

Biology
PAPER 1
Foundation tier

Total Marks

Time: 1 hour 45 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 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.

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 Some bacteria cause disease.

(a) Which word describes an organism that causes disease?

(1 mark)

☐ **A pathogen**

☐ **B culture**

☐ **C antibiotic**

☐ **D platelet**

(b) Look at the diagram for Question 1(b) in the Diagram Booklet. Draw ONE straight line from each disease to the main way that the disease is spread.

(2 marks)

(continued on the next page)

Turn over

1 continued.

- (c) A scientist investigated the effect of temperature on the growth of bacteria.**

The bacteria were grown at 10°C and 20°C.

The number of bacteria grown at each temperature were counted every two hours.

FIGURE 1 shows the result.

FIGURE 1

time in hours	number of bacteria at 10°C in thousands	number of bacteria at 20°C in thousands
0	10	10
2	20	47
4	30	74
6	40	80
8	50	80

(continued on the next page)

1 continued.

Look at FIGURE 2 for Question 1(c) in the Diagram Booklet. It shows a graph of the results at 20°C.

- (i) Plot the points on the graph for the number of bacteria at 10°C.**

**The first two points have been plotted for you.
(1 mark)**

- (ii) Draw a line of best fit on the graph for 10°C.
(1 mark)**

(continued on the next page)

1 continued.

- (iii) Describe how the growth of bacteria at 10°C was different from the growth of bacteria at 20°C.
(2 marks)**

(Total for Question 1 = 7 marks)

2 Stone tools can be found at sites used by our human ancestors.

(a) Look at FIGURE 3 and FIGURE 4 for Question 2(a) in the Diagram Booklet. They show two tools found at the same site: tool P and tool Q.

**(i) Describe how tool P was made.
(2 marks)**

(continued on the next page)

2 continued.

- (ii) A scientist stated that tool Q was made by a more evolved human ancestor than tool P.**

**Which observation supports this statement?
(1 mark)**

- ☐ **A tool Q has more colours than tool P**
- ☐ **B tool Q is more pointed than tool P**
- ☐ **C tool Q has fewer colours than tool P**
- ☐ **D tool Q is less pointed than tool P**

(continued on the next page)

2 continued.

(iii) Tools provide evidence for human evolution.

**Use words from the list to complete
the sentences below.**

(2 marks)

enlarge

human

migrate

mutate

natural

negative

**Evolution is the change of inherited
characteristics through**

_____ selection.

These changes occur because genes

_____ .

(continued on the next page)

2 continued.

(b) Fossils were also found in the soil around tool Q.

**Describe TWO ways that stone tools and fossils
can be dated to find out how old they are.**

(2 marks)

1 _____

2 _____

(Total for Question 2 = 7 marks)

- 3 The book 'On the Origin of Species' was published in 1859.**

This book describes the theory of evolution.

- (a) (i) Which scientist wrote this book explaining his theory of evolution?
(1 mark)**

- ☐ **A Charles Darwin**
- ☐ **B Robert Hooke**
- ☐ **C Richard Leakey**
- ☐ **D Gregor Mendel**

(continued on the next page)

3 continued.

**(ii) Which statement is supported by this theory of evolution?
(1 mark)**

- ☐ **A humans are not related to any other group of animals**
- ☐ **B all species have the same genes**
- ☐ **C a meteor caused the dinosaurs to evolve**
- ☐ **D new species evolve over many generations**

(continued on the next page)

3 continued.

(b) One chapter of this book discusses pentadactyl limbs.

Look at FIGURE 5 for Question 3(b) in the Diagram Booklet. It shows the bones of the pentadactyl limbs of three mammals.

**(i) Describe ONE difference between the humerus of the whale and the humerus of the human.
(1 mark)**

(continued on the next page)

3 continued.

- (ii) Describe ONE difference between the phalanges of the horse and the phalanges of the human.
(1 mark)**

(continued on the next page)

3 continued.

- (c) Another chapter of the book discusses how the shape of bird beaks has evolved on different islands.**

Look at FIGURE 6 for Question 3(c) in the Diagram Booklet. It shows two species of finch from two different islands.

These two species of finch evolved from a common ancestor that had a similar shaped beak to species B.

Beak shape is related to the food that the finches eat.

**Describe how the thinner beak of species A is a result of evolution.
(4 marks)**

(continued on the next page)

Turn over

3 continued.

(Total for Question 3 = 8 marks)

4 Alcohol is broken down by liver cells.

(a) Which process moves alcohol from the blood into the liver cells?

(1 mark)

- ☐ **A diffusion**
- ☐ **B respiration**
- ☐ **C osmosis**
- ☐ **D transpiration**

(continued on the next page)

4 continued.

- (b) If a person drinks too much alcohol, liver cells die and the person can develop cirrhosis of the liver.**

The relative risk of developing cirrhosis of the liver is affected by two factors.

- 1. The volume of alcohol a person drinks in one week.**
- 2. Whether the person drinks the alcohol on its own or with a meal.**

Look at FIGURE 7 for Question 4(b) in the Diagram Booklet. It shows how these two factors affect the relative risk of people developing cirrhosis of the liver.

(continued on the next page)

4 continued.

(i) Person A drinks alcohol on its own.

Person B drinks alcohol with their meals.

Calculate the difference in risk for these two people when each one drinks 24 units of alcohol per week.

(3 marks)

(continued on the next page)

4 continued.

- (ii) Using evidence from Figure 7, state TWO pieces of health advice for people about drinking alcohol.
(2 marks)**

1 _____

2 _____

(continued on the next page)

4 continued.

(c) Cystic fibrosis is a genetic condition that can also cause liver disease.

**(i) State where genes are found in cells.
(1 mark)**

(continued on the next page)

4 continued.

- (ii) Look at FIGURE 8 for Question 4(c) in the Diagram Booklet. It shows the inheritance of cystic fibrosis in a family.**

F represents the dominant allele that does not cause cystic fibrosis.

f represents the recessive allele that causes cystic fibrosis.

A scientist states that the genotype of person B is Ff.

**Explain why the scientist is correct.
(2 marks)**

(continued on the next page)

Turn over

4 continued.

**(iii) State the genotype of person C.
(1 mark)**

(Total for Question 4 = 10 marks)

- 5 Look at FIGURE 9 for Question 5(a) in the Diagram Booklet. It shows a plant with plantlets growing from it.**

If a plantlet touches soil, it will grow roots and become a new plant.

This is an example of asexual reproduction.

- (a) State ONE advantage of asexual reproduction for this plant.
(1 mark)**

(continued on the next page)

5 continued.

- (b) Scientists investigated how temperature affected the number of plantlets produced by this type of plant in 10 weeks.**

The scientists grew one of these plants in each of six temperatures.

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

- (i) Describe the effect of temperature on the number of plantlets produced by these plants.
(2 marks)**

(continued on the next page)

Turn over

5 continued.

**(ii) Which of these would improve the results of this investigation?
(1 mark)**

- ☐ **A grow a plant at 0 °C**
- ☐ **B grow each plant in a different type of soil**
- ☐ **C grow a different species of plant at each temperature**
- ☐ **D grow five of these plants at each temperature**

(continued on the next page)

5 continued.

- (c) The plant in Figure 9 also produces flowers for sexual reproduction.**

**Explain ONE advantage of sexual reproduction.
(2 marks)**

(continued on the next page)

5 continued.

(d) Look at FIGURE 11 for Question 5(d) in the Diagram Booklet. It shows the characteristics of three different varieties of this plant.

A gardener wants to use selective breeding to produce a plant with large green and white striped leaves and large white flowers.

**Explain which plants the gardener should use.
(3 marks)**

(continued on the next page)

Turn over

5 continued.

(Total for Question 5 = 9 marks)

- 6 (a) Look at FIGURE 12 for Question 6(a) in the Diagram Booklet. It shows a height percentile chart for boys.**

The numbers on the right-hand side of the graph show the percentiles of the population for each growth curve.

- (i) A 10-year-old boy has a height of 140 cm.**

Which is the percentile range for height for this boy?

(1 mark)

- ☐ **A 10th to 25th**
- ☐ **B 25th to 50th**
- ☐ **C 50th to 75th**
- ☐ **D 75th to 90th**

(continued on the next page)

6 continued.

**(ii) State how percentile charts are used.
(1 mark)**

(continued on the next page)

6 continued.

(b) As we grow, we make new cells by mitosis and meiosis.

(i) The cells that are made can become specialised.

Look at FIGURE 13 for Question 6(b)(i) in the Diagram Booklet. It shows a diagram of a sperm cell.

**Describe TWO ways that the sperm cell is specialised.
(2 marks)**

1 _____

2 _____

(continued on the next page)

6 continued.

- (ii) Look at TABLE 1 for Question 6(b)(ii) in the Diagram Booklet. Complete the table to show the results when a cell divides by mitosis or meiosis in humans.**

**Human body cells, except gametes, have
23 pairs of chromosomes.
(4 marks)**

(continued on the next page)

6 continued.

(c) The tips of plant roots are where many cells are dividing by mitosis.

**(i) Which term describes the area of a root where many cells are dividing by mitosis?
(1 mark)**

☐ **A meristem**

☐ **B root hair cell**

☐ **C xylem**

☐ **D phloem**

(continued on the next page)

6 continued.

- (ii) Plant root cells contain an enzyme that joins glucose molecules together to make starch.**

Devise a plan to investigate the effect of pH on the activity of this enzyme.

(3 marks)

(continued on the next page)

Turn over

6 continued.

(Total for Question 6 = 12 marks)

7 Look at FIGURE 14 for Question 7 in the Diagram Booklet. It shows a cross-section of a human eye.

(a) Cataracts can develop in the eye causing people to have blurred vision.

**(i) Which structure of the eye can develop cataracts?
(1 mark)**

☐ **A structure Q**

☐ **B structure R**

☐ **C structure S**

☐ **D structure T**

(continued on the next page)

7 continued.

- (ii) Describe how cataracts are corrected by surgery.
(2 marks)**

(continued on the next page)

7 continued.

- (b) (i) Explain how the size of the pupil of the eye changes when a torch is shone into the eye of a person.
(3 marks)**

(continued on the next page)

Turn over

7 continued.

- *(ii) Look at FIGURE 15 for Question 7(b)(ii) in the Diagram Booklet. It shows a diagram of light entering an eye of someone who cannot see distant objects clearly.**

Explain why this person cannot see distant objects clearly and how the problem can be corrected.

(6 marks)

(continued on the next page)

Turn over

7 continued.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

(Total for Question 7 = 12 marks)

8 (a) DNA molecules contain base pairs.

**Describe how the base pairs are bonded together
in a DNA molecule.**

(2 marks)

(continued on the next page)

8 continued.

(b) Look at FIGURE 16 for Question 8(b) in the Diagram Booklet. It shows part of a DNA molecule.

(i) Write the code for the complementary DNA strand in Figure 16.

(2 marks)

(ii) Three bases code for each amino acid.

Which is the maximum number of amino acids coded for by this strand of DNA?

(1 mark)

☐ **A 3**

☐ **B 4**

☐ **C 6**

☐ **D 12**

(continued on the next page)

8 continued.

**(iii) What is the shape of a DNA molecule?
(1 mark)**

- ☐ **A triple stranded**
- ☐ **B single stranded**
- ☐ **C single helix**
- ☐ **D double helix**

(continued on the next page)

8 continued.

(c) A student wanted to extract the DNA from fresh peas.

The student crushed the peas and added washing up liquid and water.

The enzyme protease was then added to this mixture.

(continued on the next page)

8 continued.

- (i) Explain why the enzyme protease was added to the mixture.
(2 marks)**

(continued on the next page)

8 continued.

(ii) The mixture was then heated and filtered.

Finally, the student poured the filtrate into a test tube and ice-cold ethanol was poured down the side of the test tube into the filtrate.

State why ice-cold ethanol was poured into the filtrate.

(1 mark)

(continued on the next page)

8 continued.

(iii) The student wanted to compare the mass of DNA found in fresh peas with the mass of DNA found in fresh beans.

**Give TWO variables the student would need to control to make this a valid comparison.
(2 marks)**

1 _____

2 _____

(Total for Question 8 = 11 marks)

- 9 (a) Look at FIGURE 17 for Question 9(a) in the Diagram Booklet. It shows the number of people diagnosed with sexually transmitted infections (STIs) in the UK during 2017.**
- (i) State the sexually transmitted infection that has the median number of people diagnosed. (1 mark)**
-
-

- (ii) The population of the UK in 2017 was 66 million people.**

Calculate the total number of people diagnosed with chlamydia in the UK in 2017. (2 marks)

_____ people

(continued on the next page)

9 continued.

- (iii) State why chlamydia can be described as a communicable disease.
(1 mark)**

- (iv) Give ONE way the transmission of chlamydia can be prevented.
(1 mark)**

(continued on the next page)

9 continued.

- (v) Explain why chlamydia can be treated with antibiotics.
(2 marks)**

(continued on the next page)

9 continued.

- *(b) When a person is infected with a disease, the immune system will respond to protect their body.**

Explain how the immune system will respond to an infection caused by bacteria.

(6 marks)

(continued on the next page)

Turn over

9 continued.

[illegible]

(Total for Question 9 = 13 marks)

10 (a) Look at FIGURE 18 for Question 10(a) in the Diagram Booklet. It shows two light receptor cells from the human eye.

**(i) Which part of the eye contains light receptor cells?
(1 mark)**

☐ **A cornea**

☐ **B iris**

☐ **C lens**

☐ **D retina**

(continued on the next page)

10 continued.

(ii) These cells require energy.

The cell organelles labelled X release energy during respiration.

**Name the organelles labelled X.
(1 mark)**

(iii) The cell organelle labelled Y contains chromosomes.

**Name the organelle labelled Y.
(1 mark)**

(continued on the next page)

10 continued.

- (iv) Cell A responds to dim light and is responsible for night vision.**

**Name cell A.
(1 mark)**

- (v) Describe how the role of light receptor cell B is different from the role of light receptor cell A.
(2 marks)**

(continued on the next page)

Turn over

10 continued.

- (b) The optic nerve carries information from the back of the eye to the brain.**

The optic nerve is 47 mm in length.

Nerve impulses travel at 75 metres per second.

- (i) Calculate the time an impulse takes to travel the length of the optic nerve.
(3 marks)**

Use the equation: speed = $\frac{\text{distance}}{\text{time}}$

_____ seconds

(continued on the next page)

10 continued.

- (ii) The impulse travels to the occipital lobe of the brain.**

Look at FIGURE 19 for Question 10(b)(ii) in the Diagram Booklet. The occipital lobe is labelled.

**Which part of the brain contains the occipital lobe?
(1 mark)**

- ☐ **A cerebral hemispheres**
- ☐ **B medulla oblongata**
- ☐ **C cerebellum**
- ☐ **D hypothalamus**

(continued on the next page)

10 continued.

- (iii) State the sense most likely to be affected if the occipital lobe is damaged.
(1 mark)**

(Total for Question 10 = 11 marks)

**TOTAL FOR PAPER = 100 MARKS
END OF PAPER**