



Pearson  
Edexcel

# Mark Scheme (Results)

January 2019

Pearson Edexcel International GCSE

In Biology (4BI0) Paper 2B

## **Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.edexcel.com](http://www.edexcel.com) or [www.btec.co.uk](http://www.btec.co.uk). Alternatively, you can get in touch with us using the details on our contact us page at [www.edexcel.com/contactus](http://www.edexcel.com/contactus).

## **Pearson: helping people progress, everywhere**

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk)

January 2019

Publications Code 4BIO\_2B\_1901\_MS

All the material in this publication is copyright

© Pearson Education Ltd 2019

## General Marking Guidance

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

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                         | Notes                                                                                                                                             | Marks |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1 (a)           | 1. smaller;<br>2. has protein coat / capsid / envelope;<br>3. no cell wall / no ribosomes / no flagellum / no plasmids / no circular chromosome / no nucleoid / no cell membrane / no capsule / no pili / non-cellular / no vacuole / no cytoplasm / no organelles / eq;<br>4. virus contains DNA <u>or</u> RNA / bacteria DNA <u>and</u> RNA / virus contains DNA <u>only</u> virus contains RNA <u>only</u> / only one kind of nucleic acid; | 1. Allow converse<br>1. Ignore shape<br>3. Allow converse<br>3. Ignore no tail / no mitochondria / no nucleus<br>4. Ignore virus contains DNA/RNA | 3 max |
| (b)             | increased / high(er) / rising temperature / increased / high(er) / rising humidity / increased / high(er) / rising rainfall / global warming / eq;                                                                                                                                                                                                                                                                                             | Ignore mosquitoes reach biting age sooner / virus multiplies more / climate change / greenhouse effect / greenhouse gases                         | 1     |
| (c)             | $(43 \div 1300 \times 100 =) 3.3 / 3.31 / 3.308 / 3.3077 / 3.30769 / 3.307692 / 3.3076923 / 3.30769231$                                                                                                                                                                                                                                                                                                                                        | Correct answer gains full marks<br>Allow one mark for $43 \div 1300 / 3 / 3.3$ recurring / 3.30                                                   | 2     |

|     |                                                                                                                                                                                                     |                                                                                                                  |       |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|-------|
| (d) | <p>1. temperature / heat / warmth / warmer climate;</p> <p>2. humidity;</p> <p>3. rainfall / rain / drought;</p>                                                                                    | <p>2. Ignore moisture / water / standing water / pools of water / swimming pool</p> <p>3. Ignore storm alone</p> | 2 max |
| (e) | <p>1. birds contain virus / birds carry virus / birds have disease / birds are infected (with virus) / eq;</p> <p>2. mosquitoes feed on birds / mosquitoes bite birds (and transfer to humans);</p> |                                                                                                                  | 2     |
| (f) | <p>1. place for mosquito to reproduce / lay eggs / breed / hatch eggs / eq;</p> <p>2. standing water / not drained / not cleaned / stagnant / not disturbed / untreated / eq;</p>                   | <p>2. Ignore abandoned / not monitored</p>                                                                       | 2     |

|     |                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                              |       |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (g) | <p>1. modified / weakened / attenuated / non-harmful<br/><u>virus</u> /<br/>dead / modified / weakened / attenuated / non-harmful /<br/><u>pathogen</u> / eq;</p> <p>2. <u>memory</u> cells / lymphocytes / white blood cells;</p> <p>3. antigen;</p> <p>4. antibodies produced quicker / sooner / more / eq;</p> <p>5. <u>secondary immune response</u>;</p> | <p>1. Ignore cells /<br/>small amount of virus /</p> <p>1. Ignore dead virus<br/>eg. weak or dead form of<br/>the virus = 1</p> <p>4. Ignore faster response /<br/>faster immune system /<br/>antitoxins</p> | 3 max |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|

**Total 15 marks**

| Question number | Answer                                                                                                                                                                                                                           | Notes                                                                                                 | Marks |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------|
| 2 (a)(i)        | <p>A <u>fetus</u> / <u>embryo</u>;</p> <p>B uterus / uterine lining / uterus wall / womb / placenta / eq;</p> <p>C amniotic fluid / amniotic sac;</p>                                                                            | <p>C Allow amniotic liquid</p>                                                                        | 3     |
| (ii)            | <p>1. oxygen / glucose / amino acids / mineral ions / vitamins / water to (fetus / baby / embryo) / eq;</p> <p>2. <u>carbon dioxide</u> / <u>urea</u> from (fetus / baby / embryo) / eq;</p> <p>3. blood from / to placenta;</p> | <p>1. Ignore food / nutrients</p> <p>2. Ignore waste</p> <p>3. Reject blood from / to mother</p>      | 1     |
| (b)             | <p>(16.6 - 2.0 = 14.6<br/>14.6 × 60 × 24 =)<br/><br/>21 024 / 21 000;;</p>                                                                                                                                                       | <p>Correct answer gains full marks</p> <p>Allow one mark for<br/>23 904 / 2 880 / 14.6 in working</p> | 2     |

|     |                                                                                                                                                                                                                   |                                                                             |   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|---|
| (c) | 1. (more) oxygen / glucose;<br>2. respiration / energy / ATP;<br>3. amino acids;<br>4. growth;<br>5. named mineral + function;<br>6. named vitamin + function;<br>7. remove <u>carbon dioxide</u> / <u>urea</u> ; | Ignore food / nutrients<br><br>Ignore exchange of oxygen and carbon dioxide | 4 |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|---|

**Total 10 marks**



| Question number   | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Notes                                                                                                                                                                                                                                                                                                         | Marks  |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------|-----|---------------|----|-----------------|----|-----------|----|---------------|--------|-------------------|--------|--|---|
| 3 (a)             | <table border="1"> <thead> <tr> <th>Process</th> <th>Letter</th> </tr> </thead> <tbody> <tr> <td>assimilation</td> <td>(G)</td> </tr> <tr> <td>decomposition</td> <td>E;</td> </tr> <tr> <td>denitrification</td> <td>I;</td> </tr> <tr> <td>excretion</td> <td>D;</td> </tr> <tr> <td>nitrification</td> <td>F / H;</td> </tr> <tr> <td>nitrogen fixation</td> <td>A / B;</td> </tr> </tbody> </table> | Process                                                                                                                                                                                                                                                                                                       | Letter | assimilation | (G) | decomposition | E; | denitrification | I; | excretion | D; | nitrification | F / H; | nitrogen fixation | A / B; |  | 5 |
| Process           | Letter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                               |        |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |
| assimilation      | (G)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                               |        |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |
| decomposition     | E;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                               |        |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |
| denitrification   | I;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                               |        |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |
| excretion         | D;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                               |        |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |
| nitrification     | F / H;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                               |        |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |
| nitrogen fixation | A / B;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                               |        |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |
| (b)               | <p>1. low to high concentration / against concentration gradient;</p> <p>2. energy / ATP;</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>low concentration gradient to high concentration gradient = 0</p> <p>diffusion of molecules from low to high concentration / diffusion against a concentration gradient / diffusion against a gradient / against a diffusion gradient = 0</p> | 2      |              |     |               |    |                 |    |           |    |               |        |                   |        |  |   |

|     |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                               |       |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| (c) | <p>1. (increase) <u>growth</u> / <u>yield</u> of plants / crops;</p> <p>2. fertiliser contains ammonium / nitrates;</p> <p>3. amino acids / protein / DNA;</p> <p>4. magnesium for chlorophyll / chloroplasts;</p> <p>5. crops deplete soil minerals / ions / salts / soil lacks minerals / ions / salts / named mineral / minerals need to be replaced / eq;</p> <p>6. organic fertiliser / manure retains water:</p> | <p>2. Ignore nitrogen</p> <p>4. Allow other named mineral and function eg phosphates for ATP / DNA / calcium for cell walls / sulphates for protein / eq;</p> | max 5 |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|

**Total 12 marks**

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                       | Notes                                                                                                                                                                                     | Marks                      |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| 4               | <p>(a)(i) energy (content) / temperature (rise);</p> <p>(ii) 1. repeating / calculate mean / calculate average / increase sample size / eq;<br/>2. identify anomalies;</p> <p>(iii) 1. heat / energy transferred to air / surroundings / heat / energy not transferred to water / beaker / eq;<br/>2. less accurate / energy values are lower / smaller / less energy in popcorn / temperature change lower / less / eq;</p> | <p>Allow energy transfer<br/>Ignore heat</p> <p>Ignore references to time taken to transfer</p> <p>quicker transfer means more energy = 0</p> <p>heat/energy lost during transfer = 0</p> | <p>1</p> <p>2</p> <p>2</p> |

|      |                                                                                                                                                                                                                                                                                                                                |                                          |       |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------|
| (iv) | <ol style="list-style-type: none"> <li>1. larger volume of water / use more water;</li> <li>2. insulate beaker / eq;</li> <li>3. provide oxygen;</li> <li>4. cover (top of beaker) with lid / foil;</li> <li>5. clamp food at same distance;</li> <li>6. calorimeter / shield flame / ignite with electricity / eq;</li> </ol> |                                          | max 2 |
| (b)  | $\frac{\text{mass of water; in g} \times \text{temperature; rise in } ^\circ\text{C} \times 4.2}{\text{mass of popcorn / food; in g}}$                                                                                                                                                                                         | Ignore mass of substance / burnt popcorn | 3     |

**Total 10 marks**



| Question number             | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Notes                                                                                            | Marks              |                    |            |         |                  |                         |     |                             |        |                 |     |        |                   |          |                    |  |   |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|--------------------|--------------------|------------|---------|------------------|-------------------------|-----|-----------------------------|--------|-----------------|-----|--------|-------------------|----------|--------------------|--|---|
| 6 (a)                       | <table border="1"> <thead> <tr> <th>Type of enzyme</th> <th>Example</th> <th>Site of production</th> <th>Optimum pH</th> </tr> </thead> <tbody> <tr> <td>amylase</td> <td>salivary amylase</td> <td><u>salivary glands;</u></td> <td>7.0</td> </tr> <tr> <td><b>protease / peptidase</b></td> <td>pepsin</td> <td><b>stomach;</b></td> <td>1.5</td> </tr> <tr> <td>lipase</td> <td>pancreatic lipase</td> <td>pancreas</td> <td><b>7.0 to 9.0;</b></td> </tr> </tbody> </table> | Type of enzyme                                                                                   | Example            | Site of production | Optimum pH | amylase | salivary amylase | <u>salivary glands;</u> | 7.0 | <b>protease / peptidase</b> | pepsin | <b>stomach;</b> | 1.5 | lipase | pancreatic lipase | pancreas | <b>7.0 to 9.0;</b> |  | 4 |
| Type of enzyme              | Example                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Site of production                                                                               | Optimum pH         |                    |            |         |                  |                         |     |                             |        |                 |     |        |                   |          |                    |  |   |
| amylase                     | salivary amylase                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <u>salivary glands;</u>                                                                          | 7.0                |                    |            |         |                  |                         |     |                             |        |                 |     |        |                   |          |                    |  |   |
| <b>protease / peptidase</b> | pepsin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>stomach;</b>                                                                                  | 1.5                |                    |            |         |                  |                         |     |                             |        |                 |     |        |                   |          |                    |  |   |
| lipase                      | pancreatic lipase                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | pancreas                                                                                         | <b>7.0 to 9.0;</b> |                    |            |         |                  |                         |     |                             |        |                 |     |        |                   |          |                    |  |   |
| (b)                         | <p>1. pH of mouth is neutral / 7.0 or<br/>pH of stomach is acidic / 1.5 / contains HCl;</p> <p>2. enzymes <u>denature</u> (at different pH);</p> <p>3. affects digestion / breakdown (of food);</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p>1. Allow mouth not acidic or alkaline<br/>1. pH mouth neutral and pH stomach alkaline = 0</p> | 3 max              |                    |            |         |                  |                         |     |                             |        |                 |     |        |                   |          |                    |  |   |

**Total 7 marks**

