

Paper Reference(s) 1BI0/2H

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Biology

Paper 2

Higher Tier

Total Marks

Monday 1 June 2020 – Afternoon

Time: 1 hour 45 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 100.

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 (a) Look at Figure 1 for Question 1(a) in the Diagram Booklet. It shows the sources of pollution and different levels of water pollution in a river.

(i) Which part of the river will have the largest number of bloodworms? (1 mark)

- ☐ **A no pollution**
- ☐ **B high pollution**
- ☐ **C some pollution**
- ☐ **D low pollution**

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1 continued.

- (ii) Give the names of the TWO indicator species from the list which provide evidence for clean water. (2 marks)**

blackspot fungus

lichen

freshwater shrimp

sludgeworm

stonefly

1 _____

2 _____

- (b) Explain why sewage pollution in the river can decrease the oxygen levels in the water. (2 marks)**

1 continued.

- (c) (i) Excess fertilisers can cause a build-up of nitrates in the rivers and lakes.**

State the name given to a build-up of nitrates in the lake. (1 mark)

- (ii) State why the build-up of nitrates is less likely to affect a river than a lake. (1 mark)**

(TOTAL FOR QUESTION 1 = 7 MARKS)

2 Look at Figure 2 for Question 2 in the Diagram Booklet. It 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)

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2 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**

- (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**

2 continued.

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

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2 continued.

- (c) Look at Figure 3 for Question 2(c) in the Diagram Booklet. It shows water lilies growing in a lake in Europe.**

One water lily plant was brought from America 10 years ago and planted in the lake shown in Figure 3.

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

(TOTAL FOR QUESTION 2 = 9 MARKS)

- 3 Look at Figure 4 for Question 3 in the Diagram Booklet.**

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

Figure 4 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

- (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**

3 continued.

(b) Look at Figures 5 and 6 for Question 2(b) in the Diagram Booklet.

A scientist investigated how the length of starch grains in potatoes changed when the potatoes were stored in the dark.

Figure 5 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 in potato 2 were measured after 5 weeks in the dark.

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

Figure 6 shows the results.

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3 continued.

- (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)**

_____ %

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

1 _____

2 _____

3 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)**

- (iv) Describe how starch is broken down into glucose. (2 marks)**

(TOTAL FOR QUESTION 3 = 9 MARKS)

- 4 Look at Figure 7 for Question 4(a) in the Diagram Booklet. It shows the world human population from 1800 to 2015.**

(a) In 2015, 13% of the world human population were classified as malnourished.

Calculate, using Figure 7, how many people were classified as malnourished in 2015. (2 marks)

_____ billion

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4 continued.

(b) Protein is an important nutrient.

Describe the laboratory test for protein. (2 marks)

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4 continued.

- (c) Look at Figure 8 for Question 4(c) in the Diagram Booklet. It shows the mass of meat eaten in the world from 1980 to 2010.**

Calculate the rate of increase in the mass of meat eaten in the world from 2000 to 2010. (2 marks)

_____ millions of tonnes per year

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4 continued.

(d) Look at Figure 9 for Question 4(d) in the Diagram Booklet. It shows an energy pyramid.

(i) Explain why the area labelled cattle is smaller than the area labelled plants. (2 marks)

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4 continued.

- (ii) The World Health Organisation uses this definition of food security.

‘When all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life’

Explain how a large increase in the mass of meat eaten will decrease food security in the future. (3 marks)

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4 continued.

(TOTAL FOR QUESTION 4 = 11 MARKS)

5 Trypsin is a protease enzyme used in the manufacture of food for babies.

**(a) (i) Which food group is digested by trypsin?
(1 mark)**

☐ **A carbohydrates**

☐ **B lipids**

☐ **C fibre**

☐ **D proteins**

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5 continued.

- (ii) The food is mashed before the trypsin is added.**

Explain the advantage of mashing the food before adding the trypsin. (2 marks)

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5 continued.

- (b) A manufacturer of baby food wanted to find out the optimum pH for trypsin.**

Equal volumes of different pH solutions were placed in six separate test tubes.

5 cm³ of 1% trypsin solution was added to each test tube.

1.5 g of mashed food was placed in each test tube.

The time taken to digest the food was recorded.

- (i) State ONE other variable that should be controlled in this investigation. (1 mark)**

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5 continued.

**(ii) State how this variable could be controlled.
(1 mark)**

(continued on the next page)

5 continued.

(c) Look at Figure 10 for Question 5(c) in the Diagram Booklet. It shows the results.

**(i) Describe the trends shown in this data.
(2 marks)**

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5 continued.

- (ii) At pH 4, the trypsin digested 1·5 g of mashed food at a rate of 0·8 g per minute.**

Calculate the rate of digestion at pH 1.

**Give your answer to one significant figure.
(2 marks)**

_____ g per minute

(continued on the next page)

5 continued.

- (iii) Explain the difference in the rate of reaction at pH 1 and the rate of reaction at pH 4.
(2 marks)**

(TOTAL FOR QUESTION 5 = 11 MARKS)

- 6 (a) Figure 11 shows the time taken for blood to clot at different temperatures.

Figure 11

temperature in °C	time taken for blood to clot in seconds
5	90
15	70
25	55
35	40
45	110

- (i) Look at the grid for Question 6(a)(i) in the Diagram Booklet. Using the grid, draw a graph to show the data. (3 marks)

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6 continued.

(ii) Give TWO safety precautions that should be used when handling blood samples. (2 marks)

1 _____

2 _____

(continued on the next page)

6 continued.

(b) (i) Which part of the blood causes blood to start clotting? (1 mark)

☐ **A erythrocytes**

☐ **B lymphocytes**

☐ **C platelets**

☐ **D antibodies**

(ii) Give ONE advantage of a blood clot forming. (1 mark)

(continued on the next page)

6 continued.

(c) Explain how ONE structure of a vein helps the blood return to the heart. (2 marks)

(TOTAL FOR QUESTION 6 = 9 MARKS)

- 7 (a) Look at Figure 12 for Question 7(a) in the Diagram Booklet.**

A gardener decided to kill the dandelion plants growing in his lawn.

The gardener set up a trial to see which concentration of weed killer would kill the most dandelions and be most economical.

He counted the number of dandelion plants in six 1 m^2 areas of the lawn.

He made six different concentrations of weed killer solution.

He applied the solutions to each of the six different areas.

After two weeks, he counted the number of dandelion plants in each area.

The results are shown in Figure 12.

- (i) Give ONE variable the gardener should control when completing this trial. (1 mark)**

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7 continued.

- (ii) State and explain the conclusions the gardener can make based on his trial. (3 marks)**

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7 continued.

(b) Some weed killers contain plant hormones.

**Explain how plant hormones work as weed killers.
(3 marks)**

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7 continued.

(c) Explain how phototropism is controlled in plant shoots. (3 marks)

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(TOTAL FOR QUESTION 7 = 10 MARKS)

- 8 Look at Figure 13 for Question 8 in the Diagram Booklet. It shows the heart rate of person A and person B.**

Person A does not do any regular exercise.

Person B has been running regularly for one year.

- (a) Both people rested for the first 6 minutes, then did the same high intensity exercise for the next 12 minutes, then rested.**

Compare the heart rates of person A with the heart rates of person B. (4 marks)

8 continued.

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8 continued.

- (b) The stroke volume for person B before exercising was 61 ml per beat.**

Calculate the cardiac output for person B before exercising.

Give your answer in litres per minute. (3 marks)

_____ litres per minute

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8 continued.

- (c) The cardiac output for person A during exercise was 5.5 litres per minute.**

Explain why the heart rate for person A needed to be higher than the heart rate for person B during exercise. (3 marks)

(TOTAL FOR QUESTION 8 = 10 MARKS)

- 9 (a) Look at Figure 14 for Question 9(a) in the Diagram Booklet.**

Hyperthyroidism is caused by an overactive thyroid gland.

Figure 14 shows a person with a normal thyroid gland and a person with hyperthyroidism.

- (i) State ONE effect of hyperthyroidism on the thyroid gland. (1 mark)**

- (ii) The thyroid gland is part of the (1 mark)**

- ☐ **A circulatory system**
- ☐ **B digestive system**
- ☐ **C endocrine system**
- ☐ **D urinary system**

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9 continued.

(b) Explain how negative feedback, involving the thyroid gland, controls metabolic rate. (4 marks)

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***(c) Explain how hormones control the menstrual cycle. (6 marks)**

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9 continued.

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9 continued.

(TOTAL FOR QUESTION 9 = 12 MARKS)

10 (a) Look at Figure 15 for Question 10(a) in the Diagram Booklet.

A person with kidney disease may need kidney dialysis treatment.

Figure 15 shows an experiment to show how a dialysis membrane works.

- (i) Describe the method that would be used to find out what is present in the solution in the beaker, after one hour. (4 marks)**

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10 continued.

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10 continued.

- (ii) Explain how this experiment represents a simple model of kidney dialysis treatment. (2 marks)**

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10 continued.

***(b) Look at Figure 16 for Question 10(b) in the Diagram Booklet.**

The nephrons in the kidney remove unwanted substances from the blood.

Figure 16 shows the structure of a nephron.

Explain how substances are exchanged between the blood entering the nephron and the filtrate leaving the collecting duct.

Include reference to named structures of the nephron in your answer. (6 marks)

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(TOTAL FOR QUESTION 10 = 12 MARKS)

TOTAL FOR PAPER = 100 MARKS

END