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## Mark Scheme (Results)

Summer 2022

Pearson Edexcel International GCSE  
In Science Double Award (4SD0) Paper 1BR

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

| Question Number | Answer  | Additional guidance | Mark     |
|-----------------|---|---------------------|----------|
| <b>1(a)(i)</b>  | D is the only correct answer<br>A is incorrect as it is the vacuole<br>B is incorrect as it is cytoplasm<br>C is incorrect as it is the cell membrane |                     | <b>1</b> |

| Question Number | Answer  | Additional guidance | Mark     |
|-----------------|---|---------------------|----------|
| <b>1(a)(ii)</b> | A is the only correct answer<br>B is incorrect as animal cells have cytoplasm<br>C is incorrect as animal cells have a cell membrane<br>D is incorrect as animal cells have a nucleus |                     | <b>1</b> |

| Question Number   | Answer   | Additional guidance | Mark     |
|-------------------|--|---------------------|----------|
| <b>1 (a)(iii)</b> | D (starch) is the only correct answer<br>A is incorrect as glucose is not a storage molecule<br>B is incorrect as glycerol is not a carbohydrate<br>C is incorrect as plant cells do not have glycogen |                     | <b>1</b> |

| Question Number | Answer   | Additional guidance   | Mark     |
|-----------------|--|---|----------|
| <b>1 (b)</b>    | <p>These are calculation steps</p> <ul style="list-style-type: none"> <li>• correct measurement of line as 50 mm</li> <br/> <li>• correct conversion of micrometres to millimetres or millimetres to micrometres</li> <br/> <li>• correct division of 50 000 <math>\mu\text{m}</math> by 125 <b>or</b> correct division of 50 mm by 0.125</li> </ul> <p><b>(x) 400 (3)</b></p> | <p><b>one mark</b> for correct measurement of line +/- 1 mm<br/>i.e. <b>one mark</b> for 50 (mm) or 5 <u>cm</u></p><br><p><b>one mark</b> for length <math>\times</math> 1000<br/><br/>OR<br/>0.125 (mm)</p><br><p><b>one mark</b> for dividing by 125</p><br><p><b>two marks</b> for 50 000 (<math>\mu\text{m}</math>) (measurement and conversion)<br/><br/>OR<br/><b>two marks</b> for (X) 0.4 or (x) 4 or (x) 40 or (x) 40 000</p><br><p><b>Allow answer in the range of (x) 392 to (x) 408 for three marks</b></p><br><p><b>Ignore</b> other units</p> | <b>3</b> |

**Total for question 1 = 6 marks**

| Question Number | Answer  | Additional guidance | Mark     |
|-----------------|---|---------------------|----------|
| <b>2 (a)(i)</b> | <p>B (fungi) is the only correct answer</p> <p>A is incorrect as animals are not single celled</p> <p>C is incorrect as plants do not have chitin or are single celled</p> <p>D is incorrect as protocists do not have chitin</p> |                     | <b>1</b> |

| Question Number | Answer  | Additional guidance   | Mark     |
|-----------------|---|---|----------|
| <b>2(a)(ii)</b> | <p>An answer that makes reference to one of the following:</p> <ul style="list-style-type: none"> <li>• (viruses) do not grow (1)</li> <li>• (viruses) do not respire (1)</li> <li>• (viruses) are not sensitive / have internal control / eq (1)</li> <li>• (viruses) do not move (1)</li> <li>• (viruses) do not excrete (1)</li> <li>• (viruses) do not reproduce (independently) / need a host to reproduce / eq (1)</li> <li>• (viruses) do not feed / have a nutritional need / eq (1)</li> </ul> | <p><b>Allow</b> do not carry out life processes / do not have all the characteristics of life /do not have MRSGREN(C)</p> <p><b>Ignore</b> need another living organisms / host to live / survive</p> <p><b>Ignore</b> need to live inside another cell</p> | <b>1</b> |

| Question Number | Answer   | Additional guidance  | Mark     |
|-----------------|--|--|----------|
| <b>2(b)</b>     | <p>An answer that makes reference to the following:</p> <ul style="list-style-type: none"> <li>• restriction (enzymes) cut DNA /gene / plasmid / open plasmid / remove gene / eq (1)</li> <li>• ligase joins DNA to plasmid / joins DNA / joins sticky ends / inserts DNA / attaches DNA / eq (1)</li> </ul> | <p><b>Allow</b> endonuclease</p> <p><b>Reject</b> lipase</p> | <b>2</b> |

| Question Number | Answer   | Additional guidance               | Mark     |
|-----------------|--|-----------------------------------|----------|
| <b>2 (c)(i)</b> | <p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• respiration / fermentation / (chemical) reactions, releases heat (energy) (1)</li> <li>• checks / monitor, temperature <b>and</b> lets (cooling) water in / open valve / water is pumped around / eq (1)</li> <li>• lowers temperature / removes heat / prevents over heating / stops temperature getting too high (1)</li> <li>• maintain <u>optimal temperature</u> / <u>optimum temperature</u> (1)</li> <li>• stop <u>enzymes</u> denaturing / stops <u>enzyme</u> shape changing / eq (1)</li> </ul> | <b>Ignore</b> cools it down alone | <b>3</b> |

| Question Number  | Answer   | Additional guidance                     | Mark     |
|------------------|--|---|----------|
| <b>2 (c)(ii)</b> | <p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• (provides) oxygen (1)</li> <li>• for respiration / prevent anaerobic respiration (1)</li> </ul> | <b>Reject for</b> anaerobic respiration | <b>2</b> |

| Question Number   | Answer  | Additional guidance   | Mark     |
|-------------------|---|---|----------|
| <b>2 (c)(iii)</b> | <p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>prevent other microbes / bacteria / fungi / pathogens / eq (1)</li> <li>prevents <u>contamination / contaminate</u> (of product) / toxins (being released) / competition (for nutrients) / eq (1)</li> </ul> | <p><b>Allow</b> remove bacteria / keep sterile<br/><b>Ignore</b> germs / keep clean</p> | <b>2</b> |

(Total for Question 2 = 11 marks)

| Question Number | Answer  | Additional guidance | Mark     |
|-----------------|---|---------------------|----------|
| <b>3 (a)(i)</b> | <p>A (beavers) is the only correct answer</p> <p>A is incorrect as coyote are secondary consumers</p> <p>B is incorrect as grass is a producer</p> <p>C is incorrect as wolf is a secondary and tertiary consumer</p> |                     | <b>1</b> |

| Question Number | Answer   | Additional guidance                                | Mark     |
|-----------------|--|--|----------|
| <b>3(a)(ii)</b> | <p>An answer which makes reference to:</p> <ul style="list-style-type: none"> <li>community and environment / biotic and abiotic parts / <u>all</u> organisms and the environment / <u>all</u> living things and non-living things / the environment and community / eq</li> </ul> | <p><b>Ignore</b> area<br/><b>Allow</b> habitat</p> | <b>1</b> |



| Question Number | Answer   | Additional guidance   | Mark     |
|-----------------|--|---|----------|
| <b>3(b)</b>     | <p>An answer which makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>• fewer elk / coyote were consumed / more elk (present) / more coyote (present) (1)</li> <li>• more consumption of plants / producers (by elk) / fewer producers / less grass / eq (1)</li> <li>• less food for mice (1)</li> <li>• more beavers <u>eaten</u> / more mice <u>eaten</u> (by coyotes) / eq (1)</li> <li>• <u>old</u> trees not removed (1)</li> <li>• younger trees are shaded / less photosynthesis / less energy fixed / enters ecosystem / eq (1)</li> <li>• less food for hawk / fewer mice for hawk / eq (1)</li> <li>• soil erosion (due to loss of plants) (1)</li> <li>• fewer shelters / habitats / nesting places (for organisms) (1)</li> </ul> | <p><b>Allow</b> fewer elk / coyote hunted (by wolves)</p> <p><b>Allow</b> fewer trees / fewer smaller plants / loss of plants</p> <p><b>Ignore</b> no / fewer beavers</p> | <b>4</b> |

| Question Number | Answer   | Additional guidance   | Mark     |
|-----------------|--|---|----------|
| <b>3(c)(i)</b>  | <ul style="list-style-type: none"> <li>• <math>180 - 50 = 130</math></li> <li>• <math>(130 \div 50) \times 100</math></li> </ul> <p style="text-align: center;"><b>260 (%) (2)</b></p> | <p><b>two marks</b> for 260 (%)</p> <p><b>one mark</b> for <math>180 - 50</math> or 130</p> | <b>2</b> |

| Question Number  | Answer  | Additional guidance   | Mark     |
|------------------|---|---|----------|
| <b>3 (c)(ii)</b> | <p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• food begins to run out / eq (1)</li> <li>• disease (spread) (1)</li> <li>• hunting (1)</li> <li>• new competitors / (high) competition / new predators (1)</li> <li>• loss of habitat (1)</li> <li>• migration (1)</li> </ul> | <p><b>Allow</b> coyote / elk numbers fall / eq</p> <p><b>Allow</b> more bears / cougars</p> | <b>2</b> |

| Question Number  | Answer   | Additional guidance                                    | Mark     |
|------------------|--|--|----------|
| <b>3(c)(iii)</b> | <p>An description that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• grid area / <u>quadrat</u> (1)</li> <li>• random (placement) / eq (1)</li> <li>• calculate / measure / count plants / eq (1)</li> <li>• repeat / calculate mean (1)</li> <li>• scale up for whole area (1)</li> </ul> | <p><b>Ignore</b> quadrant</p> <p>quadrats = 2 mark</p> | <b>3</b> |

**(Total for Question 3 = 13 marks)**

| Question Number | Answer  | Additional guidance | Mark     |
|-----------------|---|---------------------|----------|
| <b>4(a)(i)</b>  | <p>B (bronchus) is the only correct answer</p> <p>A is incorrect as bronchioles have no cartilage</p> <p>B is incorrect as oesophagus leads to stomach</p> <p>C is incorrect as there is only one trachea</p> |                     | <b>1</b> |

| Question Number  | Answer   | Additional guidance  | Mark     |
|------------------|--|--|----------|
| <b>4 (a)(ii)</b> | <p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• (S / (diaphragm)/ it) contracts (1)</li> <li>• flattens / presses down / moves down / less dome shaped / eq (1)</li> <li>• increases volume (1)</li> <li>• decreases pressure / air flows in down pressure gradient / eq (1)</li> </ul> | <p><b>Ignore</b><br/>more space</p> <p><b>Allow</b> low pressure</p> | <b>3</b> |

| Question Number | Answer  | Additional guidance | Mark     |
|-----------------|---|---------------------|----------|
| <b>4(b)(i)</b>  | <ul style="list-style-type: none"> <li>• (cycling) speed (1)</li> </ul> |                     | <b>1</b> |

| Question Number | Answer  | Additional guidance   | Mark     |
|-----------------|---|---|----------|
| <b>4(b)(ii)</b> | <ul style="list-style-type: none"> <li>• conversion of <math>\text{dm}^3</math> to <math>\text{cm}^3</math> (65 000)</li> <li>• <math>65\,000 \div 25</math></li> </ul> <p><b>2600 (cm<sup>3</sup>) (2)</b></p> | <p><b>one mark</b> for 65 000<br/><b>OR</b><br/>division by 25</p> <p><b>two marks</b> for 2600</p> | <b>2</b> |

| Question Number  | Answer  | Additional guidance   | Mark     |
|------------------|---|---|----------|
| <b>4(b)(iii)</b> | <p>An answer that makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>• <u>ventilation</u> (rate) increases (1)</li> <li>• (take in) more oxygen / eq (1)</li> <li>• (release) more energy / ATP / high(er) respiration rate (1)</li> <li>• more / faster muscle <u>contraction</u> (1)</li> </ul><br><ul style="list-style-type: none"> <li>• volume of air breathed <u>per breath</u> increases as speed increases (1)</li> </ul><br><ul style="list-style-type: none"> <li>• breathing rate increases from 20 / 25 km per hour / breathing rate does not increase between 0 – 20 km per hour (1)</li> </ul><br><ul style="list-style-type: none"> <li>• increase in volume of air <u>per breath</u> gets less as cycling speed increases / volume of air <u>per breath</u> stops increasing above 30 km per hour (1)</li> </ul> | <p><b>Allow</b> positive correlation between ventilation rate and speed</p><br><p><b>Allow</b> depth of breathing</p><br><p><b>Allow</b> up to 20 km per hr increase is due to increased volume of air each breath / depth of breathing</p><br><p><b>Allow</b> at over 20 km per hr, increase is due to increased rate of breathing</p> | <b>4</b> |

| Question Number  | Answer   | Additional guidance           | Mark     |
|------------------|--|-------------------------------|----------|
| <b>4 (b)(iv)</b> | <ul style="list-style-type: none"> <li>• repeat / calculate average / mean / more cyclists / more people / eq (1)</li> </ul> | <b>Allow</b> use other people | <b>1</b> |

(Total for Question 4 = 12 marks)

| Question Number | Answer  | Additional guidance  | Mark     |
|-----------------|---|----------------------|----------|
| <b>5(a)(i)</b>  | <ul style="list-style-type: none"> <li>section / length / part / eq, of DNA / chromosome, that codes for a protein / polypeptide (1)</li> </ul> | <b>Ignore strand</b> | <b>1</b> |

| Question Number | Answer           | Additional guidance  | Mark     |
|-----------------|------------------|--|----------|
| <b>5(a)(ii)</b> | FF <u>and</u> Ff | <p><b>Allow</b> FF and ff</p> <p><b>Allow</b> FF, Ff, and ff</p> <p><b>Allow</b> alternative letters</p> | <b>1</b> |

| Question Number | Answer   | Additional guidance | Mark     |
|-----------------|--|---------------------|----------|
| <b>5(b)(i)</b>  | <p>C (4) is the only correct answer</p> <p>A is not correct as 1, 4, 5 and 6 must be heterozygous</p> <p>B is not correct as 2, 3 and 7 must be homozygous</p> <p>D because only 2, 3 and 7 are not heterozygous</p> |                     | <b>1</b> |

| Question Number | Answer   | Additional guidance   | Mark     |
|-----------------|--|---|----------|
| <b>5(b)(ii)</b> | <p>An answer that makes reference to:</p> <ul style="list-style-type: none"> <li>parental genotypes of Ff and ff (1)</li> <li>gametes as F + f <u>and</u> f (+ f) (1)</li> <li>correct F<sub>1</sub> genotypes (Ff, ff) in correct ratio (1)</li> <li>0.5 / 50% / ½ (1)</li> </ul> | <p>MP1-3 from Punnet square</p> <p><b>Allow</b> ecf <b>ONLY</b> for MPs 2 and 3 with incorrect parental genotypes</p> <p><b>Allow</b> different letters</p> | <b>4</b> |

|  |  |  |  |
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|  |  |  |  |
|--|--|--|--|

| Question Number   | Answer   | Additional guidance                                  | Mark     |
|-------------------|--|--|----------|
| <b>5 (b)(iii)</b> | <p>An answer that makes reference to three from:</p> <ul style="list-style-type: none"> <li>• feather is discontinuous / categoric / height is continuous / eq (1)</li> <li>• height is <u>polygenic</u> (1)</li> <li>• height depends on the combination of many / several, genes / not just one gene / eq (1)</li> <li>• height may have environmental effects (1)</li> </ul><br><ul style="list-style-type: none"> <li>• feather structure is due to one gene / monogenic (1)</li> <li>• height depends on sex (1)</li> </ul> | <p><b>Allow</b><br/>named factors e.g. nutrition</p> | <b>3</b> |

(Total for Question 5 = 10 marks)

| Question Number | Answer   | Additional guidance | Mark     |
|-----------------|--|---------------------|----------|
| <b>6 (a)(i)</b> | <p>C (X and Z) is the only correct answer</p> <p>A is incorrect because the pancreas also produces amylase<br/> B is incorrect because the stomach does not produce amylase<br/> D is incorrect because the stomach does not produce amylase</p> |                     | <b>1</b> |

| Question Number                   | Answer          | Additional guidance | Mark                               |  |          |
|-----------------------------------|-----------------|---------------------|------------------------------------|--|----------|
| <b>6(a)(ii)</b>                   | <b>Enzyme</b>   | <b>Molecule</b>     | <b>Product</b>                     |  | <b>3</b> |
|                                   | <u>amylase</u>  | <u>starch</u>       | <u>maltose</u>                     |  |          |
|                                   | <u>lipase</u>   | <u>lipid</u>        | <u>fatty acids / glycerol</u>      |  |          |
|                                   | <u>protease</u> | <u>protein</u>      | <u>amino acids / (poly)peptide</u> |  |          |
| one mark for each correct row (3) |                 |                     |                                    |  |          |

| Question Number | Answer  | Additional guidance  | Mark     |
|-----------------|---|--|----------|
| <b>6(b)(i)</b>  | <ul style="list-style-type: none"> <li>calculate mass of lentils that has 1 g of protein<br/> <math>100 \div 25 = 4</math> g of lentils has 1 g of protein</li> <li>scale up to 46 g of protein <math>46 \times 4</math></li> </ul> <p><b>184 (2)</b></p> | <p>184 = <b>two marks</b></p> <p><b>one mark</b> for <math>\div 25</math> or <math>\times 4</math></p> | <b>2</b> |

| Question Number | Answer  | Additional guidance  | Mark     |
|-----------------|---|--|----------|
| <b>6(b)(ii)</b> | <p>An answer that makes reference to five of the following:</p> <ul style="list-style-type: none"> <li>• excess energy may lead to obesity / eq (1)</li> <li>• (excess energy / obesity) increases risk of diabetes / joint damage / heart disease / eq (1)</li> <li>• enough protein / protein is same as RDA, so growth should be normal (rate) / eq (1)</li> <li>• enough vitamin A / vitamin A is same as RDA so no risk of night blindness / eye problems / vision is normal / eq (1)</li> <li>• vitamin C is low so may be at risk of scurvy / eq (1)</li> <li>• calcium is too low so may be at risk of rickets / osteoporosis / eq (1)</li> <li>• enough iron / iron is same as RDA so no risk of anaemia / can make red blood cells / haemoglobin / no problems carrying oxygen (1)</li> <li>• fibre is low so risk of constipation / can't egest / release faeces / eq (1)</li> <li>• data does not list other named dietary components / eq (1)</li> <li>• no mention of activity levels / sex / age / pregnancy / eq of person (1)</li> </ul> | <p><b>max three</b> for effects with no link to RDA e.g. they will become obese<br/> <b>Allow</b> puts weight on / get fat</p> <p><b>Allow</b> can build muscle / can grow</p> <p><b>Allow</b> more risk of gums bleeding / connective tissue problems / collagen /have healthy skin</p> <p><b>Ignore</b> waste unqualified</p> <p><b>max three</b> for descriptions of functions of dietary components with no ref to deficiency e.g. vitamin C is for healthy skin</p> | <b>5</b> |



| Question Number  | Answer   | Additional guidance   | Mark     |
|------------------|--|-----------------------|----------|
| <b>6(b)(iii)</b> | <p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>activity / exercise / active lifestyle / sport / job (may affect energy need) / eq (1)</li> <li>pregnancy (may affect energy need) (1)</li> <li>different metabolic rate (1)</li> <li>age (may affect energy need) (1)</li> <li>sex (may affect energy need) (1)</li> <li>body mass / weight / (may affect energy need) (1)</li> </ul> | <b>Ignore</b><br>size | <b>2</b> |

(Total for question 6= 13 marks)

| Question Number | Answer  | Additional guidance  | Mark     |
|-----------------|---|--|----------|
| <b>7 (a)</b>    | <ul style="list-style-type: none"> <li>different /several group of tissues (1)</li> </ul> | <b>Ignore</b> made of tissues<br><b>Allow</b> made of different cell types | <b>1</b> |

| Question Number | Answer   | Additional guidance  | Mark     |
|-----------------|--|--|----------|
| <b>7 (b)(i)</b> | <p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>increased blood flow to skin (surface) / increased blood flow through capillaries / eq (1)</li> <li>(because) <u>vasodilation</u> occurs (1)</li> <li>arteriole / blood vessel widens / expands / eq (1)</li> </ul> | <p><b>Reject</b> movement of blood vessels</p> <p><b>Reject</b> vasodilation of capillaries / veins</p> <p><b>Reject</b> capillaries / veins widen</p> | <b>3</b> |

|  |  |   |  |
|--|--|---|--|
|  | <ul style="list-style-type: none"> <li>• (increased) heat loss (1)</li> <li>• by radiation / convection (1)</li> </ul> | <b>Allow</b> cools<br><b>Ignore</b> refs to sweat / heat evaporates |  |
|--|--|---|--|

| Question Number | Answer  | Additional guidance   | Mark     |
|-----------------|---|---|----------|
| <b>7(b)(ii)</b> | <p>An answer that makes reference to six of the following:</p> <p>C – drinks of different temperatures / warm drink and cold drink / eq (1)</p> <p>O – people of same age / mass / sex / fitness / body temperature / eq (1)</p> <p>R – repeats / several people / groups / eq (1)</p> <p>M1 – mass of sweat / volume of sweat / weigh cotton wool / weigh shirt / area of sweat / colour of cloth on skin / count sweat drops / eq (1)</p> <p>M2 – over <u>stated</u> time period (1)</p> <p>S1 – same exercise / food / water / volume of drink / type of drink / same clothes / material / eq (1)</p> <p>S2 – same room temperature / air conditioned room / humidity / time of day / eq (1)</p> | <p><b>Allow</b> same person</p> <p><b>Ignore</b> amount<br/><b>Ignore</b> body mass</p> <p><b>two marks</b> for time taken to produce set mass / set volume / eq of sweat for M1 and M2</p> | <b>6</b> |

(Total for question 7= 10 marks)

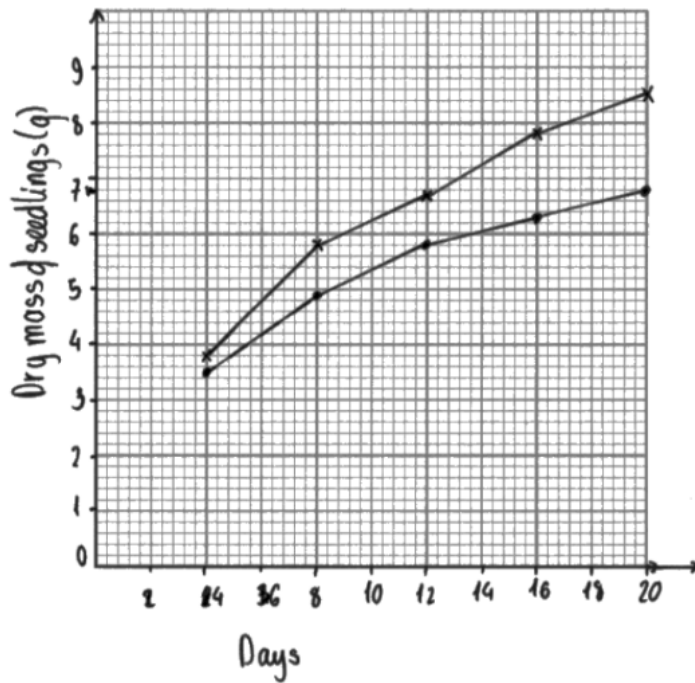
| Question Number | Answer  | Additional guidance   | Mark     |
|-----------------|---|---|----------|
| <b>8 (a)(i)</b> | <p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• light (intensity) / lamp / eq (1)</li> <li>• water <u>volume</u> / watering <u>frequency</u> (1)</li> <li>• mass /weight, of compost (1)</li> </ul> | <p><b>Ignore</b><br/>amount</p> <p><b>Ignore</b><br/>fertiliser</p> | <b>2</b> |

| Question Number  | Answer   | Additional guidance   | Mark     |
|------------------|--|---|----------|
| <b>8 (a)(ii)</b> | <p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• water (content) would vary / water increases the mass / adds mass / makes seeds heavier / some seeds would absorb more water than others (1)</li> <li>• so comparison is valid / fair comparison (1)</li> <li>• water is not <u>biomass</u> / dry mass is the true <u>biomass</u> / (dry mass is) organic molecules (1)</li> </ul> | <p><b>Allow</b><br/>water changes mass</p> <p><b>Ignore</b><br/>accuracy / reliable</p> <p><b>Ignore</b><br/>fair test alone</p> <p><b>Allow</b><br/>converse for all MPs</p> | <b>2</b> |

| Question Number | Answer  | Additional guidance  | Mark     |
|-----------------|---|--|----------|
| <b>8(b)(i)</b>  | <p>S – <u>linear</u> scale that takes up at least half of grid <b>and</b> right way round (1)</p> <p>L – ruled, straight lines that join points with no extrapolation (1)</p> <p>A – axes fully labelled with units (1)</p> | <p><b>Allow</b> S, L, A if only one line</p> <p>Bar chart loses L<br/>Axes labels are mass (g) and day</p> | <b>5</b> |

P – all points correct (1)  
K – key for each line / each line  
labelled (1)

| Day | Dry mass of seedlings in g |                 |
|-----|----------------------------|-----------------|
|     | Without fertiliser         | With fertiliser |
| 4   | 3.5                        | 3.8             |
| 8   | 4.9                        | 5.8             |
| 12  | 5.8                        | 6.7             |
| 16  | 6.3                        | 7.8             |
| 20  | 6.8                        | 8.5             |



| Question Number  | Answer  | Additional guidance   | Mark     |
|------------------|---|---|----------|
| <b>8 (b)(ii)</b> | <p>An answer that makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>• magnesium ions (increase) chlorophyll / chloroplasts (1)</li> <li>• (so more) photosynthesis (1)</li> <li>• (which produces) carbohydrates / glucose / starch / cellulose / eq (1)</li> <li>• nitrate ions for amino acids (1)</li> <li>• (nitrate / amino acid) for protein (synthesis for growth) (1)</li> </ul> | <p>If no other marks, award <b>one mark</b> for making chlorophyll <u>and</u> amino acids / protein with no ref to minerals</p> <p><b>Allow</b> for enzymes</p> | <b>4</b> |

(Total for Question 8 = 13 marks)

| Question Number | Answer                                    | Additional guidance | Mark     |
|-----------------|---|---------------------|----------|
| <b>9 (a)(i)</b> | <p>X: stigma (1)</p> <p>Y: anther (1)</p> |                     | <b>2</b> |

| Question Number  | Answer  | Additional guidance   | Mark     |
|------------------|---|---|----------|
| <b>9 (a)(ii)</b> | <p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• insect (pollination) / bee / eq (1)</li> <li>• (because it has) large petals / eq (1)</li> <li>• (and) Y / anthers / stamen, within the flower / not hanging out / eq (1)</li> <li>• (and) X / stigma within the flower / not feathery / not hanging out / eq (1)</li> </ul> | <p><b>Ignore</b> colours / scents / bright / nectar(y)</p> <p><b>Allow</b> the structures given in part (i) are within the petals if they are correct</p> | <b>3</b> |

| Question Number | Answer   | Additional guidance   | Mark     |
|-----------------|--|---|----------|
| <b>9 (b)(i)</b> | <p><i>ungerminated seeds</i>: starch (1)</p> <p><i>germinating seeds</i>: starch and, <u>glucose</u> / <u>sugar</u> / <u>maltose</u> (1)</p> | <p><b>Reject</b> if additional incorrect substances listed e.g. protein, fats</p> <p><b>Reject</b> if additional incorrect substances listed e.g. protein, fats</p> | <b>2</b> |

| Question Number  | Answer   | Additional guidance  | Mark     |
|------------------|--|--|----------|
| <b>9 (b)(ii)</b> | <p>An explanation that makes reference to three of the following:</p> <p><i>In ungerminated seeds:</i></p> <ul style="list-style-type: none"> <li>• starch is for (energy) storage (1)</li> <li>• as it is insoluble / does not affect osmosis / eq (1)</li> </ul> <p><i>In germinating seeds:</i></p> <ul style="list-style-type: none"> <li>• (water activates) enzymes / amylase / carbohydrase (1)</li> <li>• digests / converts / breaks down starch into maltose / glucose / sugar (1)</li> <li>• (glucose is used in) respiration / for energy (1)</li> </ul> | <p><b>Allow</b> converse throughout</p> <p><b>Allow</b> starch is a store</p> <p><b>Allow</b> starch not broken down into glucose in ungerminated seeds</p> <p><b>Allow</b> less / no respiration in ungerminated seed</p> | <b>3</b> |

| Question Number   | Answer   | Additional guidance  | Mark     |
|-------------------|--|--|----------|
| <b>9 (b)(iii)</b> | <p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>allows oxygen in (1)</li> <li>for germination / respiration / eq (1)</li> <li>allows carbon dioxide to escape / eq (1)</li> </ul> | <p><b>Ignore</b> oxygen and carbon dioxide</p> <p><b>Reject</b> if carbon dioxide <u>for</u> respiration</p> <p><b>Ignore</b> light / references to photosynthesis</p> | <b>2</b> |

(Total for Question 9 = 12 marks)

| Question Number  | Answer  | Additional guidance   | Mark     |
|------------------|---|-----------------------|----------|
| <b>10 (a)(i)</b> | <ul style="list-style-type: none"> <li>nucleus (present) (1)</li> </ul> | <b>Allow</b> converse | <b>1</b> |

| Question Number   | Answer   | Additional guidance   | Mark     |
|-------------------|--|---|----------|
| <b>10 (a)(ii)</b> | <p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>(shape gives) lower surface area (to volume ratio) (1)</li> <li>less space / nucleus takes up space (in cell) (1)</li> <li>(less space for) haemoglobin (1)</li> <li>less diffusion / less oxygen absorbed / less oxygen taken up / eq (1)</li> </ul> | <p><b>Allow</b> converse for human cells</p> <p><b>Allow</b> less volume (for oxygen)</p> <p><b>Ignore</b> gas exchange</p> | <b>2</b> |



| Question Number | Answer   | Additional guidance   | Mark     |
|-----------------|--|---|----------|
| <b>10 (b)</b>   | <p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>• mutation (1)</li> <li>• variation (in haemoglobin / how much oxygen is absorbed) (1)</li> <li>• llamas survive / compete better / eq (1)</li> <li>• reproduce / create offspring / eq (1)</li> <li>• pass on allele / gene / eq (1)</li> </ul> | <p>Pass on allele to offspring / next generation = <b>two marks</b></p> <p><b>Ignore</b> pass on characteristic</p> | <b>4</b> |

| Question Number | Answer   | Additional guidance   | Mark     |
|-----------------|--|---|----------|
| <b>10 (c)</b>   | <p>A description that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• engulf / eq (1)</li> <li>• microbes / pathogens / bacteria / viruses / eq (1)</li> <li>• digest / break down (1)</li> <li>• using enzymes (1)</li> </ul> | <p><b>Allow</b> ingest</p> <p>Digestive enzymes is <b>2 marks</b></p> | <b>3</b> |

(Total for Question 10 = 10 marks)

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