



# Mark Scheme (Results)

Summer 2021

Pearson Edexcel International Advanced Level  
In Biology (WBI14) Paper 01  
Energy, Environment, Microbiology and  
Immunity

| Question number | Answer  | Mark |
|-----------------|---|------|
| 1(a)(i)         | <p>The only correct answer is <b>D</b>.</p> <p><i>A is incorrect because cutting grass is biotic and competition is biotic</i><br/> <i>B is incorrect because cutting grass is a biotic factor</i><br/> <i>C is incorrect because cutting grass is biotic</i></p> | (1)  |

| Question number | Answer  | Mark |
|-----------------|---|------|
| 1(a)(ii)        | <p>The only correct answer is <b>C</b>.</p> <p><i>A is incorrect because <math>0.7 \times 100 \div 0.3 = 233.3</math></i><br/> <i>B is incorrect because <math>0.7 \times 100 \div 0.3 = 233.3</math></i><br/> <i>D is incorrect because <math>0.7 \times 100 \div 0.3 = 233.3</math></i></p> | (1)  |

| Question number | Answer   | Additional guidance  | Mark |
|-----------------|--|--|------|
| 1(a)(iii)       | <p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> <li>• in the cut field the grass is faster growing reducing the light available to other plants (1)</li> <li>• in the cut field the grass is faster growing and absorbing {water / mineral ions / named mineral ion} (1)</li> <li>• bushes are slower growing so have not got time to grow before they are cut back (1)</li> <li>• bushes damaged during the cutting process (1)</li> </ul> | <p><b>ACCEPT</b> bushes become established and shade the grass</p> <p><b>ACCEPT</b> bushes become established and take up the {mineral ions / water}</p> | (2)  |

| Question number | Answer   | Mark |
|-----------------|--|------|
| 1(b)(i)         | <p>The only correct answer is <b>D</b>.</p> <p><i>A is incorrect because P is not the middle value and this is not a bar chart</i></p> <p><i>B is incorrect because P is not the middle value</i></p> <p><i>C is incorrect because this is not a bar chart</i></p> | (1)  |

| Question number | Answer  | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 1(b)(ii)        | <ul style="list-style-type: none"> <li>• 2</li> </ul> |                     | (1)  |

| Question number | Answer    | Additional guidance  | Mark |
|-----------------|-----------|--|------|
| 1(b)(iii)       | 1 : 2.049 | <b>ACCEPT</b> 1 : 2.05 / 1 : 2 / 0.488:1 /<br>0.49:1 / 0.5:1<br><b>DO NOT ACCEPT</b> 1 : 2.1 | (1)  |

| Question number | Answer  | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 1(b)(iv)        | <ul style="list-style-type: none"> <li>• class 2 mosses have (about) twice the genome size of class 1 mosses</li> </ul> |                     | (1)  |

| Question number | Answer   | Additional guidance  | Mark              |
|-----------------|--|--|-------------------|
| 2(a)            | <p>An answer that includes three of the following points, with at least <b>one</b> similarity and <b>one</b> difference :</p> <p><b>Similarities</b></p> <ul style="list-style-type: none"> <li>• both have (circular) DNA (1)</li> <li>• both have ribosomes (1)</li> <li>• both have double membranes (1)</li> </ul> <p><b>Differences</b></p> <ul style="list-style-type: none"> <li>• chloroplasts have stroma and mitochondria have a matrix (1)</li> <li>• chloroplasts have {thylakoids / thylakoid membranes / grana / intergranal lamellae} and mitochondria have {a folded inner membrane / cristae} (1)</li> <li>• chloroplasts have starch grains and mitochondria do not (1)</li> </ul> | <p><b>DO NOT PIECE TOGETHER</b></p> <p><b>ACCEPT</b> both have an envelope</p> | <p><b>(3)</b></p> |

| Question number | Answer   | Additional guidance   | Mark       |
|-----------------|--|---|------------|
| 2(b)(i)         | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>(D) chlorophyll / light-absorbing pigments / photosystems / PSI / PSII (1)</li> <li>(E) electron carriers / electron transport proteins / cytochromes (1)</li> <li>(F) {ADP / adenosine diphosphate} and<br/>(G) {phosphate (ions) / Pi / PO<sub>4</sub><sup>2-</sup>} and<br/>(H) ATP / adenosine triphosphate (1)</li> </ul> | <p><b>ACCEPT</b> named pigments</p> <p><b>ACCEPT F &amp; G</b> the other way around</p> <p><b>DO NOT ACCEPT</b> P or incorrect formula for phosphate ions</p> | <b>(3)</b> |

| Question number | Answer   | Additional guidance   | Mark       |
|-----------------|--|---|------------|
| 2(b)(ii)        | <ul style="list-style-type: none"> <li>reduced NADP / NADPH</li> </ul> | <p><b>ACCEPT</b> {r / red} for reduced reduced NADPH</p> <p><b>DO NOT ACCEPT</b> NADP /reduced NAD/ NADH / reduced NADH</p> | <b>(1)</b> |

| Question number | Answer  | Additional guidance | Mark       |
|-----------------|---|---------------------|------------|
| 2(b)(iii)       | <p>A description that includes two of the following points:</p> <ul style="list-style-type: none"> <li>• to split water (1)</li> <li>• electrons replace those lost by {photosystems / PSI / PSII / chlorophyll} (1)</li> <li>• {hydrogen ions / H<sup>+</sup> / protons} involved in formation of NADPH (1)</li> </ul> |                     | <b>(2)</b> |

| Question number | Answer   | Additional guidance  | Mark       |
|-----------------|--|--|------------|
| 3(a)(i)         | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>• a place where organisms live (1)</li> <li>• (African) Plains is the place and the organisms are the {lions / giraffes / (acacia) trees} (1)</li> </ul> | <p><b>NB</b> the African Plains is where {lions / giraffe / (acacia) trees} live = 2 marks</p> | <b>(2)</b> |

| Question number | Answer   | Additional guidance            | Mark       |
|-----------------|--|--------------------------------|------------|
| 3(a)(ii)        | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>organisms of <b>one</b> species found in a particular area (1)</li> <li>{(one from) lions / giraffe / (acacia) trees} found on the (African) Plains (1)</li> </ul> | <b>ACCEPT</b> type for species | <b>(2)</b> |

| Question number | Answer   | Additional guidance   | Mark       |
|-----------------|--|---|------------|
| 3(a)(iii)       | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>a group of organisms of <b>different</b> species interacting in a particular area (1)</li> <li>lions, giraffes and (acacia) trees on the (African) plains (1)</li> </ul> | <p><b>ACCEPT</b> {dependent / rely} on each other for interacting</p> <p><b>ACCEPT</b> two of the named organisms</p> | <b>(2)</b> |

| Question number | Answer  | Additional guidance | Mark |
|-----------------|---|---------------------|------|
| 3(a)(iv)        | <p>An answer that includes two of the following points:</p> <ul style="list-style-type: none"> <li>the role of an organism in its habitat (1)</li> </ul> <p><b>One of the following</b></p> <ul style="list-style-type: none"> <li>(acacia) trees provide food for giraffes (1)</li> <li>(acacia) trees provide shade for the lions (1)</li> <li>giraffes provide food for lions (1)</li> <li>giraffes keeping the {size / number} of (acacia) tree under control (1)</li> <li>lions keep the number of giraffes under control (1)</li> <li>{lions / giraffes} are a source of mineral ions for the (acacia) trees (1)</li> </ul> |                     | (2)  |

| Question number | Answer             | Additional guidance | Mark |
|-----------------|--------------------|---------------------|------|
| 3(b)            | 8.42 / 8.4 / 8 (%) |                     | (1)  |

| Question number | Answer  | Additional guidance  | Mark |
|-----------------|---|--|------|
| 4(a)            | <p>An explanation that includes the following points:</p> <ul style="list-style-type: none"> <li>• allopatric speciation (1)</li> <li>• (allopatric) because lemurs have the same common ancestor isolated from those in Africa (1)</li> <li>• sympatric speciation (1)</li> <li>• (sympatric) because Sifakas and Indri live together but have a different diet (1)</li> </ul> | <p><b>ACCEPT</b> geographic speciation</p> <p><b>ACCEPT</b> description of how diet is different</p> | (4)  |

| Question number | Answer  | Additional guidance                                   | Mark |
|-----------------|---|---|------|
| 4(b)(i)         | <p>An explanation that includes two of the following points:</p> <ul style="list-style-type: none"> <li>• because only small quantities of DNA can be collected (1)</li> <li>• therefore need to {amplify / increase the number of copies of} DNA (1)</li> <li>• so that there is enough to {run on gel electrophoresis / analyse} (1)</li> </ul> | <p><b>ACCEPT</b> collecting a sample is difficult</p> | (2)  |

| Question number | Answer  | Additional guidance   | Mark |
|-----------------|---|---|------|
| 4(b)(ii)        | <p>An explanation that includes two of the following points:</p> <ul style="list-style-type: none"> <li>• gel electrophoresis run on DNA from both groups of lemurs (1)</li> <li>• pattern of bands were similar showing the lemurs were genetically similar (1)</li> <li>• base sequencing would show similar sequences (1)</li> </ul> | <p><b>ACCEPT</b> use of bioinformatics to show that the base sequences were similar</p> | (2)  |

| Question number | Answer   | Mark |
|-----------------|--|------|
| 5(a)            | <p>The only correct answer is <b>C</b>.</p> <p><i>A is incorrect because dendrochronology is dating trees using tree rings</i></p> <p><i>B is incorrect because epigenetics studies changes in gene expression</i></p> <p><i>D is incorrect because species diversity is a measure of the number of different species in an area</i></p> | (1)  |

| Question number | Answer   | Additional guidance   | Mark |
|-----------------|--|---|------|
| 5(b)(i)         | <ul style="list-style-type: none"> <li>• 0.12 (1)</li> <li>• mm hr<sup>-1</sup> (1)</li> </ul> | <p><b>NB</b> If different units have been used, award a correct numerical value<br/>e.g. 0.012 cm hr<sup>-1</sup> = 2 marks</p> | (2)  |

| Question number | Answer   | Additional guidance   | Mark |
|-----------------|--|---|------|
| 5(b)(ii)        | <p>An answer that includes three of the following points:</p> <ul style="list-style-type: none"> <li>• suitable as a mean is calculated (1)</li> <li>• but there is no indication of sample size so may not be that suitable (1)</li> <li>• data looks more suitable in the first 45 hours as the error bars are small (1)</li> <li>• may not be suitable as the incubation temperature may be different to body temperature (1)</li> <li>• will not be suitable if person died more than 120 hours ago (1)</li> </ul> | <p><b>ACCEPT</b> {reliable / accurate} as an alternative for suitable throughout</p> <p><b>ACCEPT</b> overall the error bars are (quite) small<br/><b>parts</b> of the graph where the error bars do not overlap are suitable / converse</p> <p><b>ACCEPT</b> body temperature does not remain constant</p> | (3)  |

| Question number | Answer   | Additional guidance  | Mark              |
|-----------------|--|--|-------------------|
| 5(b)(iii)       | <p>A description that includes three of the following points:</p> <ul style="list-style-type: none"> <li>• (start the investigation with) several blowfly eggs (1)</li> <li>• measure the length of larvae (at intervals) over a period of 120 hours (1)</li> <li>• credit a named control variable appropriate to this data collection (1)</li> <li>• calculate mean <b>and</b> {standard deviation / range bars / error bars} (1)</li> </ul> | <p><b>e.g.</b> same food supply, species of blowfly<br/> <b>IGNORE</b> inappropriate named control variables eg pH</p> | <p><b>(3)</b></p> |

| Question number | Answer   | Additional guidance  | Mark              |
|-----------------|--|--|-------------------|
| 5(c)            | <p>An answer that includes four of the following points:</p> <p><b>THREE FROM:</b></p> <ul style="list-style-type: none"> <li>• body temperature is readily available information (1)</li> <li>• {calibration curves / formulae} available to work backwards to estimate time of death (1)</li> <li>• but the change in body temperature is due to several factors (1)</li> <li>• credit example of one of these factors (1)</li> </ul> <p><b>AND</b></p> <ul style="list-style-type: none"> <li>• therefore of limited use unless used in conjunction with other methods (1)</li> </ul> | <p><b>ACCEPT</b> calculations can be made to estimate time of death</p> <p><b>e.g.</b> ambient temperature</p> <p><b>ACCEPT</b> on its own</p> | <p><b>(4)</b></p> |

| Question number | Answer   | Mark                          |                               |                            |  |  |                         |                               |                               |                            |         |                          |          |                          |                          |         |          |                          |                          |                          |          |                          |                          |          |                          |        |                          |          |                          |                          |     |
|-----------------|--|-------------------------------|-------------------------------|----------------------------|--|--|-------------------------|-------------------------------|-------------------------------|----------------------------|---------|--------------------------|----------|--------------------------|--------------------------|---------|----------|--------------------------|--------------------------|--------------------------|----------|--------------------------|--------------------------|----------|--------------------------|--------|--------------------------|----------|--------------------------|--------------------------|-----|
| 6(a)            | <table border="1"> <thead> <tr> <th rowspan="2">Structure</th> <th colspan="4">Carbohydrate found in</th> </tr> <tr> <th>both plants and animals</th> <th>plants but <b>not</b> animals</th> <th>animals but <b>not</b> plants</th> <th>neither plants nor animals</th> </tr> </thead> <tbody> <tr> <td>Amylose</td> <td><input type="checkbox"/></td> <td><b>X</b></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Glucose</td> <td><b>X</b></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Glycogen</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><b>X</b></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Starch</td> <td><input type="checkbox"/></td> <td><b>X</b></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table> | Structure                     | Carbohydrate found in         |                            |  |  | both plants and animals | plants but <b>not</b> animals | animals but <b>not</b> plants | neither plants nor animals | Amylose | <input type="checkbox"/> | <b>X</b> | <input type="checkbox"/> | <input type="checkbox"/> | Glucose | <b>X</b> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | Glycogen | <input type="checkbox"/> | <input type="checkbox"/> | <b>X</b> | <input type="checkbox"/> | Starch | <input type="checkbox"/> | <b>X</b> | <input type="checkbox"/> | <input type="checkbox"/> | (4) |
| Structure       | Carbohydrate found in  |                               |                               |                            |  |  |                         |                               |                               |                            |         |                          |          |                          |                          |         |          |                          |                          |                          |          |                          |                          |          |                          |        |                          |          |                          |                          |     |
|                 | both plants and animals  | plants but <b>not</b> animals | animals but <b>not</b> plants | neither plants nor animals |  |  |                         |                               |                               |                            |         |                          |          |                          |                          |         |          |                          |                          |                          |          |                          |                          |          |                          |        |                          |          |                          |                          |     |
| Amylose         | <input type="checkbox"/>   | <b>X</b>                      | <input type="checkbox"/>      | <input type="checkbox"/>   |  |  |                         |                               |                               |                            |         |                          |          |                          |                          |         |          |                          |                          |                          |          |                          |                          |          |                          |        |                          |          |                          |                          |     |
| Glucose         | <b>X</b>   | <input type="checkbox"/>      | <input type="checkbox"/>      | <input type="checkbox"/>   |  |  |                         |                               |                               |                            |         |                          |          |                          |                          |         |          |                          |                          |                          |          |                          |                          |          |                          |        |                          |          |                          |                          |     |
| Glycogen        | <input type="checkbox"/>   | <input type="checkbox"/>      | <b>X</b>                      | <input type="checkbox"/>   |  |  |                         |                               |                               |                            |         |                          |          |                          |                          |         |          |                          |                          |                          |          |                          |                          |          |                          |        |                          |          |                          |                          |     |
| Starch          | <input type="checkbox"/>   | <b>X</b>                      | <input type="checkbox"/>      | <input type="checkbox"/>   |  |  |                         |                               |                               |                            |         |                          |          |                          |                          |         |          |                          |                          |                          |          |                          |                          |          |                          |        |                          |          |                          |                          |     |

| Question number | Answer  | Additional guidance   | Mark |
|-----------------|---|---|------|
| 6(b)(i)         | <ul style="list-style-type: none"> <li>diffusion of carbon dioxide / carbon dioxide dissolving</li> </ul> | <b>ACCEPT</b> CO <sub>2</sub><br><b>DO NOT ACCEPT</b> CO / Co / C | (1)  |

| Question number | Answer  | Additional guidance                            | Mark |
|-----------------|---|--|------|
| 6(b)(ii)        | <ul style="list-style-type: none"> <li><math>6.1 \times 10^{13}</math> / 61 000 000 000 000 (kg)</li> </ul> | <b>ACCEPT</b> 61 trillion / 61 million million | (1)  |

| Question number | Answer  | Additional guidance              | Mark       |
|-----------------|---|----------------------------------|------------|
| 6(b)(iii)       | <p>A description that includes three of the following points:</p> <ul style="list-style-type: none"> <li>• as carbon dioxide from respiration (1)</li> </ul> <p><b>AND ANY TWO FROM:</b></p> <ul style="list-style-type: none"> <li>• by plants (1)</li> <li>• by microorganisms that decompose (dead) plants (1)</li> <li>• by {animals that eat the plants / herbivores} (1)</li> </ul> | <b>DO NOT ACCEPT</b> CO / Co / C | <b>(3)</b> |

| Question number | Answer   | Additional guidance  | Mark       |
|-----------------|--|--|------------|
| 6(c)(i)         | <p>An answer that includes the following points:</p> <ul style="list-style-type: none"> <li>• (anthropogenic) caused by the effect of humans (1)</li> <li>• (climate change) changes to (mean) {temperature / rainfall} (1)</li> </ul> | <p><b>IGNORE</b> named activities</p> <p><b>ACCEPT</b> long-term (mean) change in weather patterns</p> <p><b>IGNORE</b> weather unqualified / global warming / results of global warming / climate</p> | <b>(2)</b> |

| Question number | Answer   | Additional guidance   | Mark              |
|-----------------|--|---|-------------------|
| 6(c)(ii)        | <p>An explanation that includes the following points:</p> <ul style="list-style-type: none"> <li>• named example of method to reduce the burning of fossil fuels (1)</li> <li>• because this will reduce the carbon dioxide released into the atmosphere (1)</li> </ul> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>• reforestation (1)</li> <li>• because more plants will absorb more carbon dioxide for photosynthesis (1)</li> </ul> <p><b>OR</b></p> <ul style="list-style-type: none"> <li>• reduce the number of cattle being farmed (1)</li> <li>• as this will reduce the methane being released into the atmosphere (1)</li> </ul> | <p>e.g. lift sharing, public transport, use of solar power</p> <p><b>ACCEPT</b> decrease deforestation</p> <p><b>ACCEPT</b> reduce the extent of rice farming</p> | <p><b>(2)</b></p> |

| Question number | Answer   | Mark        |
|-----------------|--|-------------|
| 7(a)(i)         | <p>The only correct answer is <b>D</b>.</p> <p><i>A is incorrect because pH is a log scale so the difference of 2 is 100 fold</i><br/> <i>B is incorrect because pH is a log scale so the difference of 2 is 100 fold</i><br/> <i>C is incorrect because there are fewer hydrogen ions at pH 8.5 than pH 6.5</i></p> | (1)<br>COMP |

| Question number | Answer  | Additional guidance | Mark |
|-----------------|---------|---------------------|------|
| 7(a)(ii)        | 650 (%) |                     | (1)  |

| Question number | Answer   | Additional guidance  | Mark |
|-----------------|--|--|------|
| *7(a)(iii)      | <p>Indicative content:</p> <ul style="list-style-type: none"> <li>• soil depth increases with distance from the sea (D)</li> <li>• because these are older sand dunes (E)</li> <li>• so more time for humus to build up (E)</li> <br/> <li>• organic material increases with distance from the sea (D)</li> <li>• because these are older sand dunes</li> <li>• so more decomposition adds organic material to the sand (E)</li> <li>• due to activity of microorganisms (E)</li> <br/> <li>• pH falls with distance from the sea (D)</li> <li>• because more humus is added to the sand (E)</li> <li>• more rain (over the years) washes out minerals (E)</li> <br/> <li>• percentage of bare rock decreases with distance from sea (D)</li> <li>• because pioneer species break it down (E)</li> <li>• because as more soil is produced, it covers the bare rock (E)</li> <br/> <li>• number of different species of plant increase with distance from sea (D)</li> <li>• because the soil {is becoming more fertile / salinity is decreasing} (E)</li> <li>• organic material holds more moisture than sand alone (E)</li> <br/> <li>• types of plant change with distance from sea (D)</li> <li>• as soil becomes more favourable for more plant species (E)</li> <li>• more plants improve soil conditions further (E)</li> </ul> | <p>Level 1 :</p> <p>1 mark = 1 description of {data / succession}<br/> 2 marks = 3 descriptions {of data / succession}<br/> OR<br/> 1 description of data + an explanation</p> <p>Level 2 :</p> <p>3 marks = 2 descriptions of the data and an explanation of both<br/> 4 marks = 3 descriptions of the data and all three explained</p> <p>Level 3 :</p> <p>5 marks = 4 descriptions of the data and all 4 explained<br/> 6 marks = 5 descriptions of the data and all five explained</p> | (6)  |

| Question number | Answer  | Additional guidance | Mark       |
|-----------------|---|---------------------|------------|
| 7(b)(i)         | <p>A description that includes the following points:</p> <ul style="list-style-type: none"> <li>• NPP above ground is always greater than the NPP below the ground (1)</li> <li>• the NPP above and below the ground depends on the type of sand dune (1)</li> <li>• fixed sand dunes have the highest (total) NPP / shifting sand dunes have the lowest (total) NPP (1)</li> <li>• shifting sand dune has the largest {percentage difference / ratio} between NPP above the ground and NPP below the ground (1)</li> </ul> |                     | <b>(3)</b> |

| Question number | Answer  | Additional guidance                             | Mark              |
|-----------------|---|---|-------------------|
| 7(b)(ii)        | <p>An explanation that includes four of the following points:</p> <ul style="list-style-type: none"> <li>• because {light-independent reactions / Calvin cycle} produce {GALP / glucose / hexose} (1)</li> <li>• {GALP / glucose / hexose} used to produce sucrose (1)</li> <li>• {GALP / glucose / hexose} used to produce amino acids (1)</li> <li>• (sucrose / amino acids) transported in the phloem to the {roots / rhizomes} (1)</li> <li>• {glucose / sucrose / amino acids} used to synthesise {organic material / biomass / named organic molecule / NPP} (1)</li> </ul> | <p><b>DO NOT ACCEPT</b> glucose transported</p> | <p><b>(4)</b></p> |

| Question number | Answer   | Additional guidance                            | Mark       |
|-----------------|--|--|------------|
| 8(a)(i)         | <p>An explanation that includes the following points:</p> <ul style="list-style-type: none"> <li>• (combination of antibiotics given) because different bacteria are resistant to different antibiotics (1)</li> <li>• (given for several months) to expose bacteria to high enough doses for long enough (1)</li> </ul> | <b>ACCEPT</b> to ensure all bacteria destroyed | <b>(2)</b> |

| Question number | Answer   | Additional guidance  | Mark       |
|-----------------|--|--|------------|
| 8(a)(ii)        | <p>An answer that includes three of the following points:</p> <ul style="list-style-type: none"> <li>• because <i>Mycobacterium</i> infects the lungs (1)</li> <li>• (<i>Mycobacterium</i> infection) destroying lung tissue (1)</li> <li>• therefore reduced <u>gas exchange</u> (1)</li> <li>• so insufficient oxygen to meet (oxygen) demands of patient (1)</li> </ul> | <p><b>ACCEPT</b> a description e.g. necrosis</p> <p><b>IGNORE</b> breathing problems</p> | <b>(3)</b> |

| Question number | Answer   | Additional guidance   | Mark              |
|-----------------|--|---|-------------------|
| 8(a)(iii)       | <p>An explanation that includes four of the following points:</p> <ul style="list-style-type: none"> <li>• because if DNA synthesis cannot take place neither can <u>mitosis</u> (1)</li> <li>• and therefore clonal expansion of {T cells / B cells} cannot take place (1)</li> <li>• without T killer cells, host-infected cells cannot be destroyed (1)</li> <li>• without {B cells / plasma cells} there will be no antibody for opsonisation (of bacteria) (1)</li> <li>• therefore macrophages cannot destroy the <i>Mycobacteria</i> (1)</li> </ul> | <p><b>ACCEPT</b> {T cells / B cells} cannot divide</p> <p><b>DO NOT ACCEPT</b> B cells release antibody</p> | <p><b>(4)</b></p> |

| Question number | Answer  | Additional guidance   | Mark |
|-----------------|---|---|------|
| *8(b)           | <p><b>Indicative content:</b></p> <ul style="list-style-type: none"> <li>• number of bacteria still increasing at start of phage therapy (D)</li> <li>• because it takes time for lytic cycle (E)</li> <br/> <li>• bacteria number decrease (D)</li> <li>• because cells get destroyed when viruses burst out (E)</li> <li>• due to lytic cycle (E)</li> <br/> <li>• virus numbers increase (D)</li> <li>• because viruses replicate inside bacteria (E)</li> <li>• and burst out (E)</li> <br/> <li>• virus numbers increase after bacterial numbers increase (D)</li> <li>• because it takes time for synthesis of new components (E)</li> <br/> <li>• virus particles decrease (D)</li> <li>• because they get {engulfed / destroyed} by macrophages (E)</li> <br/> <li>• cyclical increase and decrease in the number of bacteria (D)</li> <li>• because not all bacteria get infected (E)</li> <li>• therefore surviving bacteria reproduce and increase in number (E)</li> <br/> <li>• cyclical increase and decrease in number of viruses (D)</li> <li>• because macrophages cannot destroy all viruses (E)</li> <li>• because viruses infect more bacteria (E)</li> </ul> | <p><b>Level 1 :</b></p> <p>1 mark = 1 comment made about the graph or viral infections</p> <p>2 marks = 3 comments made about {graph / viral infections}</p> <p style="text-align: center;"><b>OR</b></p> <p>1 description and a linked explanation</p> <p><b>Level 2 :</b></p> <p>3 marks = 2 descriptions and linked explanations</p> <p>4 marks = 3 descriptions and linked explanations</p> <p><b>Level 3 :</b></p> <p>5 marks = 4 descriptions and linked explanations that includes both virus and bacterial number changes</p> <p>6 marks = 5 descriptions and linked explanations that includes both virus and bacterial number changes + the cyclical nature of the data</p> |      |

|  |  |  |            |
|--|--|--|------------|
|  | <ul style="list-style-type: none"><li>• eventually no viruses or bacteria (D)</li><li>• because viruses destroy bacteria faster than they can reproduce (E)</li><li>• viruses have no more host cells / destroyed by macrophages (E)</li></ul> |  | <b>(6)</b> |
|--|--|--|------------|

Pearson Education Limited. Registered company number 872828  
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom