

**Biology**  
**PAPER 1**  
**Foundation Tier**

Total Marks
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**Friday 10 May 2024 – Morning**

**Time: 1 hour 45 minutes**

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

<b>Surname</b>					
<b>Other names</b>					
<b>Centre Number</b>					
<b>Candidate Number</b>					

## **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.**

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**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)**

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

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**(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)**

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- (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)**

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**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)**

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**(continued on the next page)**

**3(a) continued.**

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

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**(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)**

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**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)**

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**(Total for Question 3 = 8 marks)**

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**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)**

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**(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)**

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**(Total for Question 4 = 10 marks)**

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- 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)**

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**(continued on the next page)**

**5(a) continued.**

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

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**(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)**

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**(Total for Question 5 = 9 marks)**

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**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)**

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- (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.**

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**Turn over**



**6(b) continued.**

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**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)**

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**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)**

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**(continued on the next page)**

**Turn over**

**6(d) continued.**

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

**1** \_\_\_\_\_

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\_\_\_\_\_

**2** \_\_\_\_\_

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**(Total for Question 6 = 12 marks)**

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**7 Tissue culture can be used to grow cells.**

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

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

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

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**(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)**

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**(continued on the next page)**

**7(b) continued.**

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

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

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**(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.**

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**Turn over**



**7(c) continued.**

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**(Total for Question 7 = 12 marks)**

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- 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)**

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**(continued on the next page)**

**8(b) continued.**

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

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

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**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)**

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**(Total for Question 8 = 11 marks)**

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**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)**

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**(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)**

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**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)**

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**(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.**

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**9(d)(ii) continued.**

[illegible]

**Turn over**

**9(d)(ii) continued.**

[illegible]

**Turn over**

**9(d)(ii) continued.**

[illegible]

**Turn over**

**9(d)(ii) continued.**

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**(Total for Question 9 = 13 marks)**

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- 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)**

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**(Total for Question 10 = 11 marks)**

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