

# Mark Scheme (Results)

## Summer 2024

Pearson Edexcel Advanced Subsidiary

In Biology B (8BI0)

Paper 02: Core Physiology and Ecology

**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

Summer 2024
Question Paper Log Number P74475A
Publications Code 8BI0_02_2406_MS
All the material in this publication is copyright
© Pearson Education Ltd 2024

**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.

**Using the Mark Scheme**

Examiners should look for qualities to reward rather than faults to penalise. This does NOT mean giving credit for incorrect or inadequate answers, but it does mean allowing candidates to be rewarded for answers showing correct application of principles and knowledge. Examiners should therefore read carefully and consider every response: even if it is not what is expected it may be worthy of credit.

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

**Quality of Written Communication**

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

| Question Number | Answer | Mark |
|---|---|---|
| **1(a)(i)** | **The only correct answer is B doctors only prescribing antibiotics that are effective against the pathogen**<br><br>***A*** *is not correct because antibiotics being given to farm animals to prevent disease would increase numbers of resistant bacteria*<br><br>***C*** *is not correct because doctors only prescribing antibiotics for viral infections may increase numbers of resistant bacteria*<br><br>***D*** *is not correct because patients stopping taking the antibiotics when they feel better would increase numbers of resistant bacteria* | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(a)(ii)** | **The only correct answer is D the resistant bacteria surviving the antibiotic**<br><br>**A** *is not correct because competition between bacteria is reduced*<br><br>**B** *is not correct because the antibiotic does not reduce the frequency of mutation in the bacteria*<br><br>**C** *is not correct because the resistant bacteria is not killed by the antibiotic* | **(1)** |

| Question Number | Answer | additional guidance | Mark |
|---|---|---|---|
| **1(b)(i)** | An explanation that includes two of the following points:<br>• more sterile precautions / example of in hospital / screen patients before admission (1)<br>• so less disease transmitted / spread (1)<br>• infection can be identified / spotted by medical staff / patient isolated (1) | **Accept** converse for community | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(b)(ii)** | An explanation that includes two of the following points:<br>• community cases fall more / continue to fall and hospital cases level off(1)<br>• because most precautions in hospital already taken / staff aware of precautions (1)<br>• because in community more precautions are now being taken (1) | **(2)** |

| Question Number | Answer | additional guidance | Mark |
|---|---|---|---|
| **1(c)** | An explanation that includes the following points:<br><br>• because DNA mapping of bacteria can identify resistance / genes that confer resistance (1)<br><br>• so (only) targeted / effective / specific antibiotic for that bacterium are prescribed (1) | DNA mapping of bacteria can elucidate genes that show membrane / binding sites for antibiotics.<br><br>Allow converse for use non-specific antibiotic | **(2)** |

**(Total for Question 1 = 8 marks)**

| Question Number | Answer | Mark |
|---|---|---|
| **2(a)(i)** | **The only correct answer is C T**<br><br>**A** *is not correct because R is the epidermis*<br><br>**B** *is not correct because S is the cambium*<br><br>**D** *is not correct because U is the parenchyma* | **(1)** |

| Question Number | Answer | | Mark |
|---|---|---|---|
| **2(a)(ii)** | • measurement in mm allow 57-59<br><br>• and division by 12<br><br>= 4.7 – 4.9 (2) | Example of calculation<br><br>58mm ÷ 12<br><br>=4.7 – 4.9 (2)<br><br>Correct answer with no working gains full marks<br>allow 1 mark correct measurement **or** dividing by 12 | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **2(b)(i)** | **The only correct answer is**<br><br>**B transport mineral ions from roots to growing regions**<br><br>**A** *is not correct the xylem does not transport amino acids to growing regions*<br><br>**C** *is not correct because xylem does not transport sucrose from leaves to growing regions*<br><br>**D** *is not correct because xylem does not transport water from leaves to stem* | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **2(b)(ii)** | **The only correct answer is**<br><br>**D the movement of substances is upwards and downwards**<br><br>**A** *is not correct the movement of substances is not downwards only*<br><br>**B** *is not correct the movement of substances is not a passive process*<br><br>**C** *is not correct the movement of substances is not upwards only* | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(c)** | An answer that makes reference to **four** of the following<br><br>Similarities<br><br>• vertical arrangement of cells / contain fibres / vascular tissue (1)<br><br>• contain cellulose cell walls (1)<br><br>• contain parenchyma cells (1)<br><br>Differences<br><br>• Xylem mainly made up of lignified / cell walls contain lignin / secondary thickening / xylem has pits (1)<br><br>• xylem cell walls break down / no <u>end</u> walls in xylem / xylem continuous tube (1)<br><br>• phloem contains sieve tubes / sieve plates / companion cells (1) | At least one similarity and one difference<br><br>**Accept** converse for phloem<br><br>Not 'no cell walls' | **(4)** |

**(Total for Question 2 = 9 marks)**

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3(a)(i)** | • (removing) roots affects water loss (1) | **Accept** null hypothesis or question | **(1)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **3(a)(ii)** | An explanation that refers to two of the following<br>• same <u>species</u> / same <u>surface area</u> of leaves / size of leaves (1)<br>• so same density / number of stomata (1)<br>• therefore same rate of transpiration / water loss (1) | Not type of plant / size of plant / number of leaves | **(2)** |

| Question Number | Answer | Mark |
|---|---|---|
| **3(a) (iii)** | • prevent <u>evaporation</u> / water loss from surface of water / surface of beaker | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(b)** | An explanation that makes reference to two of the following:<br>• water loss is less than water uptake / water uptake is greater than water loss (1)<br>• because some water used in photosynthesis (1)<br>• to maintain turgor (1) | not all water taken up is evaporated | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(c)** | A description that includes to the following<br>• use seedlings all with roots / all seedlings without roots (1)<br>• method of changing humidity (1)<br>• control named abiotic variable (1)<br>• repeat to calculate mean (1)<br>• for <u>stated</u> time / change in mass per unit time (1) | E.g. using plastic bag/ moist air spray/ in greenhouse<br>E.g. temperature / light / wind | **(4)**<br>**ACCEPT** other methods |

**(Total for Question 3 = 10 marks)**

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(a)** | An answer that includes<br><br>• calculation of numerator<br><br>• calculation of denominator<br><br>• correct calculation of D<br><br>D = 4.4 (3) | Example of calculation<br><br>20 x 19 = 380<br><br>(12 +56+0+6+12) = 86<br><br>380 ÷ 86<br><br>D = 4.42 or 4.4186<br><br>Correct answer with no working gains full marks<br><br>allow 1 mark for 380<br>allow 1 mark for 86 | **(3)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(b)** | An answer that makes reference to three of the following points:<br>• more (different) species in woodland A / higher species richness in A / no Woodrush and no Sedge in B (1)<br>• more species evenness / similar relative species abundance in woodland A (1)<br>• as numbers of each species more similar in woodland A (1)<br>• no measure of diversity within a species (1) | **Accept** converse for woodland B<br><br>B dominated by Holly<br><br>genetic diversity | **(3)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **4(c)** | An description that includes two of the following points:<br>• use coordinates / random samples (1)<br>• more samples / more quadrats / repeat sampling / larger area (1)<br>• measure / count at same time of year / season (1)<br>• sample more species (1) | not time of day<br><br>sample more species | **(2)** |

**(Total for Question 4 = 8 marks)**

| Question Number | Answer | Mark |
|---|---|---|
| **5(a)(i)** | **The only correct answer is D T**<br><br>***A*** *is not correct because Q is not involved in clotting*<br><br>***B*** *is not correct because R is not involved in clotting*<br><br>***C*** *is not correct because S is not involved in clotting* | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(a) (ii)** | **The only correct answer is D U and V**<br><br>***A*** *is not correct because P and Q are not both involved in the immune response*<br><br>***B*** *is not correct because S and T are not both involved in the immune response*<br><br>***C*** *is not correct because T and U are not both involved in the immune response* | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(a) (iii)** | **The only correct answer is D U**<br><br>***A*** *is not correct because P is not a* lymphocyte<br><br>***B*** *is not correct because R is not a* lymphocyte<br><br>***C*** *is not correct because T is not a* lymphocyte | **(1)** |

| Question Number | Indicative content |
|---|---|
| **5(b)** | Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.<br><br>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.<br><br>**Reference to changes in number of blood cells**<br><br>• Condition A too few<br><br>• Condition B too many<br><br>• Condition C too few<br><br>• Condition D too many<br><br>• notes that normal range is very wide<br><br>• small change can lead to condition being diagnosed<br><br>**Reference to symptoms**<br><br>• Condition A cannot prevent /defend against infection as too few antibodies produced<br><br>• Condition B causing swelling as overproduction of lymphocytes and antibodies<br><br>• Condition C unable to produce (nonspecific) immune response so less phagocytosis /bacteria in gut body mouth not destroyed engulfed<br><br>• Condition D too many phagocytes produced in response to infection |

| | |
|---|---|
| | **Advice**<br>• Condition A avoid infection as few antibodies produced / have vaccinations to boost antibody production<br>• Condition B check overproduction not due to blood cancer / leukemia<br>• Condition C avoid infections lack of cells may be due to chemotherapy killing fast growing cells<br>• Condition D too many normally not an issue but check overproduction not due to blood cancer / leukemia<br>• Advice depends upon age as cell numbers change with age |

**(Total for Question 5 = 9 marks)**

| Level | Mark | Descriptor |
|---|---|---|
| | 0 | No awardable content |
| 1 | 1-2 | The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.<br><br>***Makes one or two reference to number of white cells =1***<br><br>***Makes reference to at least one change in number of cells and refers to symptoms or advice = 2*** |
| 2 | 3-4 | An explanation will be given with occasional evidence of analysis, interpretation and/or evaluation of the scientific information.<br><br>The explanation shows some linkages and lines of scientific reasoning with some structure.<br><br>***Makes reference to change in number of cells and a link to symptom / advice =3***<br><br>***Makes reference to increase and decrease in number of cells and links each to symptoms or advice =4*** |
| 3 | 5-6 | An explanation is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information.<br><br>The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured.<br><br>***Makes reference to increase and decrease in number of cells and links each to symptoms and medical advice =5***<br><br>***Makes reference to increase and decrease in number of cells and links each to symptoms and explains medical advice =6*** |

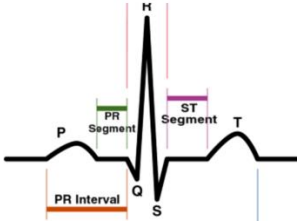
| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(a)** | An explanation that includes three of the following:<br>• because it does not allow for species with sexual dimorphism (1)<br>• does not consider organisms in living different areas that cannot attempt to interbreed (1)<br>• some species can produce hybrid offspring / plant species which can be fertile (1)<br>• some species reproduce asexually (1) | allow examples | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(b)** | **The only correct answer is D smaller fragments travel further**<br>***A*** *is not correct because all fragments do not travel the same distance*<br>***B*** *is not correct because larger fragments do not travel faster*<br>***C*** *is not correct because larger fragments do not travel further* | **(1)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **6(c)(i)** | An answer that includes four of the following points:<br>• unknown species has 5 bands of DNA none of other species has 5 bands / has bands that don't match (1)<br>• so is new species (1)<br>• 4 / most bands are in same position as species C (so most closely related to species C) (1)<br>• 3 bands in common with D (so next most related) / 2 bands in common with A (1)<br>• least bands (only 1 band / no bands) in common with B (so least related) (1) | must indicate so is closely / less closely /less related once | **(4)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(c)(ii)** | A description that includes two of the following points:<br>• examine protein biochemistry / proteomics/ (as similar species will have similar proteins coded for by similar DNA / genes) (1)<br>• bioinformatics / DNA barcodes / CBOL (Consortium for the Barcode of Life) (1)<br>• DNA sequencing / DNA profiling / molecular phylogeny (1)<br>• examine ecology niche (to see if similar) (1)<br>• look at morphology / anatomy / histology / structures (1)<br>• examine shared evolutionary relationships (to see if evolved from common ancestor) (1) | **(2)** |

**(Total for Question 6 = 10 marks)**

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7 (a)(i)** | An answer that includes<br>• correctly shaped ECG wave and labelled (1)<br>• aligned correct position with cardiac cycle (1) |  | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7 (a)(ii)** | rate = 60 ÷ 0.8<br>= 75 cycles per minute allow | allow 75-78 | **(1)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7 (b)** | An explanation that makes reference to the following points:<br><br>• A atrioventricular valve closes because pressure in ventricle becomes higher than pressure in atrium (1)<br><br>• B semilunar valve / aortic valve opens because pressure in ventricle becomes higher than pressure in aorta (1)<br><br>• C semilunar valve closes because pressure in aorta exceeds pressure in ventricle (1)<br><br>• D atrioventricular valve opens because ventricular pressure falls below pressure in atrium (1) | **Accept** converse<br><br>Must have valve change and pressure change | **(4)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **7 (c)** | A description that makes reference to **four** of the following:<br>• SAN acts as pacemaker (1)<br>• impulse travels through heart (muscle / fibres) cause atrial contraction (1)<br>• AVN delays transmission of impulse so contraction of ventricle after atria (1)<br>• impulse spreads through Purkinje / Purkyne fibres via bundle of His (1)<br>• impulse travels from apex of the ventricles (1) | **Accept** initiates depolarisation / depolarisation starts at SAN | **(4)** |

**(Total for Question 7 = 11 marks)**

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **8(a)** | A description that makes reference to the following:<br>• diffusion - the movement of molecules / ions / particles down a concentration gradient (1)<br>• facilitated diffusion - the movement of molecules / ions / particles down a concentration gradient via specific transmembrane integral proteins / channels / carrier molecules (1)<br>• osmosis - the movement of water down a water potential gradient (through a partially permeable membrane) (1) | allow high to low water conc. | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **8 (b)(i)** | An answer that makes reference to:<br>• to remove excess pigment (on surface of discs) (1) | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **8(b)(ii)** | An explanation that makes reference to two of the following:<br>• maintain the discs at the same constant temperature / control temperature / stop temperature affecting permeability (1)<br>• temperature may cause {changes in membrane structure / denature proteins in membrane / lipid bilayer} causing pigment to leak out (1) | **(2)** |

| Question Number | Answer | Additional guidance | Mark |
|---|---|---|---|
| **8(b)(iii)** | $\Sigma (x - x)^2$ (1)<br><br>substitution and division<br><br>square root to obtain SD<br><br>= 0.09 (3) | Example of calculation<br><br>0.0388<br><br>÷ 5 = 0.00776<br><br>√0.00776 = 0.09<br><br>**Allow** 1 mark for 0.0388 or 0.00776<br><br>**Allow** 1 mark for dividing by 5<br><br>**Allow** 2 marks for 0.088 etc | **(3)** |

| Question Number | Answer | Acceptable answers | Mark |
|---|---|---|---|
| **8 (b)(iv)** | • 0 % | **0 / zero / distilled water** | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8b(v)** | An explanation that makes reference to the following:<br>• because standard deviation uses all of the values /data (1)<br>• not biased by outlier / less effected by one extreme / anomaly (1) | **Accept** converse for range | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(b)(vi)** | An explanation that makes reference to **three** of the following:<br>• ethanol can pass through cell membrane (1)<br>• increasing ethanol {increases fluidity of / dissolves} lipid bilayer (1)<br>• (so) membrane becomes more permeable (1)<br>• allows pigment to diffuse out of cell / allows pigment to leak out (1) | | **(3)** |

**(Total for Question 8 = 15 marks)**

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