

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.

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.

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.

(2 marks)

clean

decompose

energy

fertilise

glucose

water

The buffalo gains carbon from the

in the plants that it eats.

Bacteria will

the waste from the buffalo.

(continued on the next page)

Turn over

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.

1(b) continued.

(Total for Question 1 = 7 marks)

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)**

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

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

(continued on the next page)

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)

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)**

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

(continued on the next page)

2 continued.

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

(Total for Question 2 = 9 marks)

Turn over

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)

(continued on the next page)

3(b) continued.

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

(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

Disadvantage

(continued on the next page)

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)

(Total for Question 3 = 9 marks)

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**

(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.

(continued on the next page)

Turn over

4(b) continued.

- (i) Draw a straight line of best fit on Figure 8 to show the main trend in this data.
(1 mark)**
 - (ii) Estimate the animal biodiversity of the reforested area in 2022.
(1 mark)**
-
-

- (c) (i) The data to calculate animal biodiversity was collected using the following method.**
- a 100 m² area was chosen**
 - three 1 m² 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 _____

(continued on the next page)

4(c) continued.

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

- (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)**

Answer space continues on the next page.

4(c)(iii) 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.

4(d) continued.

(Total for Question 4 = 11 marks)

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.

**(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)

Turn over

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 dm³

- (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 mmol per dm³.**

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

Answer space continues on the next page.

5(a)(iii) continued.

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

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

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

(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**

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

Answer space continues on the next page.

Turn over

5(c) continued.

(Total for Question 5 = 11 marks)

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**

(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)**

Answer space continues on the next page.

6(b)(i) 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

6(b)(ii) continued.

2 _____

(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.

(continued on the next page)

6(c) continued.

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

(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 lines continue on the next 2 pages.

6(c)(ii) continued.

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Turn over

6(c)(ii) continued.

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS
END OF PAPER