



# Mark Scheme (Results)

Summer 2015

Pearson Edexcel International GCSE  
in Human Biology (4HB0) Paper 02

## **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)

Summer 2015

Publications Code UG041851

All the material in this publication is copyright

© Pearson Education Ltd 2015

## 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)(i)         | <ul style="list-style-type: none"> <li>Arrows towards the heart on vessels A and D;</li> <li>Arrows away from the heart on vessel B and C;</li> </ul> | Two arrows correct = 1 mark | (2)   |

| Question Number | Answer                                                                         | Notes                            | Marks |
|-----------------|--------------------------------------------------------------------------------|----------------------------------|-------|
| 1(a)(ii)        | A - vena cava;<br>B - aorta ;<br>C - pulmonary artery ;<br>D - pulmonary vein; | Ignore references to aortic arch | (4)   |

| Question Number | Answer                                                                                                                                                                                                                         | Notes                   | Marks |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|-------|
| 1(a)(iii)       | (blood vessel C) <ul style="list-style-type: none"> <li>artery;</li> <li>no valves;</li> <li>thick wall;</li> <li>(containing) more muscle / elastic tissue;</li> <li>smaller/narrower lumen;</li> </ul> (than blood vessel D) | Accept reverse argument | (2)   |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                              | Notes | Marks |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|
| 1(b)            | A description including four from: <ul style="list-style-type: none"> <li>(fat/cholesterol) blocks/builds up in <u>arteries</u> / coronary artery;</li> <li>forms plaque/atheroma;</li> <li>high blood pressure/angina;</li> <li>reduced blood flow to heart muscle;</li> <li>less oxygen to the heart <u>muscle</u>;</li> <li>(leading to) heart disease/attack/stroke;</li> </ul> |       | (2)   |

| Question Number | Answer                                                                                                | Notes | Marks |
|-----------------|-------------------------------------------------------------------------------------------------------|-------|-------|
| 1(c)(i)         | <ul style="list-style-type: none"> <li>increases (arterial) blood pressure and heart rate;</li> </ul> |       | (1)   |

| Question Number | Answer  | Notes | Marks |
|-----------------|---------|-------|-------|
| 1(c)(ii)        | plasma; |       | (1)   |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                          | Notes                            | Marks |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------|
| 1(c) (iii)      | <p>A explanation including three from:</p> <ul style="list-style-type: none"> <li>• increased heart rate/blood pressure/ blood flow;</li> <li>• more oxygen/glucose (transported);</li> <li>• to muscles;</li> <li>• for <u>aerobic</u> respiration;</li> <li>• more energy released;</li> <li>• promotes conversion of glycogen to glucose;</li> <li>• limits lactic acid build up;</li> </ul> | Do not allow produce/make energy | (3)   |

**Total for Question 1 = 15 marks**

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                               | Notes                                                                                   | Marks |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|-------|
| 2(a)(i)         | <p>An explanation including two from:</p> <ul style="list-style-type: none"> <li>• lipase/enzyme breaks down fat;</li> <li>• produces fatty acids;</li> <li>• pH (of solution) decreases/changes from alkali to acid;</li> <li>• 40°C optimum temperature/fastest rate of reaction at 40°C;</li> <li>• All fat broken down by 10 minutes;</li> </ul> | <p>Accept enzyme works best at 40°C<br/>Ignore references to body temperature/37 °C</p> | (2)   |

| Question Number | Answer                                                                                                                                                                                                                                                          | Notes                                  | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------|
| 2(a)(ii)        | <p>An explanation including two from:</p> <ul style="list-style-type: none"> <li>• less (kinetic) energy at 30°C;</li> <li>• less chance of enzyme and substrate colliding;</li> <li>• slower rate of reaction / enzyme works more slowly (at 30°C);</li> </ul> | <p>Allow reverse argument for 40°C</p> | (2)  |

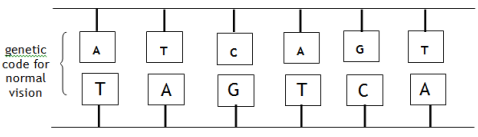
| Question Number | Answer                                                                                                                                                                                                                                                                                                                 | Notes | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| 2(a)(iii)       | <p>An explanation including two from:</p> <ul style="list-style-type: none"> <li>• enzyme denatured/inactive;</li> <li>• active site changed shape;</li> <li>• shape no longer complementary to substrate;</li> <li>• no enzyme:substrate complexes formed;</li> <li>• no fatty acids produced to lower pH;</li> </ul> |       | (2)  |

| Question Number | Answer                                                  | Notes                                                          | Mark |
|-----------------|---------------------------------------------------------|----------------------------------------------------------------|------|
| <b>2(a)(iv)</b> | using a pH probe/pH meter/<br>indicator paper/solution; | Do not allow litmus paper /<br>phenolphthalein / methyl orange | (1)  |

| Question Number | Answer                                                                                                                                                                                                                                                                        | Notes                                       | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|------|
| <b>2(a)(v)</b>  | An explanation including three from: <ul style="list-style-type: none"> <li>• bile emulsifies fats/breaks down large droplets to smaller droplets;</li> <li>• increases surface area;</li> <li>• faster reaction/breakdown of fats;</li> <li>• pH drop more rapid;</li> </ul> | Ignore bile breaks down fat /<br>molecule X | (3)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                        | Notes           | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------|
| <b>2(b)</b>     | An explanation including three from: <ul style="list-style-type: none"> <li>• villi/microvilli/long length;</li> <li>• increase surface area (of small intestine);</li> <li>• wall one cell thick;</li> <li>• faster absorption / diffusion/shorter diffusion distance;</li> <li>• into lacteal;</li> <li>• into lymphatic system;</li> </ul> | Allow thin wall | (3)  |

**Total for Question 2 = 13 marks**

| Question Number | Answer                                                                                               | Notes                                 | Mark |
|-----------------|------------------------------------------------------------------------------------------------------|---------------------------------------|------|
| 3(a) (i)        | <p>T A G T C A</p>  | Deduct 1 mark for each incorrect base | (2)  |

| Question Number | Answer                                                                                                | Notes               | Mark |
|-----------------|-------------------------------------------------------------------------------------------------------|---------------------|------|
| 3(a) (ii)       | change in a base/base sequence / nucleotide / named mutation e.g. substitution / example of mutation; | Ignore genetic code | (1)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                     | Notes | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| 3(b)            | <p>An explanation including three from:</p> <ul style="list-style-type: none"> <li>• mother/female is a carrier;</li> <li>• (faulty allele) carried on X chromosome/sex-linked;</li> <li>• males inherit one faulty allele (from mother);</li> <li>• males do not have 'normal' X chromosome to override effects;</li> <li>• females have two X chromosomes;</li> <li>• so only males affected;</li> </ul> |       | (3)  |

**Total for Question 3 = 6 marks**

| Question Number | Answer                                                                                                                                                                                                                                                       | Notes                           | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|------|
| 4(a)(i)         | <p>41 000 x 0.50 x 365;<br/>7 500 000 (7 482 500) (dm<sup>3</sup>);</p> <p><b>OR</b></p> <p>41 000 x 0.50 x 366;<br/>7 500 000 (7 503 000) (dm<sup>3</sup>);</p> <p><b>OR</b></p> <p>41 000 x 0.50 x 365.25;<br/>7 500 000 (7 487 625) (dm<sup>3</sup>);</p> | Final correct value for 2 marks | (2)  |

| Question Number | Answer                                                                                                                                                                                                                                        | Notes                            | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|------|
| 4(a)(ii)        | <p>A suggestion including two from:</p> <ul style="list-style-type: none"> <li>not enough platelets/low platelet level;</li> <li>due to cancer/trauma / excessive bleeding/ illness/during surgery/ owtte;</li> <li>to clot blood;</li> </ul> | Ignore references to haemophilia | (2)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Notes | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| 4(b)            | <p>An explanation including two from:</p> <p>(Group O as donor) -</p> <ul style="list-style-type: none"> <li>Group O contain no (A/B) antigens;</li> <li>anti-A/anti-B antibodies from blood groups A/B/AB cause no agglutination/clumping;</li> </ul> <p>(Group O as recipient) -</p> <ul style="list-style-type: none"> <li>Group O contains anti A/anti B antibodies;</li> <li>that cause agglutination / clumping (of red cells) with A/B/AB antigens</li> </ul> |       | (3)  |

**Total for Question 4 = 7 marks**

| Question Number | Answer                | Notes | Mark |
|-----------------|-----------------------|-------|------|
| 5(a)(i)         | phagocyte/macrophage; |       | (1)  |

| Question Number | Answer                                                                                                                                        | Notes                 | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|
| 5(a) (ii)       | <ul style="list-style-type: none"> <li>phagocytosis/engulfs/ingests/digests pathogens/microbes/bacteria/viruses/foreign particles;</li> </ul> | Ignore kills/destroys | (1)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                   | Notes                                                 | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------|
| 5(a)(iii)       | <p>An explanation including three from:</p> <ul style="list-style-type: none"> <li>binds to surface of a cell;</li> <li>injects genetic material/RNA;</li> <li>RNA incorporated into DNA of cell;</li> <li>viral RNA/genetic material replicated inside host cell;</li> <li>new viral proteins/viruses made;</li> <li>cell lysis/cell bursts;</li> </ul> | <p>Ignore DNA throughout</p> <p>Ignore kills cell</p> | (3)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                           | Notes                        | Mark |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------|
| 5(a)(iv)        | <p>An explanation including two from:</p> <ul style="list-style-type: none"> <li>less T-helper cells/T-helper cells destroyed;</li> <li>phagocytes / white blood cell X/ B-cells/lymphocytes not stimulated;</li> <li>no phagocytosis/no antibodies made;</li> <li>unable to destroy other pathogens;</li> </ul> | Allow immune system weakened | (2)  |

| Question Number | Answer  | Notes | Mark |
|-----------------|---------|-------|------|
| 5(a)(v)         | nucleus |       | (1)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                           | Notes | Mark |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| <b>5(a)(vi)</b> | <p>A suggestion including two from:</p> <ul style="list-style-type: none"> <li>• shape of CD4/protein changed;</li> <li>• HIV can no longer recognise CD4/ protein</li> <li>• can no longer bind to (T-helper cell/host) cell / shapes no longer complementary;</li> <li>• virus cannot replicate/reproduce/multiply;</li> </ul> |       | (2)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                           | Notes | Mark |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------|
| <b>5(b)</b>     | <p>An explanation including three from:</p> <p>EITHER</p> <ul style="list-style-type: none"> <li>• attenuated/weakened virus/pathogen/antigen injected;</li> <li>• lymphocytes produce antibodies;</li> <li>• clump/destroy virus/pathogen;</li> <li>• memory cells/memory lymphocytes produced;</li> <li>• faster secondary response/immune response more rapid on second infection;</li> </ul> |       | (3)  |

**Total for Question 5 = 13 marks**

| Question Number | Answer         | Notes | Mark |
|-----------------|----------------|-------|------|
| 6(a)            | B          ADH |       | (1)  |

| Question Number | Answer             | Notes | Mark |
|-----------------|--------------------|-------|------|
| 6(b)            | pituitary (gland); |       | (1)  |

| Question Number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Notes                    | Mark |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|
| 6(c)            | <p>A description including four from:</p> <p>(Blood too concentrated)</p> <ul style="list-style-type: none"> <li>• ADH/hormone X released from <u>pituitary</u> gland;</li> <li>• kidney tubules more permeable to water;</li> <li>• more water reabsorbed/ less water lost as urine;</li> <li>• (volume of blood increases/blood more dilute) detected by hypothalamus / osmoregulatory centre;</li> <li>• ADH/hormone X inhibited/less ADH/hormone X released;</li> </ul> | ORA for blood too dilute | (4)  |

**Total for question 6 = 6 marks**



