration gradient<br><br>• facilitated diffusion involves (specific) protein channels/channels may have receptors/ molecules that are diffusing have complementary shape to {receptors/channels}<br>• osmosis may involve {channels/aquaporins}<br>• osmosis is movement of water molecules only/is a special type of diffusion<br>• large fat-soluble molecules can diffuse by dissolving in fatty bilayer of membrane<br><br>• endo- and exo-cytosis and active transport decrease if respiration is inhibited (as less ATP available)<br>• more than one type of transport may work together – e.g. ions actively pumped out of a cell to create a gradient, causing diffusion inwards<br>• reference to cotransporter mechanisms/symports<br>• reference to antiports/uniports<br><br>**Other valid responses should be credited.** |

| 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 | · Adequate interpretation, analysis and/or evaluation of the scientific information with generalised comments being made<br>· Generic statements may be presented rather than linkages to the context being made so that lines of reasoning are unsupported or partially supported<br>· The comparison will contain some similarities and differences showing some structure and coherence |
| Level 2 | 3–4 | Good analysis, interpretation and/or evaluation of the scientific information<br>· Lines of argument mostly supported through the application of relevant evidence drawn from the context<br>· Demonstrate an awareness of both similarities and differences leading to a comparison which has a structure which is mostly clear, coherent and logical |
| Level 3 | 5–6 | · Comprehensive analysis, interpretation and/or evaluation of all pieces of scientific information<br>· Line(s) of argument consistently supported throughout by sustained application of relevant evidence drawn from the context<br>· The comparison shows a logical chain of reasoning which is supported throughout by sustained application of relevant evidence |

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