

Combined Science  
PAPER 4  
Foundation Tier

|             |
|-------------|
| Total Marks |
|-------------|

Friday 9 June 2023 – Afternoon

Time: 1 hour 10 minutes

In the boxes below, write your name, centre number and candidate number.

|                  |  |  |  |  |  |
|------------------|--|--|--|--|--|
| Surname          |  |  |  |  |  |
| Other names      |  |  |  |  |  |
| Centre Number    |  |  |  |  |  |
| Candidate Number |  |  |  |  |  |

**YOU MUST HAVE**

**Ruler, calculator**

**YOU WILL BE GIVEN**

**Diagram Booklet**

**INSTRUCTIONS**

**Answer all questions.**

**Answer the questions in the spaces provided in this Question Paper or in the separate Diagram Booklet – there may be more space than you need.**

**INFORMATION**

**The total mark for this paper is 60.**

**The marks for each question are shown in brackets – use this as a guide as to how much time to spend on each question.**

**(continued on the next page)**

**Turn over**

**INFORMATION continued.**

**In questions marked with an *ASTERISK* (\*), marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.**

**There may be spare copies of some diagrams.**

**ADVICE**

**Read each question carefully before you start to answer it.**

**Try to answer every question.**

**Check your answers if you have time at the end.**

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**Answer ALL questions. Write your answers in the spaces provided.**

**Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.**

**1 Look at FIGURE 1 for Question 1 in the Diagram Booklet. It shows a bird called an egret on the back of a buffalo.**

**(a) (i) The egret eats parasites that live on the skin of the buffalo.**

**Which term describes this relationship, where the buffalo and the egret both benefit?  
(1 mark)**

☐ **A eutrophication**

☐ **B mutualism**

☐ **C indigenous**

☐ **D biodiverse**

**(continued on the next page)**

**1(a) continued.**

**(ii) The buffalo is part of the carbon cycle.**

**Use words from the list to complete the sentences on the next page.  
(2 marks)**

**clean**

**decompose**

**energy**

**fertilise**

**glucose**

**water**

**(continued on the next page)**

**1(a)(ii) continued.**

**The buffalo gains carbon from the  
\_\_\_\_\_ in the plants  
that it eats.**

**Bacteria will \_\_\_\_\_  
the waste from the buffalo.**

**(continued on the next page)**

**1(a) continued.**

**(iii) Look at FIGURE 2 for Question 1(a)(iii) in the Diagram Booklet. It shows part of the carbon cycle.**

**Draw and label an arrow on Figure 2 to show the process plants use to make glucose from carbon dioxide.**

**(2 marks)**

**(b) Enzymes are used to digest proteins.**

**Look at FIGURE 3 for Question 1(b) in the Diagram Booklet. It shows an enzyme and a protein.**

**Explain how boiling the enzyme stops the protein being digested.**

**(2 marks)**

**Answer space continues on the next page.**

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**Turn over**



**1(b) continued.**

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**(Total for Question 1 = 7 marks)**

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**2 Look at FIGURE 4 for Question 2(a) in the Diagram Booklet. It shows a diagram of the human blood system.**

**(a) (i) Name blood vessel X.  
(1 mark)**

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**(ii) Which row of the table shows the width of the wall and blood pressure in blood vessel X?  
(1 mark)**

|                                   | <b>width of wall</b> | <b>blood pressure</b> |
|-----------------------------------|----------------------|-----------------------|
| <input type="checkbox"/> <b>A</b> | <b>thick</b>         | <b>high</b>           |
| <input type="checkbox"/> <b>B</b> | <b>thick</b>         | <b>low</b>            |
| <input type="checkbox"/> <b>C</b> | <b>thin</b>          | <b>high</b>           |
| <input type="checkbox"/> <b>D</b> | <b>thin</b>          | <b>low</b>            |

**(continued on the next page)**

**Turn over**

**2 continued.**

**(b) Look at FIGURE 5 for Question 2(b) in the Diagram Booklet. It shows the pressure of blood flowing through the arteries, capillaries and veins of a person.**

**Calculate the difference in blood pressure from the maximum in the arteries to the minimum in the veins.  
(2 marks)**

**\_\_\_\_\_ kPa**

**(continued on the next page)**

**Turn over**

**2 continued.**

**(c) Look at FIGURE 6 for Question 2(c) in the Diagram Booklet. It shows a diagram of a vein with blood cells.**

**(i) Identify structure Q.  
(1 mark)**

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**(ii) State the function of structure Q.  
(1 mark)**

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**(continued on the next page)**

**Turn over**

**2 continued.**

- (d) Describe how the heart causes blood to move to the lungs.  
(3 marks)**

**Answer space continues on the next page.**

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**Turn over**

**2(d) continued.**

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

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**3 Hormones are chemicals produced in endocrine glands.**

**(a) Look at the diagram for Question 3(a) in the Diagram Booklet. Draw ONE straight line from each hormone to the endocrine gland that produces it. (2 marks)**

**(b) Look at FIGURE 7 for Question 3(b) in the Diagram Booklet. It shows some of the changes that occur during the menstrual cycle.**

**(i) The level of oestrogen peaks on day 13.**

**State the effect on the follicle caused by the peak in oestrogen. (1 mark)**

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**(continued on the next page)**

**Turn over**

**3(b) continued.**

**(ii) Describe the effect of  
progesterone on the uterus lining  
from day 13 to day 21.  
(2 marks)**

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**(continued on the next page)**



**3 continued.**

**(c) The condom is an example of a barrier contraceptive.**

**State ONE advantage and ONE disadvantage of using this barrier method of contraception.  
(2 marks)**

**Advantage**

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**Disadvantage**

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**(continued on the next page)**

**Turn over**

**3 continued.**

**(d) The contraceptive pill is an example of a hormonal method of contraception.**

**Explain ONE way that the contraceptive pill stops a woman from becoming pregnant.  
(2 marks)**

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**(Total for Question 3 = 9 marks)**

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**Turn over**

**4 In 2000, a council planted indigenous trees as part of a reforestation programme.**

**(a) Why were indigenous trees used instead of non-indigenous trees?  
(1 mark)**

- ☐ **A indigenous trees will bring in more pests**
- ☐ **B indigenous trees are less likely to survive**
- ☐ **C indigenous trees will support more native wildlife**
- ☐ **D indigenous trees will cause more damage to the soil**

**(continued on the next page)**

**4 continued.**

**(b) The animal biodiversity in this reforested area was measured from 2004 to 2017.**

**Biodiversity is measured on a scale from 0 to 1.**

**0 = low biodiversity**

**1 = maximum biodiversity**

**Look at the FIGURE 8 for Question 4(b) in the Diagram Booklet. It shows the results.**

**(i) Draw a straight line of best fit on Figure 8 to show the main trend in this data.  
(1 mark)**

**(continued on the next page)**

**4(b) continued.**

- (ii) Estimate the animal biodiversity of the reforested area in 2022.  
(1 mark)**
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- (c) (i) The data to calculate animal biodiversity was collected using the following method.**
- a 100 m<sup>2</sup> area was chosen
  - three 1 m<sup>2</sup> quadrats were placed randomly on the ground
  - animals inside the quadrat were counted
  - the number of each species of animal was recorded

**(continued on the next page)**

**4(c)(i) continued.**

**State TWO ways that the quality of the results from this method could be improved.  
(2 marks)**

**1** \_\_\_\_\_

**2** \_\_\_\_\_

**(ii) State why point A on Figure 8 was ignored when considering the trend in animal biodiversity.  
(1 mark)**

**(continued on the next page)**

**Turn over**

**4(c) continued.**

**(iii) The data shown in Figure 8 was collected during the summer.**

**Explain why animal biodiversity would be different if the data had been collected in the winter.  
(2 marks)**

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**(continued on the next page)**

**4 continued.**

**(d) A scientist observes that trees at the edge of a forest shade part of a field.**

**Describe how a belt transect could be used to see how light intensity affects the biodiversity of plants growing in the field.**

**(3 marks)**

**Answer space continues on the next page.**

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**Turn over**



**4(d) continued.**

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**(Total for Question 4 = 11 marks)**

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- 5 People with diabetes cannot always control the concentration of glucose in their blood.**

**(a) Two people eat identical meals.**

**One person has diabetes, the other person does not have diabetes.**

**Look at FIGURE 9 for Question 5(a) in the Diagram Booklet. It shows the concentration of glucose in the blood of these two people after eating the meals.**

**(continued on the next page)**

**5(a) continued.**

- (i) Describe TWO differences in the concentration of glucose in the blood of the two people shown in Figure 9.  
(2 marks)**

**1** \_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

**(continued on the next page)**

**5(a) continued.**

- (ii) Calculate the maximum increase in the concentration of glucose in the blood of the person with diabetes.  
(1 mark)**

\_\_\_\_\_ mmol per dm<sup>3</sup>

**(continued on the next page)**

**5(a) continued.**

**(iii) Water moved out of the red blood cells of the person with diabetes when the concentration of glucose in the blood was above  $15 \text{ mmol per dm}^3$ .**

**Explain why water moved out of the red blood cells of the person with diabetes.  
(2 marks)**

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**(continued on the next page)**

**Turn over**

**5 continued.**

**(b) The pancreas produces a hormone that causes the concentration of glucose in the blood to decrease.**

**(i) Name this hormone.  
(1 mark)**

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**(ii) State how this hormone is transported from the pancreas to its target organs.  
(1 mark)**

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**(continued on the next page)**

**5(b) continued.**

**(iii) Which is the target organ for the hormone that controls the concentration of glucose in the blood?  
(1 mark)**

- ☐ **A kidney**
- ☐ **B pancreas**
- ☐ **C liver**
- ☐ **D lung**

**(continued on the next page)**

**5 continued.**

**(c) Explain how type 2 diabetes can be controlled.  
(3 marks)**

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**(Total for Question 5 = 11 marks)**

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**Turn over**



**6 Respiration occurs in cells.**

**(a) Why do cells respire?  
(1 mark)**

☐ **A to produce nitrogen**

☐ **B to release oxygen**

☐ **C to produce glucose**

☐ **D to release energy**

**(continued on the next page)**

**6 continued.**

**(b) An athlete runs every day as part of their training.**

**(i) Explain why the breathing rate of the athlete increases when running.  
(2 marks)**

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**(continued on the next page)**

**Turn over**

**6(b) continued.**

- (ii) When the athlete is running, their muscle cells use both aerobic respiration and anaerobic respiration.**

**State TWO differences between aerobic respiration and anaerobic respiration.  
(2 marks)**

**Answer space continues on the next page.**

**1** \_\_\_\_\_

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\_\_\_\_\_

**Turn over**

**6(b)(ii) continued.**

**2** \_\_\_\_\_

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**(continued on the next page)**

**6 continued.**

**(c) Bromothymol blue (BTB) solution is an indicator of pH.**

**Look at FIGURE 10 for Question 6(c) in the Diagram Booklet. It shows the colour of BTB at different pH levels.**

**When air is passed through green BTB, for one minute, the solution stays green.**

**When a person breathes out through a straw into BTB for one minute the solution turns yellow.**

**(i) Explain why the air breathed out turns the BTB solution yellow.  
(2 marks)**

**Answer space continues on the next page.**

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**Turn over**

**6(c)(i) continued.**

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**(continued on the next page)**

**6(c) continued.**

- \*(ii) Devise a plan, using green BTB solution, to investigate the amount of carbon dioxide in the air athletes breathe out after they have been running at different speeds.**

**Include:**

- how you would use green BTB solution.**
  - how you would control at least two variables.**
- (6 marks)**

**Answer space continues on the next 3 pages.**

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**Turn over**

**6(c)(ii) continued.**

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**Turn over**



**6(c)(ii) continued.**

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**Turn over**

**6(c)(ii) continued.**

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**(Total for Question 6 = 13 marks)**

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**TOTAL FOR PAPER = 60 MARKS**  
**END OF PAPER**