

Combined Science

Paper 4

Foundation Tier

Total Marks

Monday 1 June 2020 – Afternoon

Time: 1 hour 10 minutes plus your additional time allowance

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

Surname					
Other names					
Centre Number					
Candidate Number					

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet

INSTRUCTIONS

Answer ALL questions.

Answer the questions in the spaces provided – there may be more space than you need.

Calculators may be used.

Any diagrams may NOT be accurately drawn, unless otherwise indicated.

You must show all your working out with your answer clearly identified at the end of your solution.

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.

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.

Figure 1 shows a diagram of the heart.

(a) (i) Draw arrows on Figure 1 to show how oxygenated blood moves through the heart. (1 mark)

(ii) What happens when the right ventricle contracts? (1 mark)

☐ **A valve T opens**

☐ **B valve T closes**

☐ **C blood is forced into the left atrium**

☐ **D blood is forced into the pulmonary vein**

(continued on the next page)

1 continued.

(iii) Look at the diagram for Question 1(a)(iii) in the Diagram Booklet.

Draw ONE straight line from each structure to its function. (2 marks)

(b) Look at Figure 2 for Question 1(b) in the Diagram Booklet.

Figure 2 shows a dissected vein.

(i) Explain how the valves in veins help the blood, at low pressure, flow towards the heart. (2 marks)

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Turn over

1 continued.

- (ii) The equipment used to dissect the vein was cleaned and put into disinfectant.**

State why this equipment was put into disinfectant. (1 mark)

(TOTAL FOR QUESTION 1 = 7 MARKS)

- 2 Look at Figure 3 for Question 2(a) in the Diagram Booklet. The animal shown in Figure 3 is a tick burrowing into the skin of a human.**

**(a) Use words from the list to complete the sentences.
(2 marks)**

enzymes

food

herbivores

parasites

producers

prey

(i) The tick burrows into the skin to obtain

_____ .

(ii) When a tick burrows into human skin the tick benefits but the human is harmed.

This means that ticks are classed as

_____ .

(continued on the next page)

2 continued.

(b) When skin is cut a blood clot forms.

Which part of the blood starts the clotting process? (1 mark)

- ☐ **A red blood cells**
- ☐ **B water**
- ☐ **C platelets**
- ☐ **D white blood cells**

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2 continued.

(c) Look at Figure 4 for Question 2(c) in the Diagram Booklet.

Figure 4 shows a bird called an oxpecker eating ticks that are living on a zebra.

(i) Name the type of relationship where both the oxpecker and the zebra benefit. (1 mark)

(ii) Look at the diagram for Question 2(c)(ii) in the Diagram Booklet.

Zebras eat grass.

Complete the food chain that includes zebras, ticks, oxpeckers and grass. (2 marks)

(continued on the next page)

2 continued.

(d) Look at Figure 5 for Question 2(d) in the Diagram Booklet.

Figure 5 shows the maximum numbers of oxpeckers observed on four types of mammal.

(i) Describe the difference in the maximum number of oxpeckers on the white rhino and on the hippo. (2 marks)

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2 continued.

- (ii) Give ONE reason why more oxpeckers were observed on giraffes than on zebras. (1 mark)**

(TOTAL FOR QUESTION 2 = 9 MARKS)

3 A scientist investigated the distribution of invertebrates found in a garden.

(a) Look at Figure 6 for Question 3(a) in the Diagram Booklet.

Figure 6 shows an invertebrate about to fall into a pitfall trap.

The steps the scientist used to set up the pitfall trap are shown below.

The steps are not in the correct order.

- 1. put some sand around the beaker**
- 2. put a beaker, baited with food, in the hole**
- 3. place a flat stone on pebbles over the beaker**
- 4. check the pitfall trap each day**
- 5. dig a hole in the garden**

Complete the steps in the correct order, from left to right.

**The first number has been written in for you.
(2 marks)**

5				
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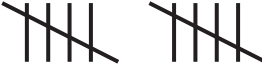


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Turn over

3 continued.

(b) Look at Figure 7 for Question 3(b) in the Diagram Booklet. It shows 30 invertebrates that the scientist collected.


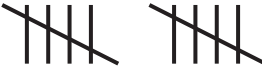


(i) Complete the table by filling in the tally and number for the spiders and worms. (2 marks)

invertebrate	tally	number of invertebrates
ant		6
beetle		10
slug		2
snail		3
spider		
worm		

(continued on the next page)

4 continued.

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invertebrate	tally	number of invertebrates
ant		6
beetle		10
slug		2
snail		3
spider		
worm		

(continued on the next page)

3 continued.

- (ii) The scientist selected an invertebrate at random to observe it in more detail.**

State the probability that the invertebrate selected is an ant.

**Give your answer in its simplest form.
(2 marks)**

-
- (iii) State how the type of food used to bait the pitfall trap could affect the number of different invertebrates caught. (1 mark)**

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Turn over

3 continued.

- (c) The scientist also counted the number of snails in four 1m^2 areas of the garden.**

The garden had a total area of 40m^2 .

Describe how the scientist can use this information to estimate the number of snails in the garden. (2 marks)

(TOTAL FOR QUESTION 3 = 9 MARKS)

- 4 (a) (i) Which row of the table shows the endocrine gland and hormone involved in the control of blood glucose concentration? (1 mark)

	endocrine gland	hormone
<input type="checkbox"/> A	ovary	oestrogen
<input type="checkbox"/> B	ovary	insulin
<input type="checkbox"/> C	pancreas	oestrogen
<input type="checkbox"/> D	pancreas	insulin

- (ii) State a target organ for the hormone that controls blood glucose concentration. (1 mark)

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4 continued.

(b) Look at Figure 8 for Question 4(b) in the Diagram Booklet.

People with a high BMI are more likely to develop type 2 diabetes.

Figure 8 shows the mass, height and BMI for two people.

(i) Use the formula to calculate the BMI for person A

$$\text{BMI} = \frac{\text{mass}}{\text{height}^2}$$

(2 marks)

(continued on the next page)

4 continued.

(ii) Person B develops type 2 diabetes.

Describe TWO lifestyle changes person B should make to help to control their blood glucose concentration. (2 marks)

1 _____

2 _____

(continued on the next page)

4 continued.

- (c) (i) Which row of the table shows the type or types of respiration that use glucose?
(1 mark)

	aerobic respiration	anaerobic respiration
<input type="checkbox"/> A	yes	yes
<input type="checkbox"/> B	yes	no
<input type="checkbox"/> C	no	yes
<input type="checkbox"/> D	no	no

(continued on the next page)

4 continued.

- (ii) Look at Figure 9 for Question 4(c)(ii) in the Diagram Booklet.**

A scientist measured the rate of respiration in a person when sleeping and then running at different speeds.

Figure 9 shows the results.

Explain the trend shown in Figure 9. (3 marks)

(continued on the next page)

Turn over

4 continued.

(TOTAL FOR QUESTION 4 = 10 MARKS)

- 5 Look at Figure 10 for Question 5 in the Diagram Booklet.

Figure 10 shows the leaves and flowers of water lily plants (*Nymphaea odorata*) on a lake.

- (a) Water lilies have stomata on the upper surface of the leaves.

Explain why water lilies have no stomata on the lower surface of the leaves. (2 marks)

(continued on the next page)

5 continued.

- (b) (i) The white petals of the water lily flowers cannot photosynthesise.**

Which structure in leaf cells is the site of photosynthesis? (1 mark)

- ☐ **A nucleus**
- ☐ **B vacuole**
- ☐ **C mitochondrion**
- ☐ **D chloroplast**

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5 continued.

(ii) Glucose is made by photosynthesis.

Glucose is converted to another sugar to be transported in the plant.

What is the name of this sugar? (1 mark)

☐ **A glycerol**

☐ **B ribose**

☐ **C sucrose**

☐ **D starch**

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5 continued.

**(iii) Describe how this sugar is transported from the leaves to the flowers of the water lily.
(2 marks)**

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5 continued.

(c) Look at Figure 11 for Question 5(c) in the Diagram Booklet.

Figure 11 shows water lilies growing in a lake in Europe.

(i) One water lily plant was brought from America 10 years ago and planted in the lake shown in Figure 11.

**Explain why this non-indigenous plant now covers the whole surface of the lake.
(3 marks)**

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5 continued.

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5 continued.

(ii) Explain how the water lilies will affect the biodiversity of this lake. (3 marks)

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(TOTAL FOR QUESTION 5 = 12 MARKS)

Turn over

- 6 A slide of potato cells was viewed using a light microscope.**

Look at Figure 12 for Question 6 in the Diagram Booklet.

Figure 12 is a drawing of the slide showing starch grains in the potato cells.

- (a) (i) Calculate the mean number of starch grains in potato cells P, Q and R. (1 mark)**

_____ starch grains

(continued on the next page)

6 continued.

(ii) Which structures are found in plant cells but are NOT found in animal cells? (1 mark)

- ☐ **A cell membrane, nucleus, chloroplast**
- ☐ **B cell wall, cell membrane, cytoplasm**
- ☐ **C nucleus, large vacuole, chloroplast**
- ☐ **D cell wall, chloroplast, large vacuole**

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6 continued.

- (b) A scientist investigated how the length of starch grains in potatoes changed when the potatoes were stored in the dark.**

Look at Figure 13 for Question 6(b) in the Diagram Booklet.

Figure 13 shows a potato after being stored in the dark.

Three potatoes were used in the investigation.

The length of starch grains in potato 1 were measured at the start.

The length of starch grains were measured in potato 2 after 5 weeks in the dark.

The length of starch grains were measured in potato 3 after 10 weeks in the dark.

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6 continued.

Look at Figure 14 for Question 6(b) in the Diagram Booklet.

Figure 14 shows the results.

- (i) Calculate the percentage difference in the mean length of starch grains in potato 2 at 5 weeks and in potato 3 at 10 weeks.
(2 marks)**

_____ %

(continued on the next page)

6 continued.

- (ii) State TWO variables the scientist should have controlled to improve this investigation. (2 marks)**

1 _____

2 _____

(continued on the next page)

6 continued.

(iii) The starch grains in the potatoes became smaller as the starch was converted into glucose.

**State why the potatoes need glucose.
(1 mark)**

(continued on the next page)

6 continued.

***(c) Look at Figure 15 for Question 6(c) in the Diagram Booklet.**

Figure 15 shows a diagram of some equipment that can be used to investigate the rate of photosynthesis.

Devise a plan to investigate the effect of light intensity on the rate of photosynthesis.

**Include variables you would need to control.
(6 marks)**

(continued on the next page)

Turn over

6 continued.

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(TOTAL FOR QUESTION 6 = 13 MARKS)

TOTAL FOR PAPER = 60 MARKS
END