Z

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

AS
BIOLOGY

PAPER 2

7401/2

Tuesday 7 June 2016 Afternoon

Time allowed: 1 hour 30 minutes

For this paper you must have:
- **a ruler with millimetre measurements**
- **a calculator, which you are expected to use where appropriate.**

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

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INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write on blank pages.**
- **All working must be shown.**
- **Do all work in this book. Cross through any work you do not want to be marked.**

INFORMATION

- **The marks for questions are shown in brackets.**
  The maximum mark for this paper is 75.

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

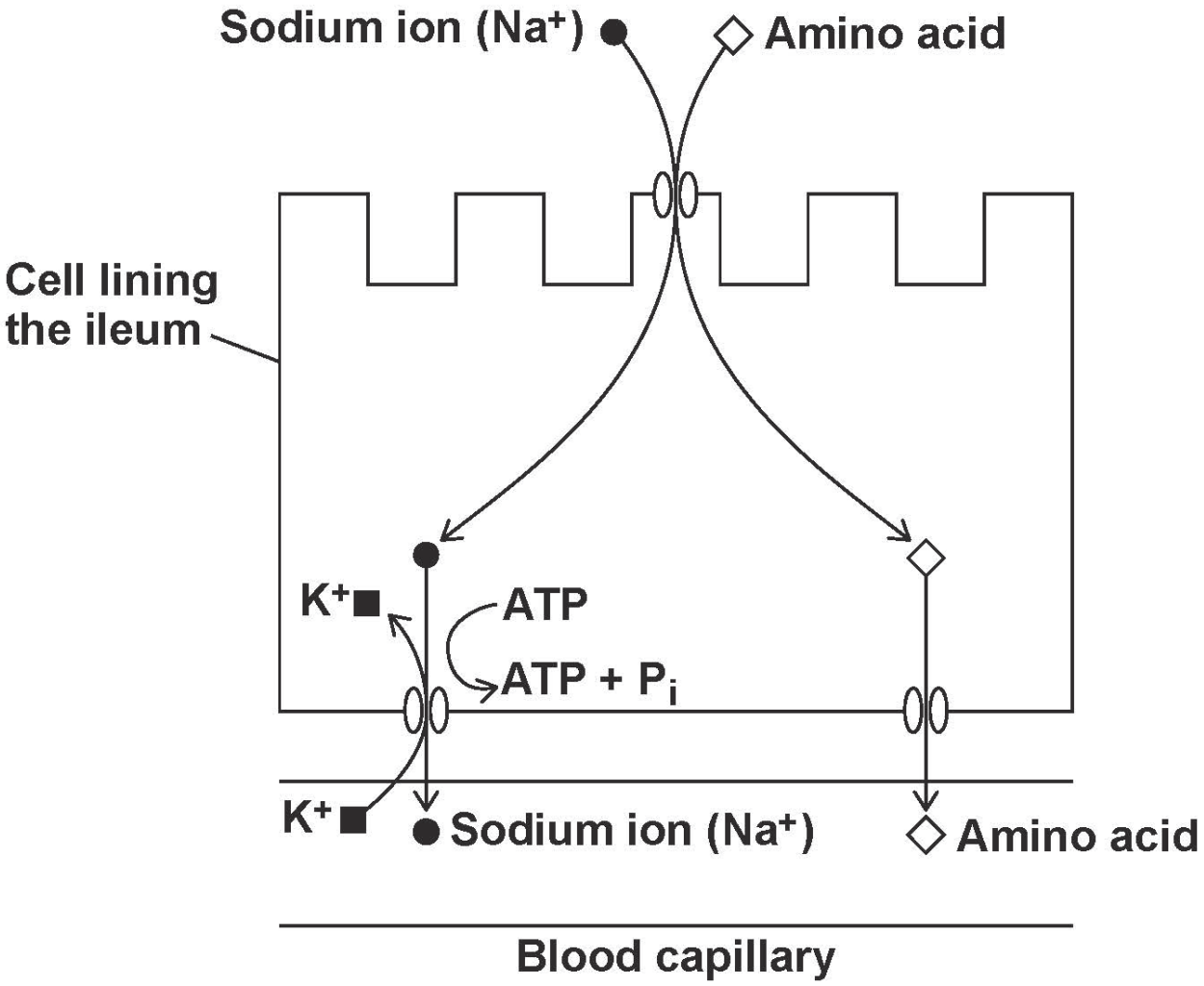
0 1 . 1 **Endopeptidases and exopeptidases are involved in the hydrolysis of proteins.**

Name the other type of enzyme required for the complete hydrolysis of proteins to amino acids. [1 mark]

0 1 . 2 **Suggest and explain why the combined actions of endopeptidases and exopeptidases are more efficient than exopeptidases on their own. [2 marks]**

0 1 . 3 **Figure 1 shows the co-transport mechanism for the absorption of amino acids into the blood by a cell lining the ileum.**

FIGURE 1



The addition of a respiratory inhibitor stops the absorption of amino acids.

Use Figure 1 to explain why. [3 marks]

[Turn over]

0 2 **A student investigated the distribution of stomata on leaves from two species of plant. She removed small pieces from the lower surface of the leaves of each plant species. She mounted these pieces on separate microscope slides. She then counted the number of stomata in several parts of the epidermis on each piece of leaf tissue using an optical microscope.**

0 2 . 1 **Suggest appropriate units the student should use to compare the distribution of stomata on leaves. [1 mark]**

0 2 . 2 **The pieces of leaf tissue examined were very thin.**

Explain why this was important. [2 marks]

0 2 . 3 **Give TWO reasons why it was important that the student counted the number of stomata in several parts of each piece of leaf tissue.**
[2 marks]

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0 2 . 4 One of the two plant species used by the student in this investigation was a xerophyte.

Other than the distribution of stomata, suggest and explain TWO xerophytic features the leaves of this plant might have. [2 marks]

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[Turn over]

0 2 . 5 **The student then compared the rate of transpiration (evaporation of water) from the two species of plant. She did this by measuring the rate of water uptake by each plant species.**

Suggest TWO reasons why the rate of water uptake by a plant might not be the same as the rate of transpiration. [2 marks]

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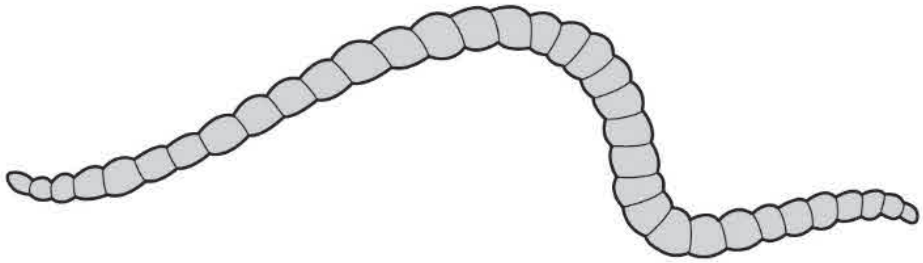
0 3 **Tubifex worms are small, thin animals that live in water. They have no specialised gas exchange or circulatory system.**

Figure 2 shows a tubifex worm.

FIGURE 2



0 3 . 1 **Name the process by which oxygen reaches the cells inside the body of a tubifex worm. [1 mark]**

_____

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_____

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0 3 . 2 **Using the information provided, explain how two features of the body of the tubifex worm allow efficient gas exchange. [2 marks]**

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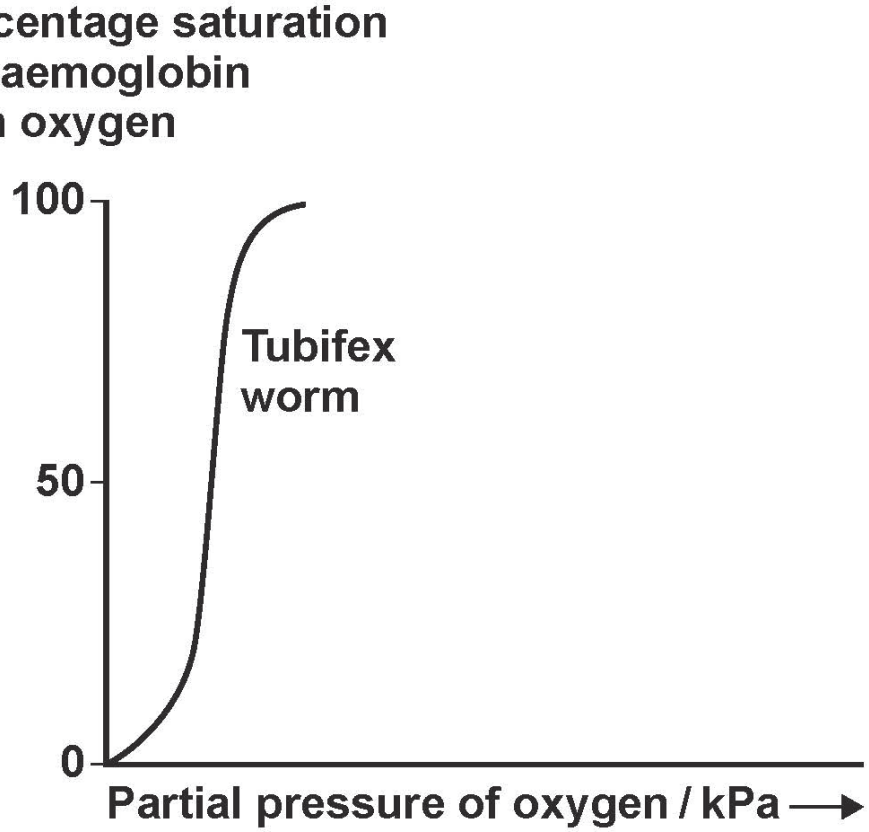
[Turn over]

0 3 . 3 Most species of tubifex worms live at the bottom of ponds, lakes and rivers where the partial pressure of oxygen is low. Pollution of water by sewage can cause the partial pressure of oxygen to fall below 0.2 kPa.

Figure 3 shows the oxyhaemoglobin dissociation curve for a species of tubifex worm found in a river polluted with sewage.

FIGURE 3



The species of tubifex worm in Figure 3 has 50% saturation of their haemoglobin with oxygen at 0.08 kPa.

Explain how this enables this species to survive in water polluted with sewage.
[2 marks]

0 3 . 4 **Species of tubifex worm that live in ponds, lakes and rivers cannot survive in seawater.**

Use your knowledge of water potential to explain why they cannot survive in seawater. [2 marks]

0 4 **Scientists investigated the effect of different types of animal farming on the diversity and number of dung beetles. They determined the number of dung beetle species and their total number on intensive (I), rough grazing (R) and organic (O) farms.**

Figure 4 and Figure 5 show some of their results.

FIGURE 4

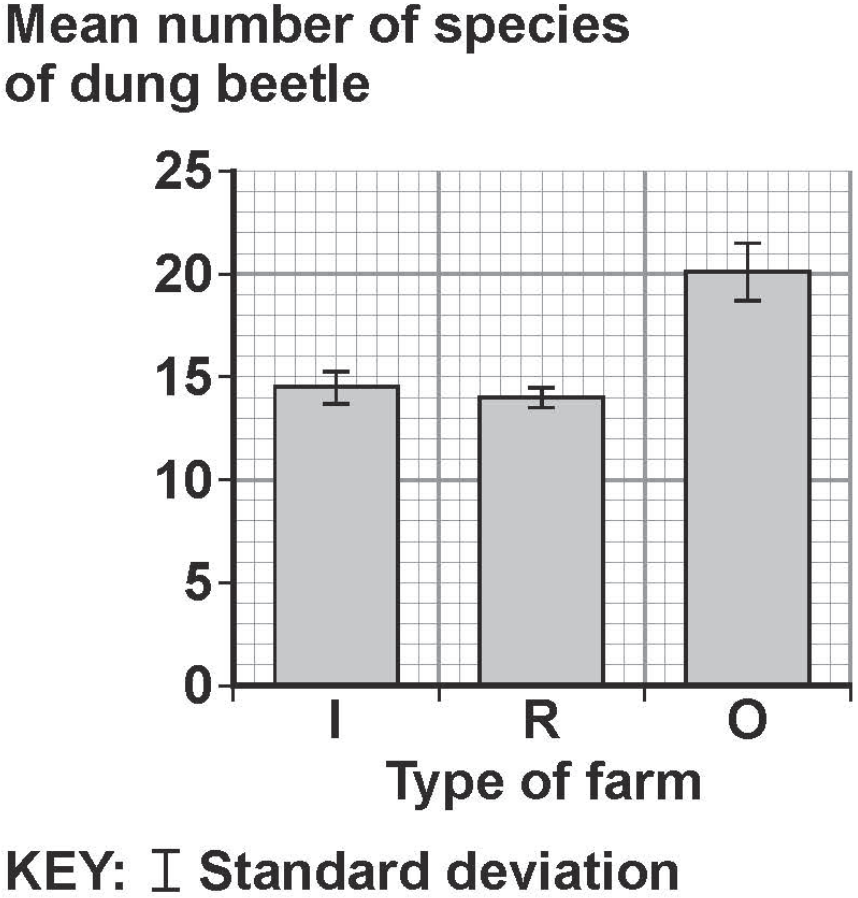
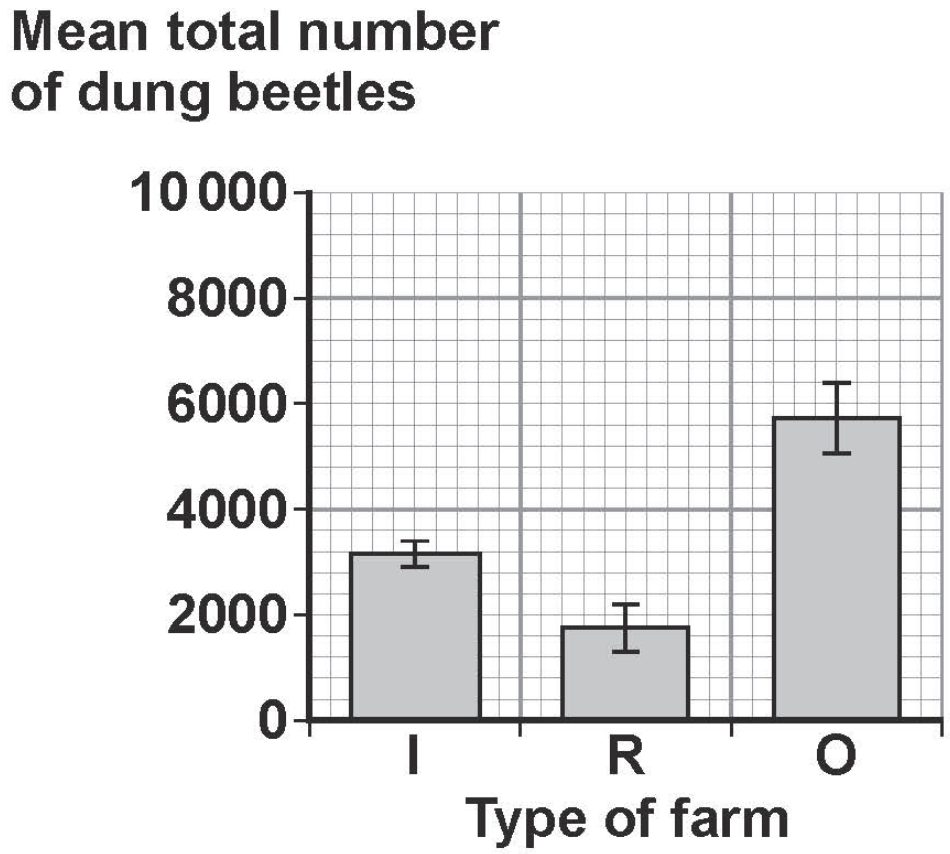


FIGURE 5



0 4 . 1 **What is the mean species richness for dung beetles on the rough grazing farms?**
[1 mark]

0 4 . 2 **In addition to the information provided in Figures 4 and 5, what other measurement is required to calculate an index of diversity for dung beetles? [1 mark]**

0 4 . 3 **Explain what the standard deviations suggest about the difference in mean total number of dung beetles between the different types of farm. [2 marks]**

0 4 . 4 **The scientists placed traps to collect the dung beetles at sites chosen at random.**

Explain the importance of the sites being chosen at random. [1 mark]

0 4 . 5 **On the intensive farms, the farmers had removed hedges to increase land for grazing. This resulted in a decrease in the diversity of birds on these farms.**

Explain why the removal of hedges caused a decrease in the diversity of birds. [3 marks]

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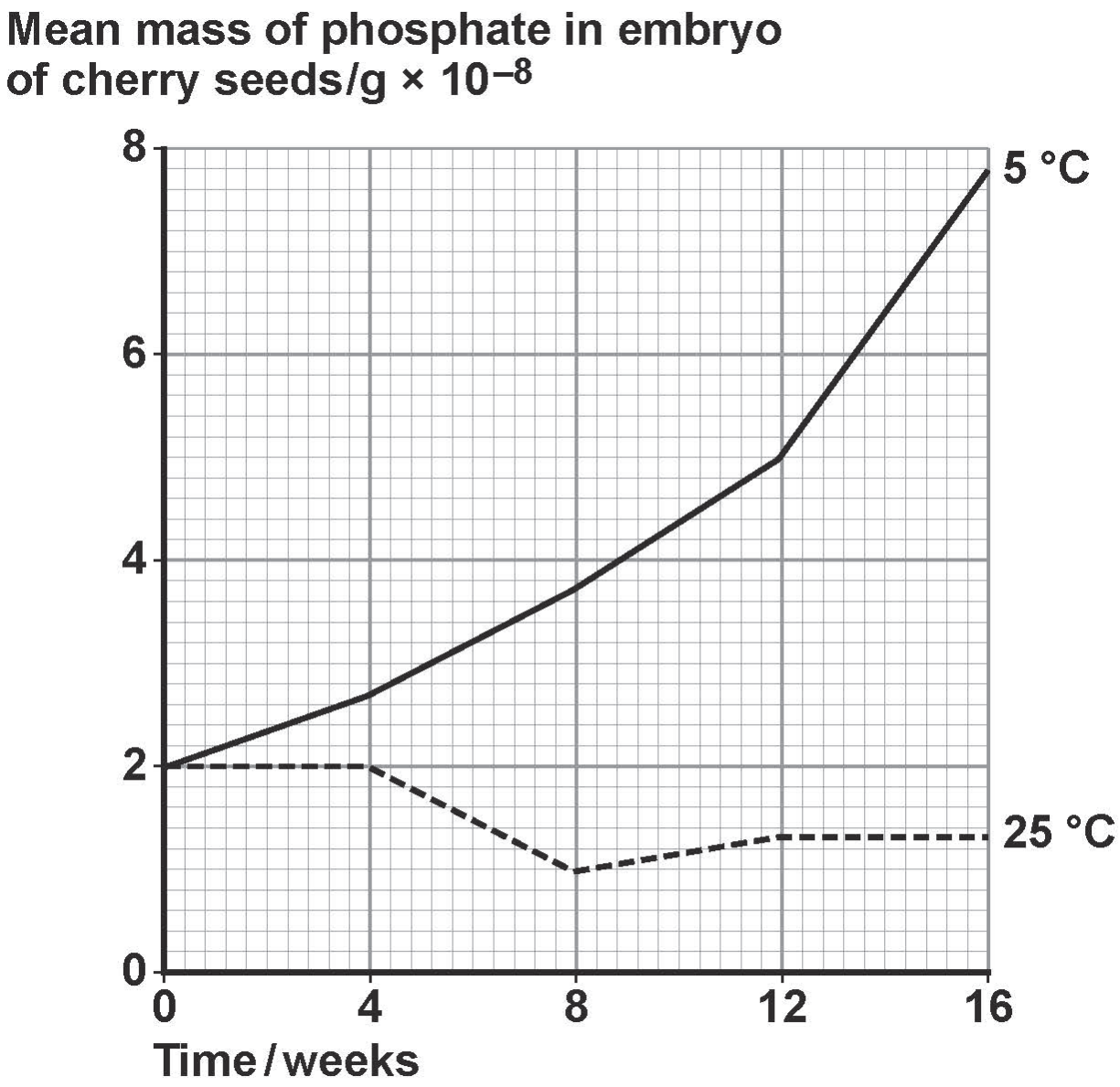
0 5 **The seeds of some plant species require chilling (exposure to low temperatures) before the embryos they contain grow into plants. During chilling, storage molecules in the seed that contain phosphate are broken down and phosphates are transported to the embryo. Scientists investigated the change in the mass of phosphate in the embryos of cherry seeds exposed to two different temperatures for 16 weeks.**

Figure 6 shows their results.

FIGURE 6


Mean mass of phosphate in embryo of cherry seeds/g × 10⁻⁸
8
6
4
2
0
0
4
8
12
16
Time / weeks
5 °C
25 °C

0 5 . 1 **Phospholipids are one of the storage molecules found in cherry seeds.**

Name the type of reaction used to break down phospholipids to release phosphate. [1 mark]

0 5 . 2 **The scientists concluded that an increase in phosphate in the embryo was linked to growth of the embryo.**

Suggest TWO reasons why an increase in phosphate can be linked to growth of the embryo. [2 marks]

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0 5 . 3 **Calculate the ratio of the mean mass of phosphate found at 5 °C to the mean mass of phosphate found at 25 °C after 9 weeks of chilling. [1 mark]**

Ratio = _____

0 5 . 4 **The chilling requirement of seeds of certain plant species is considered to be an adaptation for survival in countries with seasonal changes in environmental conditions.**

Suggest how this adaptation may enable these plant species to survive and respond to seasonal changes. [3 marks]

[Turn over]

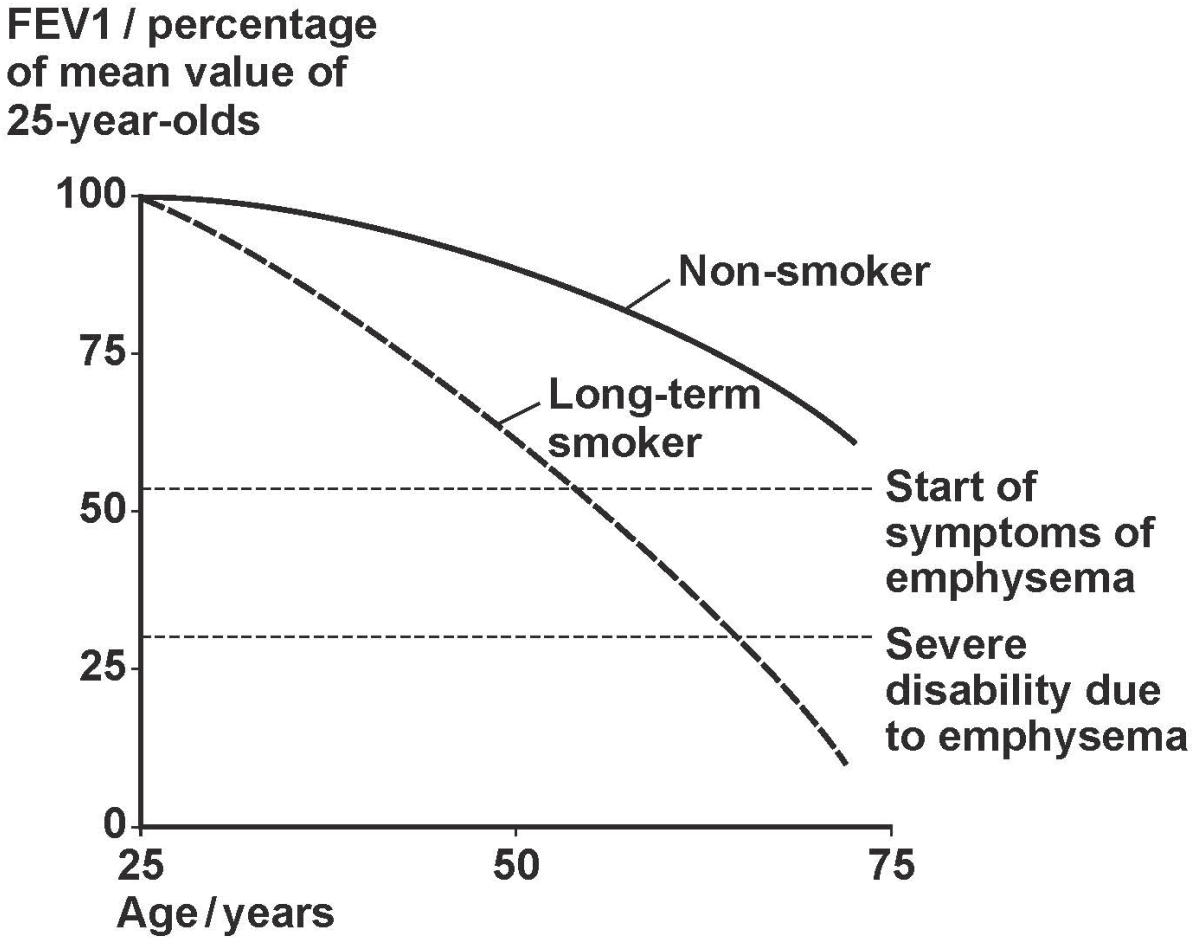
0 6 Forced expiration volume (FEV1) is the volume of air a person can breathe out in 1 second.

Emphysema is a lung disease which results in a reduction in FEV1. Emphysema is mainly caused by long-term cigarette smoking.

Scientists investigated the effects of ageing and long-term cigarette smoking on FEV1 and on the development of emphysema.

Figure 7 shows their results.

Figure 7



0 6 . 1 **Scientists determined the mean FEV1 value of 25-year-olds in the population.**

Suggest TWO precautions that should have been taken to ensure that this mean FEV1 value was reliable. [2 marks]

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[Turn over]

0 6 . 2 **Explain the importance of determining a mean FEV1 value of 25-year-olds in this investigation. [2 marks]**

0 6 . 3 **The mean FEV1 value of non-smokers decreases after the age of 30.**

Use your knowledge of ventilation to suggest why. [1 mark]

0 6 . 4 **One of the severe disabilities that results from emphysema is that walking upstairs becomes difficult.**

Explain how a low FEV1 value could cause this disability. [3 marks]

0 7 . 1 **HIV attaches to a specific protein receptor on helper T cells. A low percentage of people have a mutation of the CCR5 gene which codes for this protein receptor. This mutation results in a non-functional protein receptor.**

Explain how this mutation can result in the production of a non-functional protein receptor. [4 marks]

0 7 . 2 **People with the CCR5 mutation show a greater resistance to developing AIDS.**

Explain why. [2 marks]

0 7 . 3 **The frequency of the CCR5 mutation is highest in Europe. Scientists have collected data on the history and number of HIV infections in Europe. Using these data, scientists have concluded that the high frequency of the CCR5 mutation is not due to natural selection in response to HIV.**

Suggest TWO reasons why scientists reached this conclusion. [2 marks]

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2 _____

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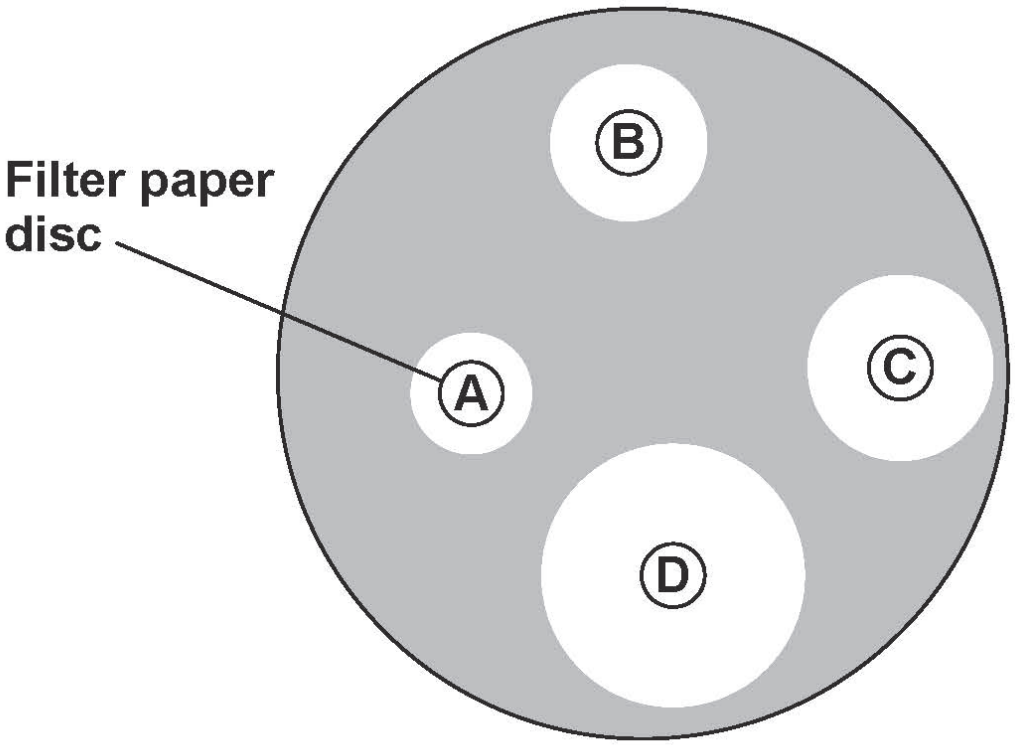
[Turn over]

0 8 **A student investigated the effectiveness of four different concentrations, A, B, C and D, of the same disinfectant on the growth of a bacterium. He grew a culture of this bacterium on nutrient agar (a solid growth medium) in a Petri dish. The student then cut out four filter paper discs and soaked each disc in one of the four concentrations. He then placed the discs on the nutrient agar in the Petri dish. He then left the Petri dish at 25 °C for 24 hours.**

Figure 8 shows the appearance of the Petri dish after 24 hours.

FIGURE 8



0 8 . 1 **Explain why there is a clear zone around each paper disc. [1 mark]**

0 8 . 2 **The student researched information on this disinfectant prior to carrying out his investigation. On the basis of this research, the student used a maximum concentration of disinfectant of 40%.**

Use Figure 8 to explain why. [1 mark]

0 8 . 3 **Suggest TWO variables the student should control in using the filter paper discs in this investigation. [2 marks]**

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0 8 . 4 **Use the areas of the clear zones in Figure 8, on page 38, to determine how many times more effective concentration D is than concentration B. Show your working.**
[2 marks]

Answer = _____

[Turn over]

0 9 **Table 1 shows the volume of blood in a woman's left ventricle at different times during one second.**

TABLE 1

Time / seconds	Volume of blood in left ventricle / cm3
0.0	112
0.1	120
0.2	95
0.3	65
0.4	50
0.5	55
0.6	82
0.7	90
0.8	100
0.9	112
1.0	120

0 9 . 1 **Use Table 1 to calculate the heart rate in beats per minute.**

Tick (✓) one box next to the correct answer.
[1 mark]

60 ☐

66.7 ☐

75 ☐

85.7 ☐

[Turn over]

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0 9 . 2 **The stroke volume is the volume of blood pumped out of the left ventricle during one cardiac cycle.**

Use Table 1 to determine the stroke volume. [1 mark]

Stroke volume = _____ cm^3

[Turn over]

0 9 . 3 **Some people produce a much higher ventricular blood pressure than normal. This can cause tissue fluid to build up outside the blood capillaries of these people.**

Explain why. [2 marks]

0 9 . 4 **Some drugs used to reduce high ventricular blood pressure cause widening of blood vessels.**

Suggest how widening of blood vessels can reduce ventricular blood pressure. [2 marks]

1 0 . 1 **Describe how the structures of starch and cellulose molecules are related to their functions. [5 marks]**

1 0 . 2 **Describe the processes involved in the transport of sugars in plant stems.**
[5 marks]

END OF QUESTIONS

There are no questions printed on this page