

Biology
PAPER 1
Foundation Tier

Total Marks

Friday 10 May 2024 – Morning

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 (a) Look at Figure 1 for Question 1(a) in the Diagram Booklet. It shows a bacterial cell.

(i) What is structure W?
(1 mark)

- ☐ **A cell wall**
- ☐ **B cytoplasm**
- ☐ **C chromosomal DNA**
- ☐ **D plasmid**

(continued on the next page)

1(a) continued.

**(ii) Give the name of structure Z.
(1 mark)**

**(iii) State the function of structure Z.
(1 mark)**

(b) Look at the diagram for Question 1(b) in the Diagram Booklet. The human body has defences to protect against infection by bacteria.

**Draw ONE straight line from each body defence to its function.
(2 marks)**

(continued on the next page)

1 continued.

(c) Smoking tobacco is a lifestyle factor that can cause disease.

Name TWO other lifestyle factors that can cause disease.

(2 marks)

1 _____

2 _____

(Total for Question 1 = 7 marks)

2 Look at Figure 2 for Question 2 in the Diagram Booklet. It shows a method used to extract DNA from strawberries.

**(a) (i) Complete the sentences using words from the list below.
(2 marks)**

indicator

membranes

salt

substrates

sugar

vacuoles

**Crushed strawberries are mixed with washing
up liquid and _____ solution.**

**Washing up liquid helps to release DNA by
breaking open cell _____.**

(continued on the next page)

2(a) continued.

- (ii) Look again at Figure 2 for Question 2 in the Diagram Booklet. Describe the method shown in stage 2.
(2 marks)**

- (iii) What is the colour of the DNA precipitate?
(1 mark)**

- ☐ **A blue**
- ☐ **B orange**
- ☐ **C white**
- ☐ **D red**

2 continued.

- (b) A scientist used this method to find the mass of DNA in four strawberries.**

Look at Figure 3 for Question 2(b) in the Diagram Booklet. It shows the results.

- (i) The range is the difference between the largest value and smallest value in a set of numbers.**

**Which is the range of these results?
(1 mark)**

☐ **A 13·2**

☐ **B 10·4**

☐ **C 5·9**

☐ **D 5·3**

(continued on the next page)

2(b) continued.

**(ii) Calculate the mean mass of DNA.
(1 mark)**

mean mass of DNA = _____ ng

(Total for Question 2 = 7 marks)

3 Look at Figure 4 for Question 3(a) in the Diagram Booklet. It shows a cross-section of a human eye.

**(a) (i) Which structure is the retina?
(1 mark)**

☐ **A P**

☐ **B Q**

☐ **c R**

☐ **D S**

**(ii) Name the structure labelled T.
(1 mark)**

(continued on the next page)

3(a) continued.

**(iii) Explain how structure R controls the amount of light entering the eye.
(2 marks)**

(continued on the next page)

3 continued.

(b) Look at Figure 5 for Question 3(b) in the Diagram Booklet. It shows a diagram of light entering an eye.

Explain why this person cannot see near objects clearly.

(2 marks)

(continued on the next page)

3 continued.

(c) Long-sightedness and short-sightedness are defects of the eye.

**(i) Draw, in the space below, the shape of the lens needed to correct long-sightedness.
(1 mark)**

**(ii) Name ONE other defect of the eye.
(1 mark)**

(Total for Question 3 = 8 marks)

Turn over

- 4 Scientists think that chickens were domesticated from red junglefowl thousands of years ago.**

Look at Figure 6 for Question 4 in the Diagram Booklet. It shows some information about these birds.

- (a) Describe how selective breeding has produced chickens that lay large numbers of eggs.
(3 marks)**

(continued on the next page)

4 continued.

- (b) Chickens have 78 chromosomes in each of their body cells.**

These chromosomes are in pairs.

- (i) Which term describes a chicken body cell?
(1 mark)**

☐ **A dominant**

☐ **B haploid**

☐ **C recessive**

☐ **D diploid**

- (ii) State the number of chromosomes found in the gametes produced by chickens.
(1 mark)**
-
-

(continued on the next page)

4 continued.

- (c) Look at the table for Question 4(c) in the Diagram Booklet. Complete the table to compare the production of body cells and gametes.**

**One box has been completed for you.
(3 marks)**

- (d) Some animal cells are stem cells.**

**Describe the function of stem cells.
(2 marks)**

(Total for Question 4 = 10 marks)

- 5 Look at Figure 7 for Question 5 in the Diagram Booklet. The calorimeter shown in Figure 7 can be used to investigate the energy content of food.**

Heat energy is released when a small sample of food is burnt, causing the water temperature to increase.

- (a) (i) Give ONE function of the lid.
(1 mark)**

(continued on the next page)

5(a) continued.

- (ii) Describe how the increase in the temperature of the water could be measured.
(2 marks)**

(continued on the next page)

5 continued.

- (b) A student used this calorimeter to investigate the energy content of a food.**

Look at Figure 8 for Question 5(b) in the Diagram Booklet. The results are shown in Figure 8.

- (i) Calculate the energy content of the food.
(2 marks)**

Use the equation

**energy in joules (J) =
mass of water \times 4.2 \times temperature change**

energy content = _____ J

(continued on the next page)

5(b) continued.

- (ii) The student repeated the investigation using a different food.**

Look at Figure 9 for Question 5(b)(ii) in the Diagram Booklet. The results are shown in Figure 9.

State TWO ways the student could improve the investigation so that the energy content of the two different foods can be compared.
(2 marks)

1 _____

2 _____

(continued on the next page)

5 continued.

- (c) Look at Figure 10 for Question 5(c) in the Diagram Booklet. It shows some facts about two foods.**

Explain the difference in the energy values of these two foods.

(2 marks)

(Total for Question 5 = 9 marks)

6 (a) The common cold is caused by a virus.

- (i) Give ONE reason why antibiotics are not used to treat the common cold.
(1 mark)**

- (ii) The development of a new antibiotic has many stages.**

**Which is the last stage in the development of a new antibiotic?
(1 mark)**

- ☐ **A preclinical testing**
- ☐ **B discovery**
- ☐ **C clinical testing**
- ☐ **D diagnosis**

(continued on the next page)

6 continued.

- (b) Look at Figure 11 for Question 6(b) in the Diagram Booklet. It shows the effect of adding an antibiotic to a culture of bacteria.**

Explain how antibiotic-resistant bacteria have evolved.

**Use information from Figure 11 in your answer.
(4 marks)**

Answer space continues on the next page.

Turn over

6(b) continued.

(continued on the next page)

6 continued.

(c) One source of evidence for human evolution is from stone tools.

Give ONE other source of evidence for human evolution.

(1 mark)

(continued on the next page)

6 continued.

(d) Look at Figure 12 for Question 6(d) in the Diagram Booklet. It shows two stone tools.

**(i) Explain how these tools provide evidence for human evolution.
(3 marks)**

(continued on the next page)

Turn over

6(d) continued.

- (ii) Describe TWO methods that scientists use to date stone tools.
(2 marks)**

1 _____

2 _____

(Total for Question 6 = 12 marks)

7 Tissue culture can be used to grow cells.

- (a) (i) State ONE difference between normal body cells and cancer cells.
(1 mark)**

- (ii) Cancer cells can be grown in tissue culture.**

**Give ONE disadvantage of testing drugs on these cancer cells.
(1 mark)**

(continued on the next page)

7 continued.

- (b) Tissue culture can be used to conserve rare plants.**

Look at Figure 13 for Question 7(b) in the Diagram Booklet. It shows some of the stages involved.

- (i) State ONE way the growth medium can be sterilised.**
(1 mark)

(continued on the next page)

7(b) continued.

- (ii) Explain ONE reason why the growth medium must be sterilised.
(2 marks)**

- (iii) Suggest ONE advantage of using tissue culture to conserve rare plants.
(1 mark)**

(continued on the next page)

7 continued.

- *(c) Look at Figure 14 for Question 7(c) in the Diagram Booklet. It shows some plant structures that protect plants from attack by pests and pathogens.**

Describe how physical barriers protect plants from attack by pests and pathogens.

**Use information from Figure 14 in your answer.
(6 marks)**

Answer space continues on the next page.

Turn over

7(c) continued.

(Total for Question 7 = 12 marks)

- 8 A student investigated the effect of temperature on the rate of reaction of the enzyme pepsin.

Figure 15 shows the data collected.

FIGURE 15

temperature in °C	rate of reaction in mg per minute
0	3·0
10	17·0
20	26·0
30	32·0
40	34·0

- (a) Look at the graph for Question 8(a) in the Diagram Booklet. Complete the graph by plotting the results shown in Figure 15 and drawing a line of best fit.

The first two points have been plotted for you.
(2 marks)

(continued on the next page)

8 continued.

- (b) Pepsin and trypsin are enzymes that break down proteins.**

Look at Figure 16 for Question 8(b) in the Diagram Booklet. It shows the results of an investigation into the activity of pepsin and trypsin at different pH levels.

- (i) Which molecules are produced when a protein is broken down?
(1 mark)**

- ☐ **A sugars**
- ☐ **B amino acids**
- ☐ **C fatty acids**
- ☐ **D starches**

(continued on the next page)

8(b) continued.

(ii) Describe the trend in the graph for the enzyme pepsin.

Use data from the graph to support your answer.

(3 marks)

(continued on the next page)

8(b) continued.

**(iii) State the optimum pH for the enzyme trypsin.
(1 mark)**

**(iv) Explain why there is no trypsin activity at pH 5.
(3 marks)**

(continued on the next page)

Turn over

8(b) continued.

- (v) Temperature is a variable that should be controlled in this investigation.**

Give ONE way the temperature could be controlled.

(1 mark)

(Total for Question 8 = 11 marks)

9 (a) Malaria is a disease that causes damage to the blood and liver.

**(i) Which type of pathogen causes malaria?
(1 mark)**

☐ **A a bacterium**

☐ **B a fungus**

☐ **C a protist**

☐ **D a virus**

**(ii) State how the pathogen that causes malaria
is spread.
(1 mark)**

(continued on the next page)

9 continued.

(b) Measles is a disease caused by a virus.

Look at Figure 17 for Question 9(b) in the Diagram Booklet. It shows the number of measles cases reported in England and Wales from 1985 to 2015.

Explain ONE conclusion that can be made about the change in the number of measles cases reported from 1985 to 2015.

(2 marks)

(continued on the next page)

Turn over

9 continued.

**(c) Describe TWO ways the immune system will respond to an infection by a pathogen.
(2 marks)**

1 _____

2 _____

(continued on the next page)

9 continued.

- (d) (i) Beriberi is a disease caused by a lack of vitamin B1 in the diet.**

Give ONE reason why beriberi is classed as a non-communicable disease.

(1 mark)

(continued on the next page)

9(d) continued.

***(ii) Beriberi can affect reflexes.**

Look at Figure 18 for Question 9(d)(ii) in the Diagram Booklet. It shows a reflex arc.

When the skin is pricked by a pin, electrical impulses travel through a reflex arc.

Describe the path taken by electrical impulses from the skin to the muscles in the arm.

Include the names of neurones **X, **Y** and **Z** in your answer.
(6 marks)**

Answer space continues on the next 4 pages.

9(d)(ii) continued.

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Turn over

9(d)(ii) continued.

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9(d)(ii) continued.

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Turn over

9(d)(ii) continued.

(Total for Question 9 = 13 marks)

- 10 (a) Mendel crossed pea plants that always produced purple flowers with pea plants that always produced white flowers.**

Look at Figure 19 for Question 10(a) in the Diagram Booklet. The flowers of the offspring were all purple, as shown in Figure 19.

- (i) Which conclusion can be made about the characteristic for purple flowers?
(1 mark)**

- ☐ **A the characteristic is recessive**
- ☐ **B the characteristic is dominant**
- ☐ **C the characteristic is a mutation**
- ☐ **D the characteristic is environmental**

(continued on the next page)

10(a) continued.

- (ii) Mendel used two of the offspring with purple flowers in another cross.**

The pea plants he obtained from this cross produced purple flowers or white flowers in a ratio of 3 : 1.

**Calculate the expected number of pea plants with purple flowers, in a sample of 160 pea plants.
(2 marks)**

**Number of pea plants
with purple flowers = _____**

(continued on the next page)

10(a) continued.

(iii) A pea plant producing purple flowers had the genotype Aa .

This pea plant was crossed with a pea plant producing white flowers.

Look at the Punnett square for Question 10(a)(iii) in the Diagram Booklet. Complete the Punnett square to show the possible genotypes of the offspring.

**Show the percentage of pea plants that produce white flowers in your answer.
(3 marks)**

**Percentage of pea plants
that produce white flowers = _____ %**

(continued on the next page)

10 continued.

(b) Asexual reproduction can be used to produce flowering plants.

**Give TWO advantages of using asexual reproduction to produce flowering plants.
(2 marks)**

1 _____

2 _____

(continued on the next page)

10 continued.

(c) Flower colour is controlled by genes.

**(i) Which is a definition of a gene?
(1 mark)**

- ☐ **A a section of a DNA molecule that codes for a protein**
- ☐ **B a section of a chromosome that codes for DNA**
- ☐ **C the entire DNA of an organism**
- ☐ **D a section of a chromosome that coils into a double helix**

(continued on the next page)

10(c) continued.

- (ii) The two strands of a DNA molecule are linked by complementary bases.**

Describe how the complementary bases are linked in a DNA molecule.

(2 marks)

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS
END OF PAPER