

Science (Single Award)  
Biology  
PAPER: 1B

Total Marks
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Friday 7 June 2024 – Afternoon

Time: 1 hour 10 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 60.**

**The marks for EACH question are shown in brackets – use this as a guide as to how much time to spend on each question.**

**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.**

**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 Look at the diagram for Question 1(a) in the Diagram Booklet. It shows part of the human breathing system with structures **P, Q, R, S** and **T** labelled.**

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

☐ **A Q**

☐ **B R**

☐ **C S**

☐ **D T**

**(continued on the next page)**

**1(a) continued.**

**(ii) Which structure is the site of gas exchange?  
(1 mark)**

☐ **A Q**

☐ **B R**

☐ **C S**

☐ **D T**

**(iii) Which two structures have rings of cartilage?  
(1 mark)**

☐ **A P and Q**

☐ **B Q and R**

☐ **C Q and S**

☐ **D S and T**

**(continued on the next page)**

**1 continued.**

- (b) A lung condition called pneumothorax can develop if the chest wall is punctured.**

**Look at the diagram for Question 1(b) in the Diagram Booklet. It shows healthy lungs and a pneumothorax.**

- (i) Give one difference between the healthy lung and the lung in pneumothorax.**  
**(1 mark)**

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**(continued on the next page)**

**1(b) continued.**

- (ii) Comment on the effects of pneumothorax on the processes of breathing and gas exchange.**

**Use information from the diagram and your own knowledge.**

**(4 marks)**

**Answer space continues on the next page.**

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**1(b)(ii) continued.**

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**(Total for Question 1 = 8 marks)**

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**2 Look at the diagram for Question 2(a) in the Diagram Booklet. It shows part of a food web from a desert.**

**(a) (i) Which of these organisms is a primary consumer in this food web?  
(1 mark)**

- ☐ **A cactus**
- ☐ **B lizard**
- ☐ **C rabbit**
- ☐ **D tarantula**

**(ii) Which of these organisms is both a secondary consumer and a tertiary consumer in this food web?  
(1 mark)**

- ☐ **A lizard**
- ☐ **B rabbit**
- ☐ **C rattlesnake**
- ☐ **D tarantula**

**(continued on the next page)**



**2 continued.**

**(b) A disease develops in the rabbit population which results in a decrease in the number of rabbits.**

**(i) Explain what effect this decrease in the number of rabbits would have on the population of hawks.**

**(2 marks)**

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**(continued on the next page)**

**2(b) continued.**

- (ii) The rabbit immune system responds to infection in a similar way to the human immune system.**

**Describe the response of the immune system of the rabbit to a bacterial infection.  
(4 marks)**

**Answer space continues on the next page.**

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**2(b)(ii) continued.**

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**(Total for Question 2 = 8 marks)**

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**3 Look at the diagram for Question 3 in the Diagram Booklet. A teacher uses this method to show that carbon dioxide is required for photosynthesis.**

- **step 1** destarch a potted plant by placing it in a dark place for 48 hours
- **step 2** cover the soil in the plant pot with a rubber sheet
- **step 3** use a rubber band to hold the rubber sheet in position
- **step 4** place the destarched plant in a bell jar
- **step 5** place a small beaker of potassium hydroxide solution in the bell jar
- **step 6** make sure the bell jar has an airtight seal
- **step 7** shine a light on the potted plant for 6 hours
- **step 8** remove a leaf from the plant
- **step 9** test the leaf for starch

**(continued on the next page)**

**3 continued.**

- (a) (i) State the function of the potassium hydroxide solution.  
(1 mark)**

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- (ii) Explain the reason for covering the soil of the potted plant in step 2  
(2 marks)**

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**(continued on the next page)**

**3 continued.**

**(b) Give the reason for step 6 in the teacher's method.  
(1 mark)**

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**(c) Describe how the teacher could safely test the leaf  
for starch in step 9  
(4 marks)**

**Answer space continues on the next page.**

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**3(c) continued.**

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**3 continued.**

- (d) The teacher needs to set up a control for this experiment.**

**Describe a suitable control experiment.  
(2 marks)**

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**(Total for Question 3 = 10 marks)**

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- 4 Look at the diagram for Question 4(a) in the Diagram Booklet. It shows the human heart with some blood vessels.

(a) Name the blood vessels labelled **W**, **X**, **Y** and **Z**.  
(4 marks)

**W** \_\_\_\_\_

\_\_\_\_\_

**X** \_\_\_\_\_

\_\_\_\_\_

**Y** \_\_\_\_\_

\_\_\_\_\_

**Z** \_\_\_\_\_

\_\_\_\_\_

(continued on the next page)

**4 continued.**

**(b) Give the function of the septum.  
(1 mark)**

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**(continued on the next page)**

**4 continued.**

- (c) Scientists produced a report that looked at the link between smoking, heart disease and strokes.**

**A stroke happens when the blood supply to part of the brain is reduced.**

**The scientists used data from 140 different studies, so included many patients.**

**They calculated the risk factor for developing heart disease and the risk factor for having strokes in men and women.**

**They did this for men and women who smoked one cigarette a day and for men and women who smoked 20 cigarettes a day.**

**A risk factor of 2·0 would mean that a person is twice as likely to develop the condition.**

**Look at the table for Question 4(c) in the Diagram Booklet. It shows their results.**

**(continued on the next page)**

**4(c) continued.**

- (i) Calculate the percentage increase in the risk factor for developing heart disease in men who smoke 20 cigarettes per day compared with men who smoke one cigarette per day. (2 marks)**

**increase = \_\_\_\_\_%**

**(continued on the next page)**

**4(c) continued.**

**(ii) A newspaper article claimed**

**‘The scientists’ report proves that it is better to quit smoking entirely rather than cutting down in order to reduce the risk of these two diseases.’**

**Discuss the newspaper’s claim.**

**Refer to information about the report and the data in the table in your answer.**

**(5 marks)**

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**4(c)(ii) continued.**

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**Turn over**

**4(c)(ii) continued.**

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**(Total for Question 4 = 12 marks)**

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- 5 Look at the image for Question 5 in the Diagram Booklet. It shows a corn cob with different coloured kernels.**

**A single corn cob can have as many as 200 kernels.**

**If planted, each kernel can grow into a new corn plant.**

**The colours of the corn kernels are inherited from the parent plants.**

**The colour of the kernel is determined by a single gene with two alleles. The allele **P** codes for purple kernel and the allele **p** codes for yellow kernel.**

**In a first cross a plant grown from a purple kernel is crossed with a plant grown from a yellow kernel.**

**All the kernels produced are purple.**

**In a second cross one of the offspring from the first cross is allowed to self-pollinate.**

**(continued on the next page)**



**5 continued.**

**(a) Use a genetic diagram to show the second cross including the**

- **phenotypes and genotypes of the parents**
- **gametes**
- **genotypes and phenotypes of the offspring**

**(4 marks)**

**5 continued.**

**(b) This second cross was repeated several times.**

**The offspring had cobs with a total of  
1915 kernels.**

**The cobs had 1453 purple kernels.**

**Calculate the ratio of purple to yellow kernels.**

**Express your answer as **N : 1****

**(2 marks)**

**ratio = \_\_\_\_\_ : 1**

**(continued on the next page)**

**5 continued.**

**(c) Scientists expected an exact ratio of 3 : 1**

**If this exact ratio was observed, calculate the expected number of purple kernels out of the 1915 produced.**

**(2 marks)**

**number of purple kernels = \_\_\_\_\_**

**(continued on the next page)**

**5 continued.**

- (d) Explain why the number of purple kernels observed is not the same as the expected number of purple kernels.  
(2 marks)**

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**(Total for Question 5 = 10 marks)**

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**6 Genetically modified plants can be used to improve crops.**

**(a) Describe how named enzymes can be used to produce a genetically modified plant.  
(4 marks)**

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**6(a) continued.**

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**6 continued.**

**(b) The plants produced are described as transgenic.**

- (i) State what is meant by the term TRANSGENIC.  
(1 mark)**

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- (ii) Give an example of how genetically modifying a plant has resulted in improved food production.  
(1 mark)**

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

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**7 Breathing rate and heart rate are often related.**

**Design an investigation to find out if a change in breathing rate also produces a change in heart rate.**

**Include experimental details in your answer and write in full sentences.**

**(6 marks)**

**Answer space continues on the next 2 pages.**

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**7 continued.**

[illegible]

**Turn over**

**7 continued.**

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**(Total for Question 7 = 6 marks)**

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**TOTAL FOR PAPER = 60 MARKS**  
**END OF PAPER**