



# Mark Scheme (Results)

Summer 2021

Pearson Edexcel International GCSE  
In Biology (4BI1) Paper 1B and Science (Double  
Award) (4SD0) Paper 1B

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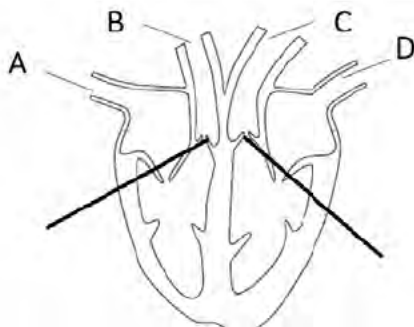
| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Mark                                                 |           |                                   |            |                                    |                                                      |                                               |               |                           |                                            |                                                          |                                                    |          |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------|-----------------------------------|------------|------------------------------------|------------------------------------------------------|-----------------------------------------------|---------------|---------------------------|--------------------------------------------|----------------------------------------------------------|----------------------------------------------------|----------|
| <b>1(a)</b>     | <table><tr><th>Value</th><th>Apparatus</th></tr><tr><td>magnification of a red blood cell</td><td>microscope</td></tr><tr><td>heat produced by germinating seeds</td><td>thermometer / temperature probe / data logger/eq (1)</td></tr><tr><td>surface area to volume ratio of a potato chip</td><td>ruler /eq (1)</td></tr><tr><td>breathing rate of a human</td><td>clock / watch / timer / spirometer /eq (1)</td></tr><tr><td>volume of gas produced by yeast in anaerobic respiration</td><td>syringe / measuring cylinder / respirometer/eq (1)</td></tr></table> | Value                                                | Apparatus | magnification of a red blood cell | microscope | heat produced by germinating seeds | thermometer / temperature probe / data logger/eq (1) | surface area to volume ratio of a potato chip | ruler /eq (1) | breathing rate of a human | clock / watch / timer / spirometer /eq (1) | volume of gas produced by yeast in anaerobic respiration | syringe / measuring cylinder / respirometer/eq (1) | <b>4</b> |
|                 | Value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Apparatus                                            |           |                                   |            |                                    |                                                      |                                               |               |                           |                                            |                                                          |                                                    |          |
|                 | magnification of a red blood cell                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | microscope                                           |           |                                   |            |                                    |                                                      |                                               |               |                           |                                            |                                                          |                                                    |          |
|                 | heat produced by germinating seeds                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | thermometer / temperature probe / data logger/eq (1) |           |                                   |            |                                    |                                                      |                                               |               |                           |                                            |                                                          |                                                    |          |
|                 | surface area to volume ratio of a potato chip                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ruler /eq (1)                                        |           |                                   |            |                                    |                                                      |                                               |               |                           |                                            |                                                          |                                                    |          |
|                 | breathing rate of a human                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | clock / watch / timer / spirometer /eq (1)           |           |                                   |            |                                    |                                                      |                                               |               |                           |                                            |                                                          |                                                    |          |
|                 | volume of gas produced by yeast in anaerobic respiration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | syringe / measuring cylinder / respirometer/eq (1)   |           |                                   |            |                                    |                                                      |                                               |               |                           |                                            |                                                          |                                                    |          |

| Question Number | Answer                                                                                                                                                                   | additional guidance                                                                                              | Mark     |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------|
| <b>1(b)</b>     | <ul style="list-style-type: none"> <li>width of cell = 5.3 cm</li> <li>width of cell = in <math>53\,000\ \mu\text{m} \div 8 = 6625</math></li> </ul> <p>6250 to 6750</p> | <p><b>5.0 – 5.4 cm</b></p> <p><b>allow full marks for answer alone</b></p> <p>allow 1 mark for dividing by 8</p> | <b>2</b> |

Total 6 marks

| Question Number | Answer                                                                                                                                                                                                                                                          | Mark     |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>2(a) (i)</b> | <p><b>The only correct answer is D</b></p> <p>A is not correct as it does not bring oxygenated blood to heart</p> <p>B is not correct as it does not bring oxygenated blood to heart</p> <p>C is not correct as it does not bring oxygenated blood to heart</p> | <b>1</b> |

| Question Number  | Answer                                                                                                                                                                                                                                                                                  | Mark     |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>2(a) (ii)</b> | <p><b>The only correct answer is C</b></p> <p>A is not correct as it does not contain blood with the highest pressure</p> <p>B is not correct as it does not contain blood with the highest pressure</p> <p>D is not correct as it does not contain blood with the highest pressure</p> | <b>1</b> |

| Question Number | Answer                                                                              | additional guidance                         | Mark     |
|-----------------|-------------------------------------------------------------------------------------|---------------------------------------------|----------|
| <b>2(b) (i)</b> |  | allow other forms of indication of location | <b>1</b> |

| Question Number | Answer                                                                                                                                                                                                                              | additional guidance  | Mark     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------|
| <b>2(b)(ii)</b> | <p>A description that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>prevent backflow of blood /one way flow /eq (1)</li> <li>(from arteries) into <u>ventricle/ ventricles</u> (1)</li> </ul> | back into heart =mp1 | <b>2</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                              | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>2(c)(i)</b>  | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• so that oxygenated and deoxygenated blood do not mix / as left hand side now contains oxygenated blood from lungs / eq (1)</li> <li>• so that oxygenated blood can be pumped around body / so deoxygenated blood does not go round body / so oxygenated blood does not go to lungs / eq (1)</li> </ul> | <b>2</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                               | Mark     |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>2(c)(ii)</b> | <p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• may appear blue / lack colour / not survive / shortness of breath/ eq (1)</li> <li>• as less oxygen (transported from heart to body) / deoxygenated blood goes to body / eq (1)</li> <li>• less (aerobic) respiration (1)</li> <li>• less energy / less ATP/ eq (1)</li> </ul> | <b>3</b> |

Total = 10 marks

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>3(a)</b>     | <p>A description that makes reference to four of the following points:</p> <ul style="list-style-type: none"> <li>• boil leaf in water / eq (1)</li> <li>• boil in <u>ethanol</u> (to remove chlorophyll) (1)</li> <li>• hot water bath / kettle / turn off Bunsen / eq (1)</li> <li>• soak in water (to rehydrate / allow diffusion) (1)</li> <li>• add iodine solution (1)</li> <li>• <u>blue black</u> / eq (leaf uncovered) <u>starch present</u> / <u>yellow</u> / eq <u>no starch</u> (leaf covered) (1)</li> </ul> | <b>4</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | additional guidance                                                                                                                                   | Mark     |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>3(b)(i)</b>  | <p>An answer that makes reference to four of the following points:</p> <ul style="list-style-type: none"> <li>• increasing carbon dioxide increases rate / eq (1)</li> <li>• CO<sub>2</sub> required / substrate (for photosynthesis)/ eq (1)</li> <li>• greater higher (in rate) at high light intensity / eq (1)</li> <li>• light required / provides energy for photosynthesis/ eq (1)</li> <li>• increase is same from 0.00 to 0.02 / first two readings / eq ( in both light intensities) (1)</li> <li>• levelling at (high light intensity) due to temperature / number of chloroplasts / amount of chlorophyll/ eq (1)</li> </ul> | <p>correct ref to CO<sub>2</sub> limiting factor</p> <p>allow converse</p> <p>light limiting/ eq factor</p> <p>ref to temperature limiting factor</p> | <b>4</b> |

| Question Number | Answer                                                                                                                                                                                                                          | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>3(b)(ii)</b> | <p>An answer that makes reference to one of the following points:</p> <ul style="list-style-type: none"> <li>• use more bulbs / change bulb / wattage / use dimmer / filters / eq (1)</li> <li>• change distance (1)</li> </ul> | <b>1</b> |

| Question Number  | Answer                                                                                                                                         | Mark     |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>3(b)(iii)</b> | <ul style="list-style-type: none"> <li>• (number of) bubbles (per minute) / rate of photosynthesis / rate of oxygen production / eq</li> </ul> | <b>1</b> |

| Question Number | Answer                                                                                                                                     | Mark              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>3(b)(iv)</b> | <ul style="list-style-type: none"> <li>• same type / species / mass / number of leaves / length / size same piece of plant / eq</li> </ul> | <b>1<br/>Grad</b> |

Total = 11 marks

| Question Number | Answer                                                                                                                                                                                                                                  | Mark     |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>4(a)(i)</b>  | <p><b>The only correct answer is C chitin glycogen</b></p> <p>A is not correct as it is not cellulose and glycogen</p> <p>B is not correct as it is not cellulose and starch</p> <p>D is not correct as it is not chitin and starch</p> | <b>1</b> |

| Question Number | Answer                                                                                                                                                                                           | Mark     |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>4(a)(ii)</b> | <p><b>The only correct answer is B fungus</b></p> <p>A is not correct as it is not a bacterium</p> <p>C is not correct as it is not a plant</p> <p>D is not correct as it is not a protocist</p> | <b>1</b> |

| Question Number | Answer                                                                                                                                                                                                                                                  | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>4(b)(i)</b>  | <p><b>Only correct answer is B glucose → ethanol + carbon dioxide</b></p> <p>A is not correct as it is not the correct equation</p> <p>C is not correct as it is not the correct equation</p> <p>D is not correct as it is not the correct equation</p> | <b>1</b> |

| Question Number | Answer                                                                                    | additional guidance                | Mark     |
|-----------------|-------------------------------------------------------------------------------------------|------------------------------------|----------|
| <b>4(b)(ii)</b> | <ul style="list-style-type: none"> <li>restriction / endonuclease / ligase (1)</li> </ul> | allow correctly named endonuclease | <b>1</b> |

| Question Number  | Answer                                                                                                                                                                                                                                                                                                                                         | Mark     |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>4(b)(iii)</b> | <ul style="list-style-type: none"> <li>contains new DNA / new gene / foreign DNA / foreign gene / altered genes / DNA from other organism/ DNA from other species / gene from other organism / gene form other species / contains gene for digesting cell walls / contains gene for digesting cellulose / gene for cellulase / eq /</li> </ul> | <b>1</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                    |                         | Mark     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|----------|
| <b>4(b)(iv)</b> | <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> <li>• less burning of fossil fuels / eq (1)</li> <li>• less carbon dioxide in air / carbon neutral / plants use CO<sub>2</sub> (in photosynthesis) / eq (1)</li> <li>• less trapping of heat / less greenhouse effect / eq (1)</li> <li>• uses renewable resource (1)</li> </ul> | allow named fossil fuel | <b>2</b> |

| Question Number | Answer                                                                                                                                                                    | Additional guidance                                                                                                                                                                                                                                                                                                                                                                                                       | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>4(c)(i)</b>  | <ul style="list-style-type: none"> <li>• <math>2.2 - 1.25 =</math></li> <li>• <math>0.95 \div 1.25 = 0.76</math></li> <li>• <math>\times 100 = 76\%</math> (2)</li> </ul> | <p>award full marks for correct numerical answer without working</p> <p>allow <math>2.2 - 1.3 = 0.9</math><br/> <math>0.9 \div 1.3 = 0.69</math><br/> <math>\times 100 = 69\%</math></p> <p>allow <math>2.2 - 1.2 = 1</math><br/> <math>1 \div 1.2 = 0.8</math><br/> <math>0.8 \times 100 = 80\%</math></p> <p>allow 1 mark for dividing by mass of normal yeast / 1.2 to 1.3</p> <p>percentage between 69 and 80 (2)</p> | <b>2</b> |

| Question Number | Answer                                                                                                                                                                                                                               | additional guidance                                                                             | Mark     |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------|
| <b>4(c)(ii)</b> | <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> <li>• running out of glucose / food / eq (1)</li> <li>• (build-up of) ethanol (1)</li> <li>• yeast cells die (1)</li> </ul> | <p>allow one mark for oxygen becomes available</p> <p>ethanol kills the yeast = mp2 and mp3</p> | <b>2</b> |

Total 11 marks

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                      | additional guidance              | Mark     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------|
| <b>5(a)</b>     | <p>An answer that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• <u>quadrat</u> (1)</li> <li>• repeat (<u>1</u>)</li> <li>• random / using coordinates / eq (1)</li> <li>• count / how many / amount / number /eq (1)</li> <li>• divide total /eq (count) by (area / number of) quadrats /eq (1)</li> </ul> | use quadrats scores mp1 and mp 2 | <b>3</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | additional guidance                                 | Mark     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|----------|
| <b>5(b)</b>     | <p>An answer that makes reference to five of the following points:</p> <ul style="list-style-type: none"> <li>• BC numbers decline slower / CC numbers lower at start / February / eq (1)</li> <li>• CC numbers lower in some / April/ June / August / stated months /eq (1)</li> <li>• BC numbers are (overall) lower / eq (1)</li> <li>• BC stays low / less variable / CC go up and down / eq (1)</li> <li>• BC no need to reapply / insects reproduce / eq (1)</li> <li>• BC less risk of pollution / eq (1)</li> <li>• BC less risk of resistance /eq (1)</li> <li>• BC is specific / not affect (other) food chains /eq (1)</li> <li>• BC no bioaccumulation / eq (1)</li> <li>• BC could become pest /eq(1)</li> </ul> | <p>allow converse</p> <p>allow biomagnification</p> | <b>5</b> |

Total = 8 marks

| Question Number | Answer                                                                                                                                                                                                                  | Mark     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>6(a)</b>     | <p>The only correct answer is C the organisms of all species in a habitat</p> <p>A is not correct as is not a community</p> <p>B is not correct as is not a community</p> <p>D is not correct as is not a community</p> | <b>1</b> |

| Question Number | Answer                                                                                                                                                                               | Additional guidance                                                                                                                                                                                                                                                                                                                                           | Mark     |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>6(b)(i)</b>  | <ul style="list-style-type: none"> <li>• <math>1.5 \times 10^4 = 15\,000</math></li> <li>• <math>2.5 \div 15\,000 =</math></li> <li>• <math>1.7 \times 10^{-4} (3)</math></li> </ul> | <p>award full marks for correct numerical answer without working</p> <p>1 mark for <math>2.5 \div 15000</math> or <math>2.5 \div 1.5 \times 10^4</math></p> <p>2 marks for</p> <p>0.00017</p> <p>2 marks for <math>17 \times 10^{-5}</math></p> <p>allow <math>1.67 \times 10^{-4} = 3</math></p> <p>allow 1.66 recurring <math>\times 10^{-4} = 3</math></p> | <b>3</b> |

| Question Number | Answer                                                                                                                    | additional guidance                     | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|----------|
| <b>6(b)(ii)</b> | <ul style="list-style-type: none"> <li>• correct order / names (1)</li> <li>• correct pyramid / shape / eq (1)</li> </ul> | <p>ignore shape</p> <p>ignore names</p> | <b>2</b> |

| Question Number | Answer                                                                                                                                                                                                                                   | additional guidance                                                               | Mark     |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------|
| <b>6(c)(i)</b>  | <p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• undigested / not absorbed / waste / faeces / not assimilated / eq (1)</li> <li>• contains energy / cellulose (1)</li> </ul> | <p>cellulose not digested = 2 marks</p> <p>energy trapped in faeces = 2 marks</p> | <b>2</b> |

| Question Number | Answer                                                                                                                                                                                                                                                      | Mark     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>6(c)(ii)</b> | <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> <li>• respiration / heat loss (1)</li> <li>• movement / eq (1)</li> <li>• uneaten / die / not consumed /eq (1)</li> <li>• excretion (1)</li> </ul> | <b>2</b> |

Total 10 marks

| Question Number | Answer                                                                                                                                                                                                                                                      | Mark       |          |   |        |   |        |   |           |   |        |   |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------|---|--------|---|--------|---|-----------|---|--------|---|
| 7(a)            | <div><div></div><table><thead><tr><th>Individual</th><th>Genotype</th></tr></thead><tbody><tr><td>P</td><td>Dd (1)</td></tr><tr><td>Q</td><td>Dd (1)</td></tr><tr><td>R</td><td><b>Dd</b></td></tr><tr><td>S</td><td>dd (1)</td></tr></tbody></table></div> | Individual | Genotype | P | Dd (1) | Q | Dd (1) | R | <b>Dd</b> | S | dd (1) | 3 |
| Individual      | Genotype                                                                                                                                                                                                                                                    |            |          |   |        |   |        |   |           |   |        |   |
| P               | Dd (1)                                                                                                                                                                                                                                                      |            |          |   |        |   |        |   |           |   |        |   |
| Q               | Dd (1)                                                                                                                                                                                                                                                      |            |          |   |        |   |        |   |           |   |        |   |
| R               | <b>Dd</b>                                                                                                                                                                                                                                                   |            |          |   |        |   |        |   |           |   |        |   |
| S               | dd (1)                                                                                                                                                                                                                                                      |            |          |   |        |   |        |   |           |   |        |   |

| Question Number | Answer              | Mark     |
|-----------------|---------------------|----------|
| <b>7(b)</b>     | 1/8 / 0.125 / 12.5% | <b>1</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Mark     |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>7(c)</b>     | <p>An answer that makes reference to four of the following points:</p> <ul style="list-style-type: none"> <li>• greater increase in testosterone in R / smaller increase in S / eq (1)</li> <li>• R male / S female / eq (1)</li> <li>• greater increase in oestrogen in S / less increase in R / eq (1)</li> <li>• more muscle / deeper voice / beard in R/ eq (1)</li> <li>• wider hips / breasts / in S (1)</li> <li>• body hair / growth spurt / eq (1)</li> <li>• gamete / sperm / egg production / start to menstruate (1)</li> <li>• <u>secondary sexual characteristics</u> (1)</li> </ul> | <b>4</b> |

Total 8 marks

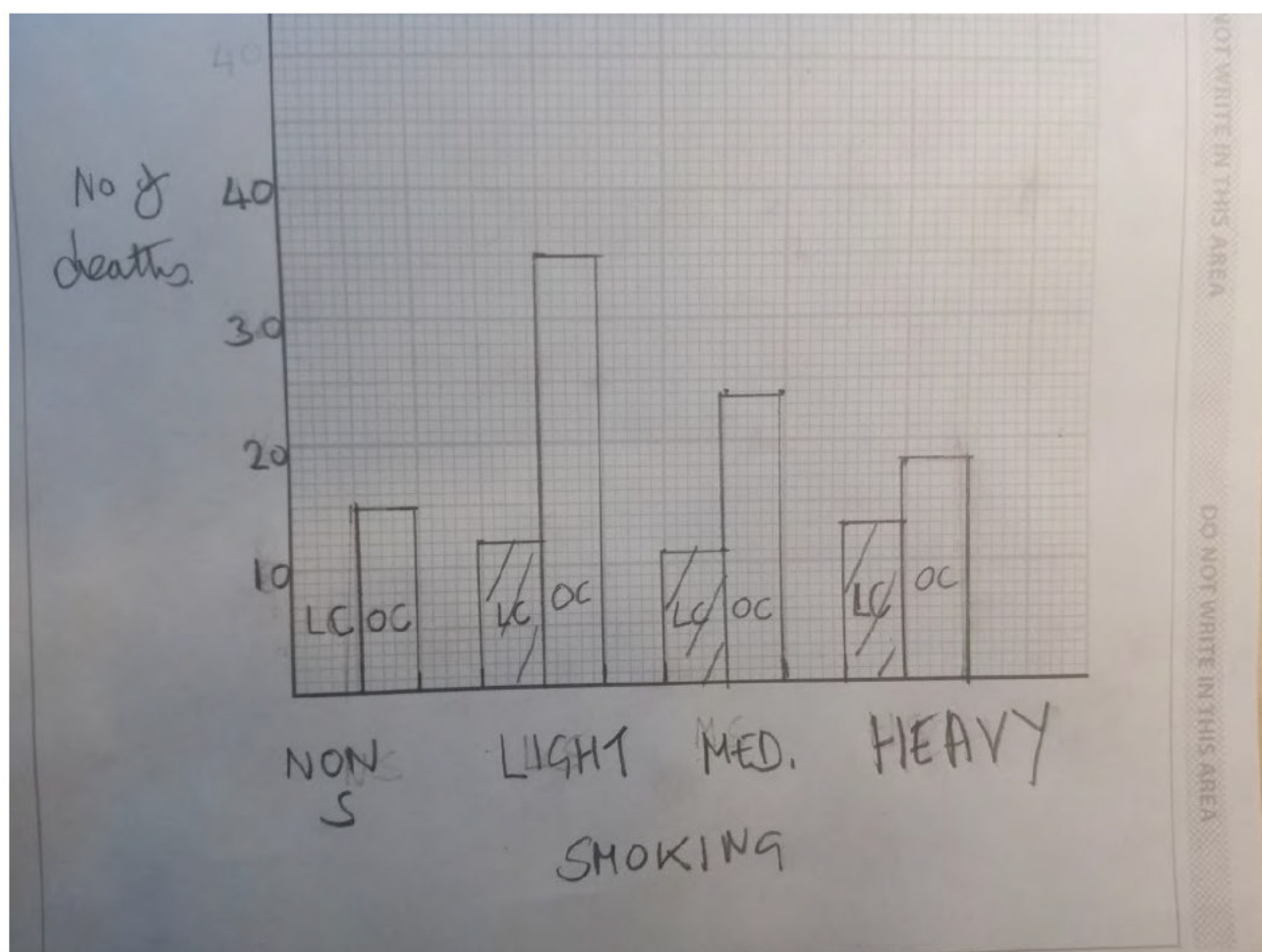
| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | additional guidance                                                                                                                                        | Mark     |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>8(a)</b>     | <ul style="list-style-type: none"> <li>• Fat more in cow's / eq (1)</li> <li>• Fat could lead to obesity / too many kJ calories / eq (1)</li> <li>• Protein more in in cow's / eq (1)</li> <li>• Minerals more in cow's / eq (1)</li> <li>• Carbohydrate less in cow's / eq (1)</li> <li>• (too little carbohydrate in cow's) so not enough (quick) energy (1)</li> <li>• Vitamins similar / same (1)</li> <li>• Water the similar / same (1)</li> <li>• Antibodies no (human antibodies ) in cow's (1)</li> <li>• Antibiotics in cow's (1)</li> </ul> | <p>allow converse for mp 1,3,4, 5, 9 and 10</p> <p>allow 'too much'</p> <p>allow 'too much'</p> <p>allow 'too much'</p> <p>allow 'too little in cows '</p> | <b>6</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                            | additional guidance                              | Mark     |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------|
| <b>8(b)</b>     | <p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> <li>• (exposure to) sun(light) (1)</li> <li>• named source of vitamin D such as cod-liver oil / oily fish – such as salmon, sardines, herring and mackerel / red meat /liver /eggs / fortified foods – such as most fat spreads and some breakfast cereals (1)</li> <li>• add drops / use supplement / eq (1)</li> </ul> | <p>give cod-liver oil (tablets) = mp 2 and 3</p> | <b>2</b> |

| Question Number | Answer                                                                                                                                                                                   | additional guidance                                                                               | Mark     |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------|
| <b>8(c)</b>     | <p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• Add biuret (1)</li> <li>• If protein present turns purple / lilac (1)</li> </ul> | <p>allow / uristix / clinistix /protein test sticks mp 1</p> <p>and stated colour change mp 2</p> | <b>2</b> |

Total = 10

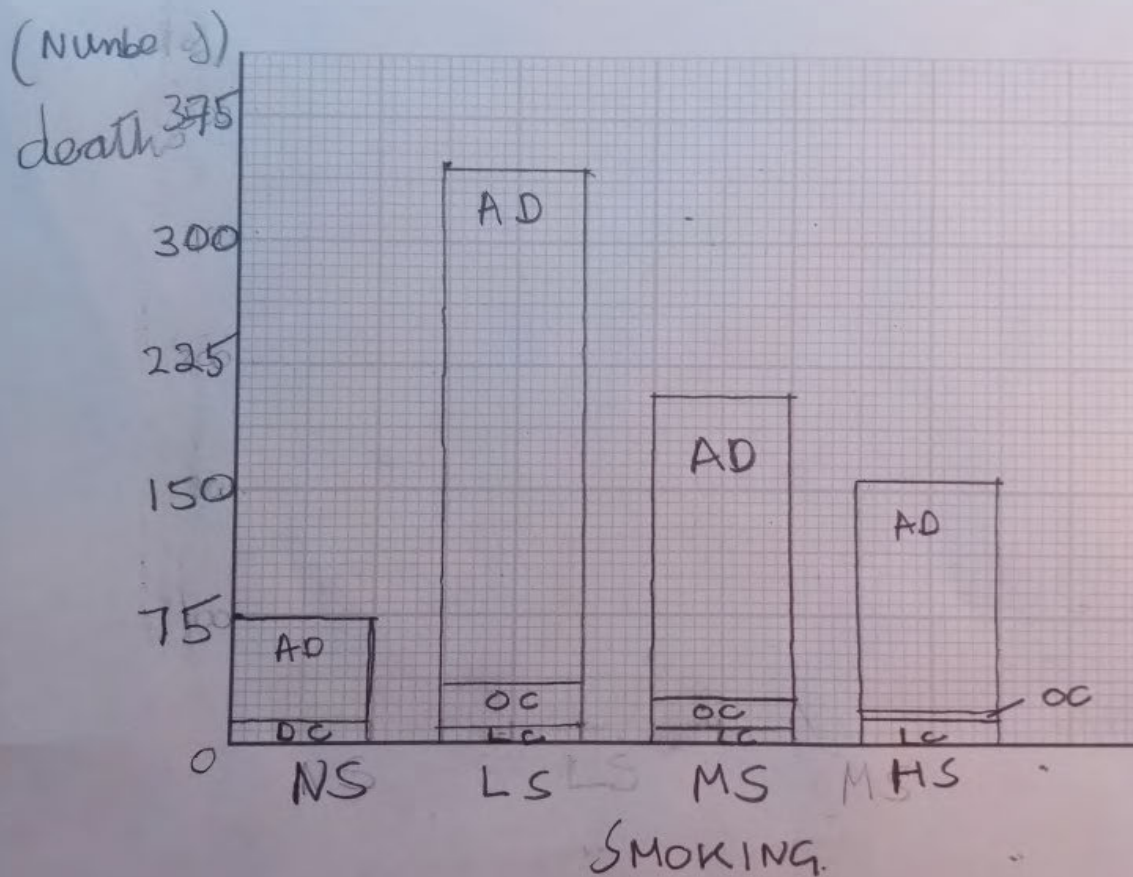
| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                               | Additional guidance                                                                          | Mark     |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|----------|
| <b>9(a)(i)</b>  | <p>An answer that makes reference to 5 of the following points:</p> <ul style="list-style-type: none"> <li>• S y axis scale linear and half the grid (1)</li> <li>• A 2 y axis labelled (number of) deaths (1)</li> <li>• P bars plotted correctly within one (1)</li> <li>• K 1 non- smoker / light/ medium /heavy labelled key shown (1)</li> <li>• K2 labelled lung / other cancer (1)</li> </ul> | <p>allow stacked bar chart for LC and OC or LC OC and All</p> <p>line graph scores 4 max</p> | <b>5</b> |



|               |    |     |     |     |     |
|---------------|----|-----|-----|-----|-----|
| lung cancer   | 0  | 12  | 11  | 13  | 36  |
| other cancers | 15 | 35  | 24  | 18  | 92  |
| all deaths    | 82 | 345 | 206 | 157 | 790 |

- (a) (i) Plot a bar chart to show the number of deaths from lung cancer and from other cancers for each of the four groups.

(5)



AD all  
 OC other C.  
 LC lung C.

| Question Number | Answer                                                                                                                                                                                                                                                                                                 | Additional guidance                                                                                                         | Mark     |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|----------|
| <b>9(a)(ii)</b> | <ul style="list-style-type: none"> <li>percentage of deaths due to lung cancer in heavy = <math>13/157 \times 100 = 8.3\%</math></li> <li>percentage of deaths caused by lung cancer in light smokers = <math>12/345 \times 100 = 3.5\%</math></li> <li>difference = <math>4.8\%</math> (3)</li> </ul> | <p>Allow 1 mark for 8.3 or 8.28/etc</p> <p>Allow 1 mark for 3.5 or 3.48/etc</p> <p>Allow full marks for 4.8%/ 4.802 etc</p> | <b>3</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                  | additional guidance             | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------|
| <b>9(b)</b>     | <p>An explanation that makes reference to two of the following</p> <ul style="list-style-type: none"> <li>as age increase higher incidence of cancers /eq (1)</li> <li>as cells more likely to mutate /eq (1)</li> <li>smoked for longer period / eq (1)</li> <li>weak immune system / eq(1)</li> </ul> | eg 'old people get more cancer' | <b>2</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | additional guidance                                                                                                                                                          | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>9(c)</b>     | <p>An explanation that makes reference to one pair of the following</p> <ul style="list-style-type: none"> <li>causing CHD / heart disease / heart attack / blood clots /eq (1)</li> <li>due to narrowing / blocking of arteries / blood vessels / damage to artery lining /blood vessels lining/ eq (1)</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>bronchitis / pneumonia/ emphysema / lung infection / shortness of breath / eq(1)</li> <li>due to damage to alveoli / reduces SA / damages cilia / build-up of mucus / prevents removal of mucus (1)</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>affects oxygen transport / shortness of breath / eq (1)</li> <li>due to carbon monoxide binding to Hb /eq (1)</li> </ul> | <p>ignore veins</p> <p>second point must match first to score 2</p> <p>ignore 'cough(ing)'</p> <p>can get second point without first eg smoking causes build-up of mucus</p> | <b>2</b> |

Total = 12 marks

| Question Number | Answer                                                            | Mark     |
|-----------------|-------------------------------------------------------------------|----------|
| <b>10(a)</b>    | <ul style="list-style-type: none"> <li>homeostasis (1)</li> </ul> | <b>1</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                               | additional guidance                                             | Mark     |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------|
| <b>10(b)</b>    | <p>An answer that makes reference to 4 of the following points.</p> <ul style="list-style-type: none"> <li>receptors in skin surface detect stimulus / are stimulated /(1)</li> <li><u>impulse</u> (1) (once)</li> <li>sensory neurone to relay neurone / CNS / eq (1)</li> <li>via diffusion of neurotransmitters / eq (1) (once)</li> <li>synapse (1) (once)</li> <li>motor neurone to muscle / effector (1)</li> <li>effector/ muscle contracts eq (1)</li> </ul> | <p>allow action potential</p> <p>ignore message / signal eq</p> | <b>4</b> |

| Question Number | Answer                                                                                                                                                                                                                     | Mark     |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>10(c)(i)</b> | <p>An explanation that makes reference to the following points.</p> <ul style="list-style-type: none"> <li>less sweat released /eq (1)</li> <li>less (sweat) evaporates / less cooling / less heat loss /eq (1)</li> </ul> | <b>2</b> |

| Question Number  | Answer                                                                                                                                                                                                                                                                                                                                                 | additional guidance                                                                                | Mark     |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|----------|
| <b>10(c)(ii)</b> | <p>An explanation that makes reference to 3 of the following points.</p> <ul style="list-style-type: none"> <li>• B / blood vessels (to surface) constrict / vasoconstriction / eq (1)</li> <li>• less blood flows (to skin surface) / eq (1)</li> <li>• less heat loss / heat conserved /eq (1)</li> <li>• less convection / radiation (1)</li> </ul> | <p>allow converse</p> <p>ignore capillaries constrict</p> <p>more blood away from surface / eq</p> | <b>3</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                    | Mark     |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>10(d)</b>    | <p>An explanation that makes reference to 4 of the following points.</p> <ul style="list-style-type: none"> <li>• variation in amount of body hair / eq (1)</li> <li>• caused by mutation (1)</li> <li>• less hair increased heat loss / can lose heat in sun / warm / hot climate / chase animals / started to wear clothes / eq (1)</li> <li>• survive and reproduce (1)</li> <li>• pass on alleles / genes to offspring (1)</li> </ul> | <b>4</b> |

Total = 14 marks

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                          | Mark     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <b>11(a)(i)</b> | <p>An explanation that makes reference to 3 of the following points.</p> <ul style="list-style-type: none"> <li>• (sulfur dioxide) released dissolves in water (vapour) (1)</li> <li>• forms sulfuric acid (1)</li> <li>• acid rain (1)</li> <li>• causes damage to plants / deforestation / eq (1)</li> <li>• breathing problems for humans / animals / eq (1)</li> <li>• death of fish /aquatic organisms / eq (1)</li> </ul> | <b>3</b> |

| Question Number  | Answer                                                                                                                                                                                      | additional guidance                                                                                           | Mark     |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|----------|
| <b>11(a)(ii)</b> | <ul style="list-style-type: none"> <li>• less burning / use of fossils fuels / named fossil fuel / low sulfur fuel / named example of alternative to using fossil fuels / eq (1)</li> </ul> | <p>allow examples</p> <p>use public transport / use wind power / cycling / electric/hybrid vehicles / etc</p> | <b>1</b> |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | additional guidance       | Mark         |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------|
| <b>11(b)</b>    | <p>An answer that makes reference to 6 of the following points.</p> <ul style="list-style-type: none"> <li>• C with and without <math>\text{HCO}_3^-</math> / changes concentrations of <math>\text{HCO}_3^-</math> (1)</li> <li>• O use same species / age / size / strain / type of seedling /eq (1)</li> <li>• R repeat (for each concentration of <math>\text{HCO}_3^-</math>) (1)</li> <li>• M1 measure / yield / height / mass / count number of leaves / number of plants that germinate / eq (1)</li> <li>• M2 after <u>stated time</u> 48 hours + (1)</li> <li>• S1 control light / <math>\text{CO}_2</math> / temperature /eq (1)</li> <li>• S2 control compost / water / humidity / moisture /minerals / fertiliser/ volume of solution / eq (1)</li> </ul> | not just same time for M2 | <b>6 Exp</b> |

Total = 10

