Pearson Edexcel

# Mark Scheme (Results)

## January 2020

Pearson Edexcel International GCSE in Biology (4BI1)
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 or 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.

**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

January 2020
Publications Code 4BI1_2B_msc_20200305

**General Marking Guidance**

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

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(a)** | An explanation that makes reference to two of the following points:<br>• (damage to) alveoli (1)<br>• reduces / less / small surface area (1)<br>• (less) diffusion / (less) oxygen in / (less) carbon dioxide out (1) | Less surface area of alveoli = two marks | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(b)** | An explanation that makes reference to the following points:<br>• bacteria / microorganisms / pathogens are killed / destroyed / removed / eq (1)<br>• no / less chance of infection (with TB) / disease / catching *Mycobacterium* / *Mycobacterium bovis* / catching TB / eq (1) | **Allow** converse<br>**Ignore** get sick / ill | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(c)** | An answer that makes reference to two of the following points:<br>• fewer cattle (to be infected) (1)<br>• fewer people in Europe (than in rest of world) (1)<br>• cattle are screened / if infected are killed (1)<br>• cattle are given antibiotics (1)<br>• vaccination (of cattle / people / badgers in Europe) (1)<br>• more pasteurised milk drunk / milk pasteurised (1)<br>• fewer badgers (in Europe to transmit TB) / fewer other animals (in Europe to transmit TB) / badgers culled (in Europe) (1) | **Allow** converse | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(d)** | • 149 000 – 1290 = 147 710<br>and 13 400 – 103 = 13 297 (1)<br>• 147 710 ÷ 13 297<br>= 11.1 : 1 (2) | award full marks for correct numerical answer without working<br>**Allow** 11.11, 11.108 etc<br>**Allow** full marks for 11.1 to 1<br>one mark for 13297 **and** 147710<br>or<br>one mark for 1:11.1<br>or<br>one mark for 11.1 alone | **2** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(e)** | An answer that makes reference to two of the following points:<br>• (find / protect / less competition for) mates / females (1)<br>• (protect) food / less competition for food / resources / obtain more food (1)<br>• protect young (1) | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **1(f)** | An explanation that makes reference to three of the following points:<br>• use attenuated / dead / weak / inactive pathogen / bacterium / eq (1)<br>• antigens (1)<br>• memory cells (1)<br>• secondary immune (response) (1)<br>• antibody production fast(er) / soon(er) / more / large amounts (1) | **Ignore** disease / virus<br>no credit for antibody production alone | **3** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(g)** | An answer that makes reference to three of the following points:<br>• vaccinate badgers in one area and not in another / eq (1)<br>• (count) number of cattle with TB / see if there are fewer / more cases of TB (1)<br>• same number / control number of badgers in each area (1)<br>• same field size / area (1)<br>• same number of cattle (1) | **3** |

Total = 16 marks

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(a)** | An explanation that makes reference to the following points:<br>• draws water up (to leaves) / enables water to be taken up (by roots) (1)<br>• cooling (1)<br>• (transport) minerals / named mineral (1)<br>• prevent wilting / eq (1)<br>• (water for) photosynthesis (1) | **Allow** maintain turgidity | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(b)(i)** | • reading from graph multiplied = 21. 5 x $10^{-4}$ = 0.00215<br>• multiply by 250<br>Answer: 0.5375 or 0.538 or 0.537 or 0.54 scores two (2) | award full marks for correct numerical answer without working<br>one mark for x 250<br>one mark for 0.00215<br>one mark for 5400 or 5375 or 5380 or 5370 | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(b)(ii)** | An explanation that makes reference to the following points:<br>• wind moves water (away from plant surface) / blows water away (1)<br>• creates / maintains / increases (concentration) gradient (1)<br>• (more) (water moves out of plant by) diffusion / evaporation (1) | **Allow** converse for still air for all marking points<br><br>Maintains diffusion gradient = two marks | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **2(c)** | An answer that makes reference to the following points:<br>• (same) light (intensity) (1)<br>• as it affects stomata opening / eq (1)<br>OR<br>• (same) temperature (1)<br>• as it affects diffusion / speed of molecules / (kinetic) energy / evaporation (1)<br>OR<br>• humidity (1)<br>• reduces / affects concentration / diffusion gradient (1)<br>OR<br>• (same) species / age / size / mass / leaf area of plant (1)<br>• as this affects number of stomata / thickness of leaves / eq (1)<br>OR<br>• same $CO_2$ concentration (1)<br>• as it affects stomata opening (1) | Mark in pairs<br><br>**Ignore** transpiration | **4** |

Total = 11 mark

| Question Number | Answer | Mark |
|---|---|---|
| **3(a)** | A the left ventricle is thick to pump blood to the body<br><br>*B is not correct because the left ventricle wall is not thin*<br><br>*C is not correct because the right ventricle pumps to the lungs*<br><br>*D is not correct because the right ventricle wall is not thick* | **1** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3(b)** | An explanation that makes reference to three of the following points:<br><br>• ventricle (wall) is thinner / ventricle (wall) has less muscle (1)<br><br>• <u>coronary artery</u> is blocked / coronary artery has less blood passing through / eq (1)<br><br>• less oxygen / glucose (1)<br><br>• less (aerobic) respiration / anaerobic respiration occurs / not enough energy / less ATP (1)<br><br>• cell / muscle / tissue death (1) | **Ignore** heart dies | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3(c)(i)** | An explanation that makes reference to three of the following points:<br><br>• (stem cells can) differentiate / can become muscle cells / can make any cell types / stem cells are undifferentiated / unspecialised cells / eq (1)<br><br>• stem cells divide / (carry out) mitosis / cell division (1) | **Allow** stems cells are pluripotent / totipotent / multipotent | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3(c)(ii)** | An explanation that makes reference to two of the following points:<br>• cells have same DNA / genes / alleles / eq (1)<br>• same antigens / tissue type / blood group (1)<br>• less risk of rejection / not rejected (1)<br>• no immune response / by immune system / no need to take immunosuppressants (1)<br>• no risk of infection / disease spread (1) | No immune rejection = two marks | **2** |

Total = 8 marks

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4 (a)** | An answer that makes reference to three of the following points:<br>• (DNA is) double stranded / helix (1)<br>• (DNA has) thymine / T / does not have uracil / U (1)<br>• (DNA has) deoxyribose (1)<br>• (DNA is) long(er) / large(r) | **Allow** converse<br>(RNA) is single stranded<br>(RNA) has uracil / U / does not have thymine / T<br>(RNA) has ribose<br>(RNA is) shorter | **3** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4 (b)** | A description that makes reference to five the following points:<br>• transcription occurs in the nucleus (1)<br>• transcription uses <u>DNA</u> to make <u>RNA</u> / eq (1)<br>• DNA unzips / one strand is copied / eq (1)<br>• transcription makes / produces <u>messenger</u> RNA / <u>m</u>RNA (1)<br>• translation takes place at the ribosomes / in cytoplasm (1)<br>• translation involves <u>messenger</u> RNA / <u>m</u>RNA **and** <u>transfer RNA</u> / <u>t</u>RNA (1)<br>• anticodons bind to codons / eq (1)<br>• translation produces amino acid chain / protein / polypeptide / eq (1) | Transcription uses DNA to make messenger RNA = two marks<br>Anticodons on tRNA bind to codons on mRNA = two marks | **5** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4 (c)** | An answer that makes reference to the following points:<br>• (if read in threes) = $4^3$ **or** 4 x 4 x 4 (1)<br>• = 64 (1)<br>• (64 is) greater / more than 20 (combinations) required / needed / eq (1)<br>• (if read in twos) = $4^2$ **or** 4 x 4 = 16 (1) | 64 is greater than 20 is two marks | **3** |

Total = 11 marks

| Question Number | Answer | Mark |
|---|---|---|
| **5(a)(i)** | A collecting duct<br><br>*B is not correct because it is not the collecting duct*<br><br>*C is not correct because it is not the collecting duct*<br><br>*D is not correct because it is not the collecting duct* | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(a)(ii)** | D T<br><br>*A is not correct because ultrafiltration does not occur here*<br><br>*B is not correct because ultrafiltration does not occur here*<br><br>*C is not correct because ultrafiltration does not occur here* | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(a)(iii)** | A P<br><br>*B is not correct because not affected by ADH*<br><br>*C is not correct because not affected by ADH*<br><br>*D is not correct because not affected by ADH* | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(a)(iv)** | B R<br><br>*A is not correct because glucose not absorbed*<br><br>*C is not correct because glucose not absorbed*<br><br>*D is not correct because glucose not absorbed* | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **5 (b)(i)** | An answer that makes reference to the following points:<br>• increasing birth mass associated with more nephrons / eq (1)<br>• a positive correlation / linear / straight line / (directly) proportional (1) | **2** |

| Question Number | Answer | Mark |
|---|---|---|
| **5 (b)(ii)** | An explanation that makes reference to four of the following points:<br>• proteins are big / large / only small molecules (1)<br>• normally will not pass out of glomerulus / through basement membrane / into Bowman's capsule / not present in glomerular filtrate (1)<br>• (high blood pressure) forces / squeezes / pushes protein molecules out (1)<br>• damage to glomerulus / Bowman's capsule / basement membrane / nephron (1) | **4** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **5 (b)(iii)** | An answer that makes reference to the following points:<br>• add Biuret (1)<br>• (changes to) purple/ lilac / mauve (1) | **Allow** NaOH and $CuSO_4$ / use urine testing strips e.g uristix / eq<br>**Allow** green colour for urine testing strip | **2** |

Total = 12 marks

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6 (a)** | An explanation that makes reference to two of the following points:<br>• to mix microorganisms / bacteria / fungi with the food substrates / prevent microorganisms / food settling / eq (1)<br>• to mix / distribute / eq oxygen (1)<br>• to keep temperature uniform / distribute heat (1) | **Allow** named nutrients e.g. glucose / amino acids | **2** |

| Question Number | Answer | Mark |
|---|---|---|
| **6 (b)** | An explanation that makes reference to the following points:<br>• oxygen for <u>respiration</u> / for <u>aerobic respiration</u> (1)<br>• (filter) remove bacteria / fungi / microorganisms / prevent competition / contamination (1) | **2** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6 (c)** | An explanation that makes reference to two of the following points:<br>• monitor temperature (in fermenter) / control / maintain temperature / detect changes in temperature / keep temperature same (1)<br>• turn on water supply to cooling jacket if temperature increases / turn off water supply to cooling jacket if temperature drops / release water if too hot / release water to cool down / adjust water supply depending on temperature (1)<br>• prevent <u>enzymes</u> being denatured / maintains optimal temperature for <u>enzymes</u> (1) | **Grad**<br>**Ignore** record and read temperature<br>**Ignore** release hot water if too cold<br>maintain optimal temperature for <u>enzymes</u> = two marks | **2** |

Total = 6 marks

| Question Number | Answer | Mark |
|---|---|---|
| **7 (a)** | • Hh / Hh and Hh / hH / hH and hH / hH and Hh / Hh and hH | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **7 (b)** | • 2.1 : 1 Allow 21 : 10, 2 : 1 | **1** |

| Question Number | Answer | Mark |
|---|---|---|
| **7 (c)** | An answer that makes reference to two of the following points:<br>• small sample size / too few crosses / eq (1)<br>• random / chance (of fertilisation) (1)<br>• of fertilisation / fusion of gametes / eq (1)<br>• fewer yellow (than predicted) / more brown (than predicted) (1)<br>• no HH offspring survive / ratio is 2 Hh : yellow to 1 hh brown / yellow mice more likely die / brown mice less likely to die (1)<br>• mutations (may have occurred) (1) | **4** |

Total 6 marks