

Biology
PAPER 1
Foundation Tier

Total Marks

Tuesday 16 May 2023 – 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

Calculator, ruler

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 shows an animal cell.

**(i) Which part of the cell is labelled Y?
(1 mark)**

- ☐ A cell wall
- ☐ B cell membrane
- ☐ C nucleus
- ☐ D cytoplasm

(continued on the next page)

1(a) continued.

**(ii) Which structures are found in the part labelled Z?
(1 mark)**

☐ **A chromosomes**

☐ **B mitochondria**

☐ **C ribosomes**

☐ **D vacuoles**

**(iii) Name the part of an animal cell where respiration occurs.
(1 mark)**

(continued on the next page)

1 continued.

- (b) Look at FIGURE 2 for Question 1(b)(i) in the Diagram Booklet. A microscope can be used to observe the structure of a cell.**

Figure 2 shows a microscope.

- (i) Give ONE advantage of using a microscope to look at cells.
(1 mark)**

(continued on the next page)

1(b) continued.

**(ii) Look at the diagram for Question 1(b)(ii) in the Diagram Booklet. Draw ONE straight line from each part of the microscope to its function.
(2 marks)**

(c) The list below shows some of the units used when cells and organelles are measured.

micrometre = 10^{-6} m

picometre = 10^{-12} m

nanometre = 10^{-9} m

millimetre = 10^{-3} m

Give the name of the smallest unit shown in the list above.

(1 mark)

(Total for Question 1 = 7 marks)

2 (a) Look at FIGURE 4 for Question 2(a)(i) in the Diagram Booklet. It shows fossils in different layers of rock.

**(i) Which layer of rock is likely to contain the most recent fossils?
(1 mark)**

☐ **A layer A**

☐ **B layer B**

☐ **C layer C**

☐ **D layer D**

(continued on the next page)

2(a) continued.

Look at FIGURE 5 for Question 2(a)(ii) in the Diagram Booklet. It shows some stone tools from two different periods of time.

- (ii) Explain ONE difference between tool A and tools B, C and D.
(2 marks)**

(continued on the next page)

2 continued.

(b) Our human ancestors domesticated animals.

Animals were domesticated to use as working animals and to keep as pets.

- (i) Look at the list of words for Question 2(b)(i) in the Diagram Booklet. Use words from the list to complete the sentences.
(2 marks)**

Animals with the most desirable

**_____ were
bred together.**

**This is called _____
breeding.**

(continued on the next page)

2(b) continued.

(ii) Scientists have analysed the genomes of domestic animals.

**Which is the definition of a genome?
(1 mark)**

- ☐ **A all the cells of an organism**
- ☐ **B all the enzymes of an organism**
- ☐ **C all the DNA of an organism**
- ☐ **D all the structures of an organism**

(continued on the next page)

2(b) continued.

**(iii) Give ONE advantage of domesticating animals.
(1 mark)**

(Total for Question 2 = 7 marks)

3 (a) Look at FIGURE 6 for Question 3(a) in the Diagram Booklet. It shows the bones in the limbs of a bird and a whale.

(i) The bird and the whale have evolved from a common ancestor.

**Give ONE way the structure of these limbs provides evidence for this evolution.
(1 mark)**

(continued on the next page)

3(a) continued.

- (ii) Charles Darwin developed the theory of evolution by natural selection.**

**Which scientist worked with Darwin on the theory of evolution by natural selection?
(1 mark)**

- ☐ **A Alexander Fleming**
- ☐ **B Gregor Mendel**
- ☐ **C Richard Leakey**
- ☐ **D Alfred Russel Wallace**

(continued on the next page)

3 continued.

(b) DNA is found in bones and stem cells.

**(i) Suggest ONE reason why DNA is found
in bones.
(1 mark)**

(continued on the next page)

3(b) continued.

**(ii) Describe how stem cells help animals to grow.
(2 marks)**

(continued on the next page)

3(b) continued.

(iii) Scientists have transplanted stem cells into the retina of the eye.

Name ONE type of light sensitive cell found in the retina.

(1 mark)

(continued on the next page)

3(b) continued.

- (iv) Explain ONE reason for transplanting stem cells into the retina.
(2 marks)**

(Total for Question 3 = 8 marks)

- 4 (a) Which is the reason why obesity is a non-communicable disease?
(1 mark)

- ☐ A it is spread from person to person
- ☐ B it is caused by a virus
- ☐ C it is not spread from person to person
- ☐ D it lasts for a short time

(continued on the next page)

4 continued.

(b) Several factors affect the risk of developing cardiovascular disease.

Look at FIGURE 7 for Question 4(b) in the Diagram Booklet. It shows different BMI ranges and their weight descriptions.

(continued on the next page)

4(b) continued.

(i) A person has a BMI of 39.0

**Explain the risk of this person developing
cardiovascular disease.**

(2 marks)

(continued on the next page)

4(b) continued.

(ii) Changes in lifestyle can reduce the risk of cardiovascular disease.

State TWO other treatments for cardiovascular disease.

(2 marks)

1 _____

2 _____

(continued on the next page)

4 continued.

(c) Look at FIGURE 8 for Question 4(c) in the Diagram Booklet. It shows the percentage of people who smoked cigarettes in England from 2011 to 2019.

**(i) State the trend shown in the graph from 2011 to 2019.
(1 mark)**

(continued on the next page)

4(c) continued.

- (ii) Give TWO reasons for this change in the number of people smoking cigarettes.
(2 marks)**

1 _____

2 _____

(continued on the next page)

4(c) continued.

**(iii) Draw a line on Figure 8 to show the likely trend in the percentage of people smoking cigarettes from 2019 to 2041.
(1 mark)**

(iv) Smoking cigarettes can increase the risk of people developing cancer.

**Which is the description of cancer?
(1 mark)**

- ☐ **A uncontrolled organ division**
- ☐ **B uncontrolled cell division**
- ☐ **C controlled cell division**
- ☐ **D controlled organ division**

(Total for Question 4 = 10 marks)

- 5 A student investigated the antibiotic properties of garlic.**

Bacteria were spread on an agar plate.

A paper disc was soaked in garlic extract and placed on this agar plate.

Look at FIGURE 9 for Question 5(a) in the Diagram Booklet. It shows the agar plate after 24 hours.

- (a) (i) Suggest why there is an area with no bacterial growth.
(1 mark)**

(continued on the next page)

5(a) continued.

- (ii) The student repeated the investigation using three separate agar plates with different concentrations of garlic extract.**

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

The concentrations of garlic extract used were 10 mg/cm^3 , 40 mg/cm^3 and 100 mg/cm^3 .

Explain which agar plate, shown in Figure 10, has the paper disc containing the 100 mg/cm^3 garlic extract.

(2 marks)

Answer space continues on the next page.

5(a)(ii) continued.

**(iii) Give ONE way the student could improve their results.
(1 mark)**

(continued on the next page)

5(a) continued.

- (iv) The area with no bacterial growth for agar plate B has a radius of 5 mm.**

Calculate the area with no bacterial growth for agar plate B.

The area of a circle is πr^2 .

**Use $\pi = 3.14$
(2 marks)**

area = _____ mm²

(continued on the next page)

5 continued.

(b) Look at FIGURE 11 for Question 5(b) in the Diagram Booklet. It shows bacteria being spread on an agar plate.

**(i) State the reason for heating the spreader in the flame of a Bunsen burner before use.
(1 mark)**

(continued on the next page)

5(b) continued.

- (ii) Give TWO other ways of working safely with microorganisms.
(2 marks)**

1 _____

2 _____

(Total for Question 5 = 9 marks)

6 Figure 12 shows some characteristics of pea plants.

The allele for purple flowers is dominant to the allele for white flowers.

FIGURE 12

flower colour	seed shape
purple	round
white	wrinkled

(a) Which term describes the allele for white flowers?
(1 mark)

- ☐ A heterozygous
- ☐ B homozygous
- ☐ C gamete
- ☐ D recessive

(continued on the next page)

6 continued.

(b) A scientist crossed a pea plant that produced round seeds (Rr) with a pea plant that produced wrinkled seeds (rr).

(i) Look at the Punnett square for Question 6(b) in the Diagram Booklet. Complete the Punnett square.

(2 marks)

(ii) State the percentage of the offspring that will produce round seeds.

(1 mark)

percentage = _____%

(continued on the next page)

6 continued.

- (c) The scientist crossed TWO purple flowering pea plants.**

The offspring were:

- 133 plants with purple flowers**
- 46 plants with white flowers**

- (i) Calculate the ratio of offspring with purple flowers to offspring with white flowers.**

**Give your answer to the nearest whole number.
(2 marks)**

ratio _____ : 1

(continued on the next page)

6(c) continued.

- (ii) Explain why it was possible for this cross to produce some offspring with white flowers. (2 marks)**

(continued on the next page)

6 continued.

(d) The cells in pea plants are diploid.

These cells have 14 chromosomes.

- (i) Explain why pea plant gametes have only seven chromosomes.
(2 marks)**

(continued on the next page)

6(d) continued.

**(ii) Describe what happens at fertilisation.
(2 marks)**

(Total for Question 6 = 12 marks)

- 7 The growth of crop plants, such as wheat, can be improved by the use of fertilisers and the control of pests.**

Look at FIGURE 13 for Question 7 in the Diagram Booklet. It shows the mass of grains produced by wheat plants grown in soil without fertiliser and in soil with fertiliser.

- (a) Give ONE effect on the grains produced, when wheat plants are grown in soil with fertiliser.
(1 mark)**

(continued on the next page)

7 continued.

- (b) Explain why farmers measure the mass of 1000 grains rather than the mass of one wheat grain.
(2 marks)**

(continued on the next page)

7 continued.

(c) Biological control can be used to reduce pest damage on crops.

**(i) Which is the definition of biological control?
(1 mark)**

- ☐ **A using antiseptics to control pests**
- ☐ **B using fertilisers to control pests**
- ☐ **C using predators to control pests**
- ☐ **D using pesticides to control pests**

(continued on the next page)

7(c) continued.

- (ii) Look at FIGURE 14 for Question 7(c)(ii) in the Diagram Booklet. It shows a crop being grown under a clear plastic cover and a crop being grown in a garden.**

Explain why biological control would be more successful when a crop is grown under a clear plastic cover.

(2 marks)

(continued on the next page)

7 continued.

***(d) Look at FIGURE 15 for Question 7(d) in the Diagram Booklet. It shows corn damaged by an insect pest.**

Scientists have genetically modified (GM) corn plants to be

- resistant to insects**
- resistant to weedkillers**

**Explain the advantages and disadvantages of growing GM corn plants.
(6 marks)**

Answer space continues on the next page.

7(d) continued.

[illegible]

(Total for Question 7 = 12 marks)

8 (a) Apple trees show genetic variation.

- (i) State ONE possible cause of genetic variation in apple trees.**
(1 mark)

- (ii) The colour of an apple is an observable characteristic.**

Which is the term for an observable characteristic?
(1 mark)

- ☐ **A gene**
- ☐ **B genotype**
- ☐ **C heterozygous**
- ☐ **D phenotype**

(continued on the next page)

8 continued.

- (b) Name the type of reproduction that produces genetically identical organisms.
(1 mark)**
-
-

- (c) Grafting is a technique used to grow some varieties of apple tree.**

Look at FIGURE 16 for Question 8(c) in the Diagram Booklet. It shows apple tree shoots grafted on to a rootstock.

Grafting can be used to produce apple trees that are genetically identical.

(continued on the next page)

8(c) continued.

**Give ONE advantage and ONE disadvantage of
growing genetically identical apple trees.
(2 marks)**

advantage

disadvantage

(continued on the next page)

Turn over

8 continued.

- (d) As apples ripen, enzymes convert starch into sugars.**

Devise a method to find the optimum pH of an enzyme that breaks down starch.

You may use standard laboratory equipment and the solutions given in the list.

(4 marks)

starch solution

enzyme solution

iodine solution

a range of pH solutions

Answer space continues on the next page.

Turn over

8(d) continued.

(continued on the next page)

8 continued.

(e) The optimum pH of an enzyme is pH 6.

**Explain why this enzyme would not work at pH 10.
(2 marks)**

(Total for Question 8 = 11 marks)

- 9 Look at FIGURE 17 for Question 9(a) in the Diagram Booklet. It shows colonies of bacteria growing on an agar plate.**

Each colony starts as one bacterium.

Every time bacteria reproduce, the number of bacteria in each colony doubles.

- (a) Calculate the number of bacteria in a colony after five hours, if each bacterium reproduces every 30 minutes.
(2 marks)**

_____ bacteria

(continued on the next page)

9 continued.

(b) Some bacteria are pathogens.

**(i) State the meaning of the term pathogen.
(1 mark)**

**(ii) Explain why antibiotics can be used to treat
bacterial infections.
(2 marks)**

(continued on the next page)

Turn over

9(b) continued.

(iii) A rod-shaped bacterium is 0.005 mm long.

A student draws the rod-shaped bacterium.

The bacterium in the drawing is 80 mm long.

**Calculate the magnification of this drawing.
(2 marks)**

magnification = _____

(continued on the next page)

9 continued.

***(c) Look at FIGURE 18 for Question 9(c) in the Diagram Booklet. It shows a bacterial cell and a plant cell.**

**Describe the similarities and differences of a bacterial cell and a plant cell.
(6 marks)**

Answer space continues on the next page.

9(c) continued.

(Total for Question 9 = 13 marks)

- 10 Look at FIGURE 19 for Question 10(a) in the Diagram Booklet. It shows a chart used by opticians to test a person's vision.**

The person's vision is judged by the lowest row of letters they can read.

- (a) (i) An optician tested the eyesight of 240 people.**

35% of these people could read the normal vision row without wearing glasses.

The rest of the people need glasses to correct their vision.

Calculate the number of people who need glasses to correct their vision.

(3 marks)

_____ people

(continued on the next page)

Turn over

10(a) continued.

- (ii) An optician can use the chart to diagnose short-sightedness.**

Give ONE reason why people are short-sighted.

(1 mark)

- (iii) Look at the diagrams for Question 10(a)(iii) in the Diagram Booklet. Which diagram shows how short-sightedness can be corrected?**
(1 mark)

☐ **Diagram A**

☐ **Diagram B**

☐ **Diagram C**

☐ **Diagram D**

(continued on the next page)

10 continued.

(b) Cataracts can affect a person's vision.

Look at FIGURE 20 for Question 10(b) in the Diagram Booklet. It shows what a person with normal vision and a person with cataracts can see for the top letter on the optician's chart.

**(i) Describe why a person with cataracts would see the image shown in Figure 20.
(2 marks)**

(continued on the next page)

10(b) continued.

- (ii) State the treatment for cataracts.
(1 mark)**
-
-

(c) Look at FIGURE 21 for Question 10(c)(i) in the Diagram Booklet. It shows the structure of the brain.

- (i) Which region of the brain is labelled structure X?
(1 mark)**

- ☐ **A cerebellum**
- ☐ **B cerebral hemisphere**
- ☐ **C medulla oblongata**
- ☐ **D spinal cord**

(continued on the next page)

10(c) continued.

- (ii) When a person reacts to a stimulus, messages from the brain are sent to their muscles.**

Describe how messages are sent from the brain to muscles.

(2 marks)

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS
END OF PAPER