Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
BIOLOGY

Foundation Tier Paper 1F

F

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have: •a ruler
•a scientific calculator.

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer all questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

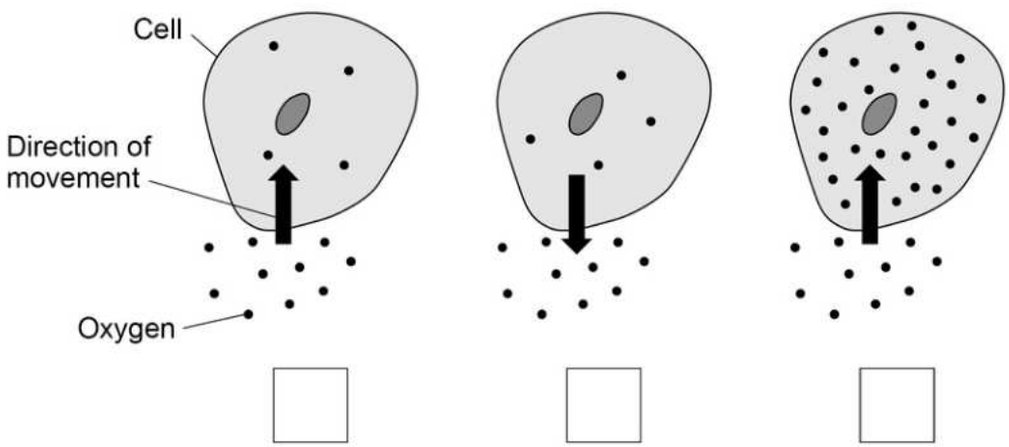
Do not write outside the box

Answer all questions in the spaces provided.

0 1 This question is about cells.

0 1 . 1 Which diagram shows oxygen moving by diffusion? Tick (✓) one box.

[1 mark]



0 1 . 2 Complete the sentences.

Choose answers from the box.

[3 marks]

carbon dioxide	chlorophyll	energy
light	mineral ions	water

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb _____ .

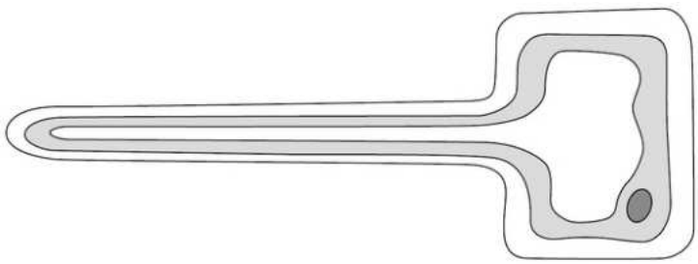
Plant cells use active transport to absorb _____ .

Active transport moves substances against the concentration gradient and needs . _____

Do not write outside the box

Figure 1 shows a specialised cell that absorbs substances from the soil.

Figure 1



0 1 . 3 Name the type of specialised cell in Figure 1 .

[1 mark]

0 1 . 4 Describe how the cell inFigure 1 is adapted to increase the absorption of substances from the soil.

[1 mark]

Question 1 continues on the next page

A sperm cell is another specialised cell.

Figure 2 shows a sperm cell.

Figure 2

0 1 . 5 Draw one line from each feature to how the feature helps the sperm cell carry out its function.

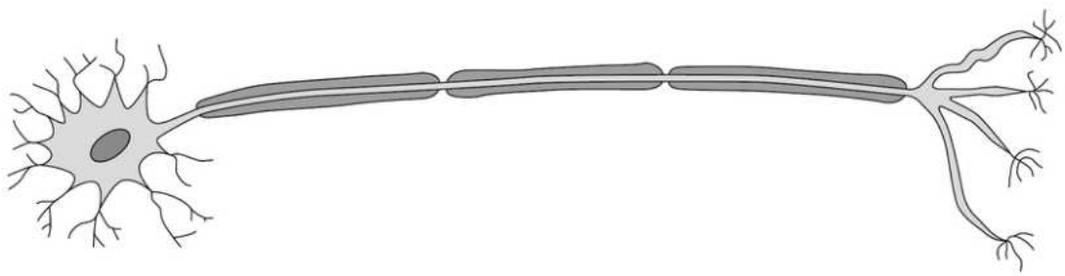
[2 marks]

Feature of sperm cell	How the feature helps
Contains a nucleus	To break the outer layer of the egg
Has a long tail	To help the cell to swim to the egg
	To provide the chromosomes for fertilisation
	To release energy

Do not write outside the box

Figure 3 shows another specialised cell.

Figure 3



0 1 . 6 Name the type of cell in Figure 3.

Describe one feature of the cell that helps it to carry out its function.

[2 marks]

Name of the cell _____

Feature of the cell _____

_____

10

Turn over for the next question

Do not write outside the box

0 2 Viruses cause disease.

0 2 . 1 What name is given to microorganisms that cause disease? Tick (✓) one box. [1 mark]

- Pathogens ☐
- Predators ☐
- Prokaryotes ☐

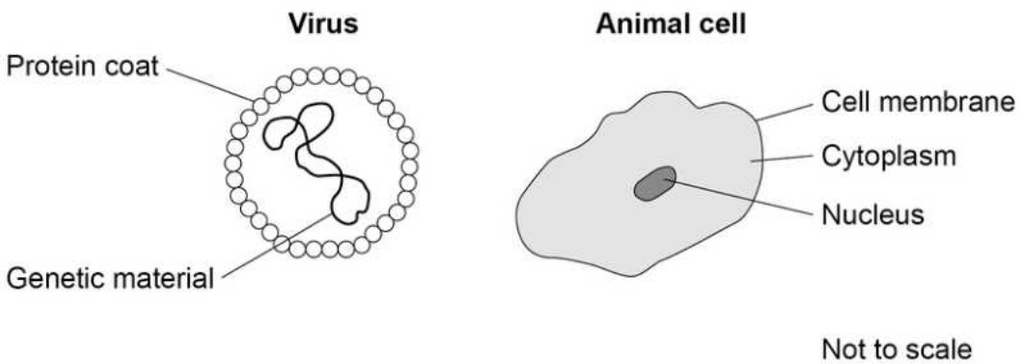
0 2 . 2 How do viruses cause the symptoms of disease? Tick (✓) one box. [1 mark]

- Viruses engulf white blood cells, destroying them. ☐
- Viruses produce antibodies that damage tissues. ☐
- Viruses reproduce inside cells, damaging them. ☐

Do not write outside the box

Figure 4 shows a virus and an animal cell.

Figure 4



0 2 . 3 Suggest one reason why viruses are not classed as cells.

[1 mark]

A vaccine can protect humans from a viral disease.

0 2 . 4 What does the vaccine contain?

Tick (✓) one box.

[1 mark]

A toxic form of a virus ☐

A weakened form of a virus ☐

An active form of a virus ☐

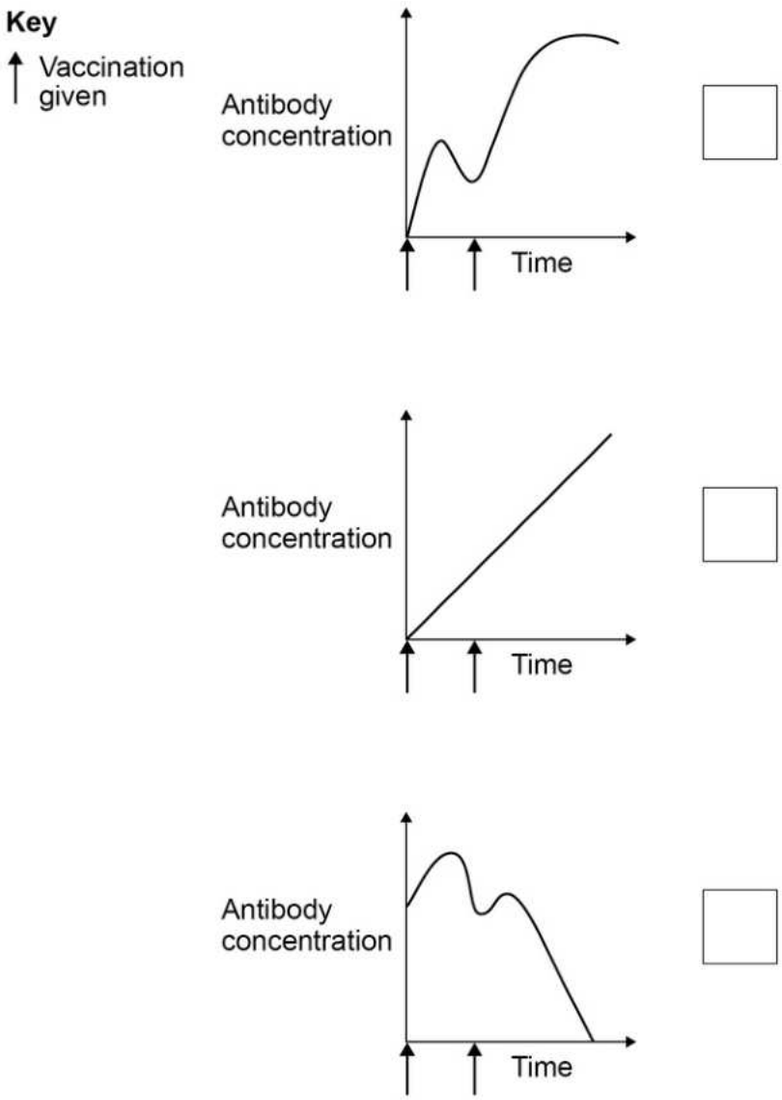
Question 2 continues on the next page

In some cases, a first vaccination needs to be followed by a second vaccination some time later.

0 2 . 5 Which graph shows how the concentration of antibodies in a person's blood changes after the first and second vaccinations?

[1 mark]

Tick (✓) one box.



Do not write outside the box

Tobacco mosaic virus (TMV) causes disease in plants.

TMV affects the rate of photosynthesis in plants.

0 2 . 6 Which part of a plant shows discolouration caused by TMV? Tick (✓) one box. [1 mark]

Flower ☐

Leaf ☐

Root ☐

Question 2 continues on the next page

Table 1 shows the rate of photosynthesis in four different tobacco plants.

Table 1

Tobacco plant	Level of TMV infection in plant	Rate of photosynthesis in arbitrary units
A	None	15
B	Mild	13
C	Medium	7
D	High	3

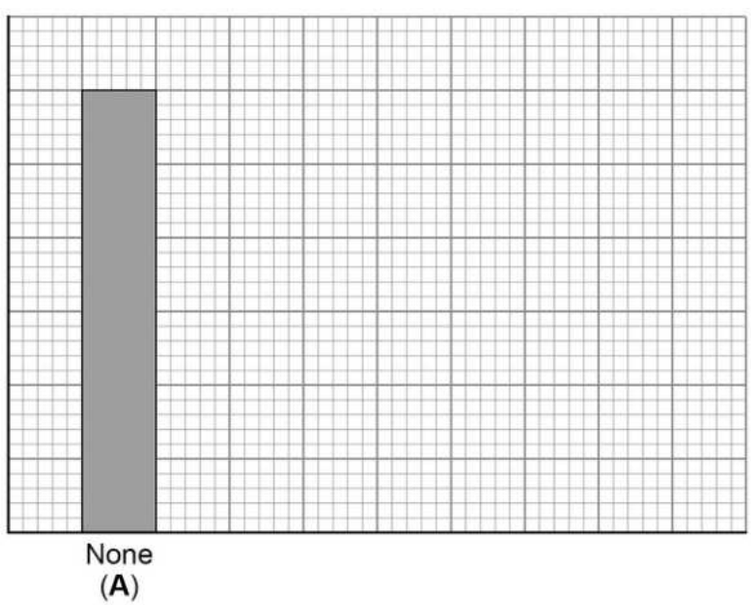
0 2 . 7 Complete Figure 5.

You should:

- label the y-axis
- add the correct scale to the y-axis
- plot the data from Table 1
- label each bar.

[5 marks]

Figure 5



Do not write outside the box

0 2 . 8 What conclusion can be made from the data in Table 1?

[1 mark]

0 2 . 9 Explain why a high level of TMV infection reduces growth in a plant.

[2 marks]

14

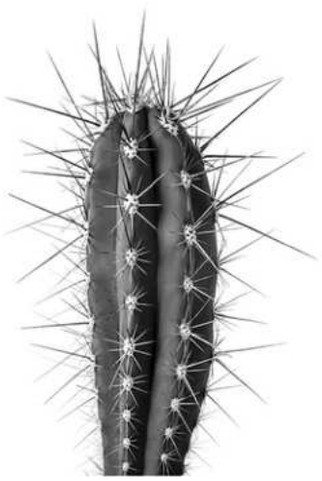
Turn over for the next question

Do not write outside the box

0 3 A cactus is a plant that lives in a dry environment.

Figure 6 shows part of a cactus plant.

Figure 6



0 3 . 1 Give one adaptation shown in Figure 6 that helps to prevent the cactus from being eaten by animals.

[1 mark]

0 3 . 2 A plant may produce poisons that make animals unwell.

What is this type of defence mechanism?

[1 mark]

Tick (☒) one box.

Chemical ☐

Mechanical ☐

Physical ☐

Do not write outside the box

0 3 . 3 Some desert plants only grow leaves after it has rained.

As soon as the soil dries out, the leaves fall off.

How could the leaves falling off the plant be an advantage to a plant that lives in a dry environment?

[1 mark]

Tick (☒) one box.

The plant is less likely to reproduce. ☐

The plant will not lose as much water. ☐

The plant will photosynthesise faster. ☐

The stem of a cactus is green.

0 3 . 4 What causes the green colour in the stem?

[1 mark]

0 3 . 5 What is the advantage to the cactus of having a green stem?

[1 mark]

Question 3 continues on the next page

Do not write outside the box

The stem of a cactus contains many different tissues.

0 3 . 6 What name is given to a group of tissues working together? Tick (✓) one box. [1 mark]

Organ ☐

Organism ☐

Organ system ☐

0 3 . 7 Name one substance transported through the xylem in the stem of the cactus. [1 mark]

0 3 . 8 Name the tissue that transports dissolved sugars through the stem of the cactus. [1 mark]

8

Do not write outside the box

0 4 Carbohydrates are needed as part of a balanced diet.

0 4 . 1 Which formula shows glucose?

[1 mark]

Tick (✓) one box.

- C6H12O6 ☐
- CO2 ☐
- H2O ☐
- O2 ☐

0 4 . 2 Which type of enzyme breaks down starch?

[1 mark]

Tick (✓) one box.

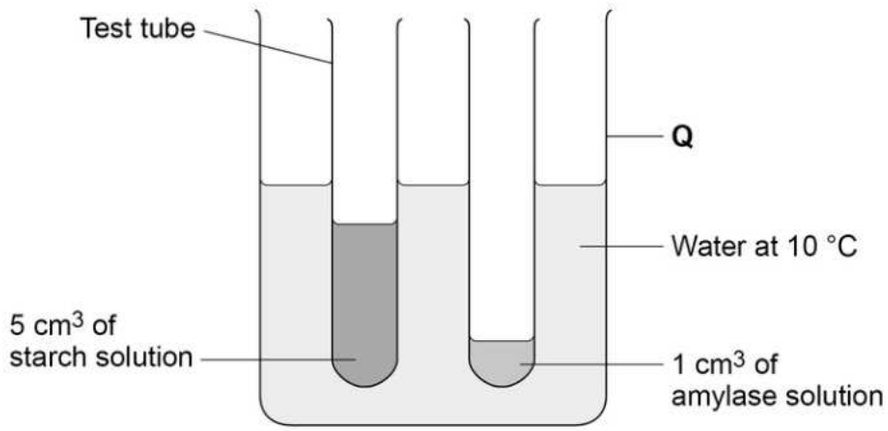
- Carbohydrase ☐
- Lipase ☐
- Protease ☐

Question 4 continues on the next page

A student investigated the effect of temperature on the activity of the enzyme amylase.

Figure 7 shows the apparatus used.

Figure 7



This is the method used.

1. Set up the apparatus as shown in Figure 7.

2. After 5 minutes, pour the starch solution into the amylase solution and mix.

3. Remove one drop of the amylase-starch solution mixture and place onto a spotting tile.

4. Immediately add two drops of iodine solution to the amylase-starch solution mixture on the spotting tile.

5. Record the colour of the iodine solution added to the amylase-starch solution mixture.

6. Repeat steps 3 to 5 every minute until the iodine solution is yellow-brown.

0 4 . 3 Name apparatus Q in Figure 7 .

[1 mark]

Do not write outside the box

0 4 . 4 Why were the starch solution and the amylase solution left for five minutes before mixing them together?

[1 mark]

Tick (☒) one box.

So that both solutions could reach 10 °C ☐

So that the student could calculate a mean ☐

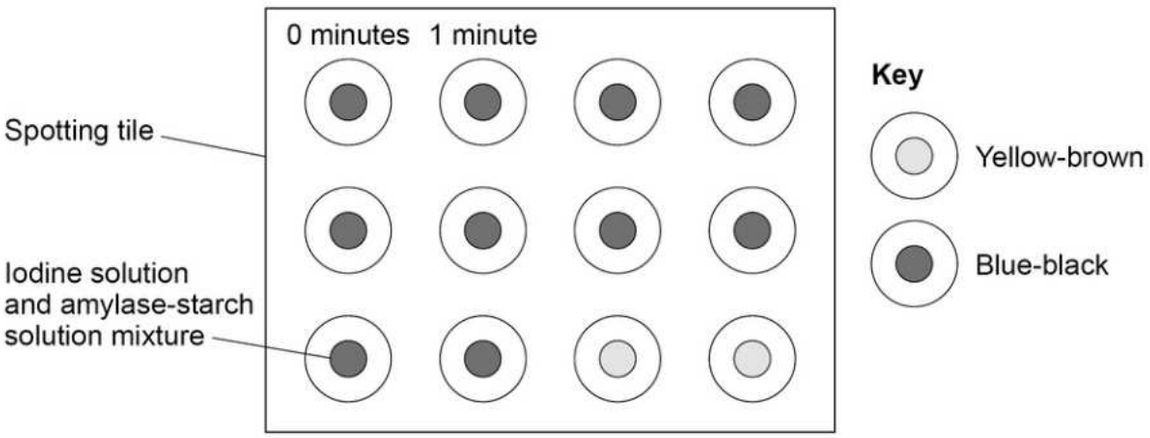
So that the student could repeat the investigation ☐

So that the student had time to draw a table of results ☐

Question 4 continues on the next page

Figure 8 shows the results.

Figure 8



0 4 . 5 How many minutes did it take until the iodine solution and amylase-starch solution mixture was yellow-brown?

Use Figure 8.

[1 mark]

_____ minutes

0 4 . 6 How could a more accurate time be obtained? Tick

[1 mark]

(✓) one box.

Add more iodine solution to the spotting tile. ☐

Test the mixture with iodine solution every 30 seconds. ☐

Test the mixture with iodine solution for more time. ☐

Use two drops of amylase-starch solution mixture in each test. ☐

Do not write outside the box

The student repeated the investigation at five different temperatures.

Table 2 shows the results.

Table 2

Temperature in °C	Time taken until iodine solution and mixture was yellow-brown in minutes
20	5
35	2
50	7
65	12
80	Remained blue-black

0 4 . 7 Which temperature did the enzyme work quickest at?

[1 mark]

Tick (✓) one box.

20 °C ☐

35 °C ☐

50 °C ☐

65 °C ☐

0 4 . 8 Explain why the iodine solution remained blue-black in the investigation at 80 C. °

[2 marks]

9

Turn over ►

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ANSWER IN THE SPACES PROVIDED

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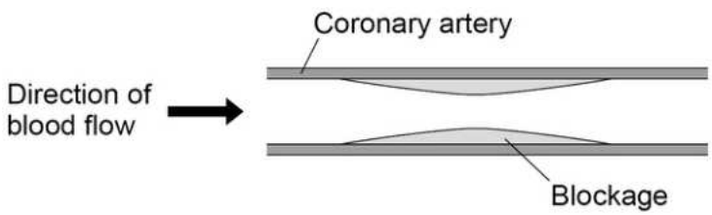
0 5 A high cholesterol concentration in the blood can lead to blockages inside arteries. The coronary arteries supply blood to the heart muscle.

Figure 9 shows a coronary artery with a blockage.

Figure 9



0 5 . 1 Why could the blockage in Figure 9 cause cells in the heart to die?

[2 marks]

Question 5 continues on the next page

Doctors can measure the concentration of cholesterol in the blood.

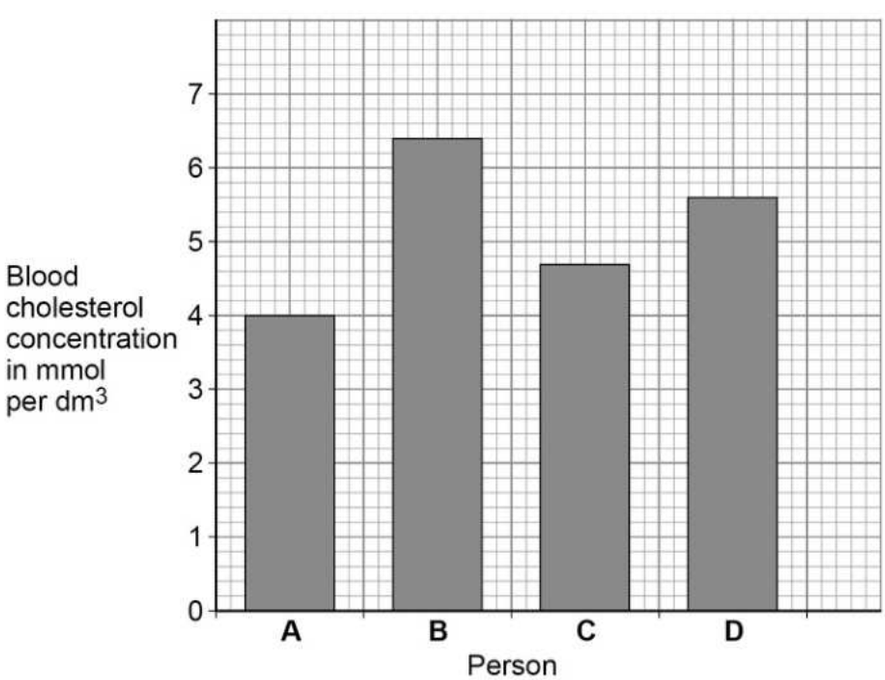
Table 3 shows four different blood cholesterol categories.

Table 3

Blood cholesterol concentration in mmol per dm3	Cholesterol category
<4.6	Low
4.6–5.0	Normal
5.1–6.1	Medium
6.2 and above	High

Figure 10 shows the blood cholesterol concentration of four people.

Figure 10



Do not write outside the box

0 5 . 2 Which person is in the medium cholesterol category? Tick

[1 mark]

(☒) one box.

A ☐ B ☐ C ☐ D ☐

0 5 . 3 Which person is most at risk of having a heart attack? Tick

[1 mark]

(☒) one box.

A ☐ B ☐ C ☐ D ☐

0 5 . 4 Give a reason for your answer to Question 05.3.

[1 mark]

0 5 . 5 The blood cholesterol concentration of person D is greater than the blood cholesterol concentration of person A.

Calculate how many times greater.

Use Figure 10.

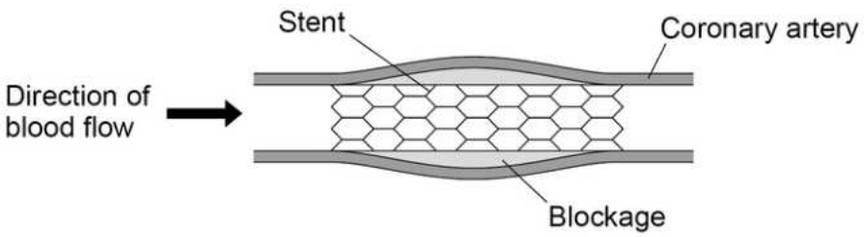
[2 marks]

Number of times greater =

Question 5 continues on the next page

Figure 11 shows how a stent can be used to treat a person with a blockage in a coronary artery.

Figure 11



0 5 . 6 Explain how a stent works as a treatment for a person with a blockage in a coronary artery.

[2 marks]

Patients are given anti-clotting drugs after they have a stent fitted. The drugs help to prevent clots forming in the blood.

0 5 . 7 Which part of the blood starts the blood clotting process?

[1 mark]

Tick (✓) one box.

- Antibodies ☐
- Plasma ☐
- Platelets ☐
- Red blood cells ☐

Do not write outside the box

0 5 . 8 When a stent is fitted the doctor gives the patient an injection of anti-clotting drugs. The patient then takes one anti-clotting tablet every day.

Anti-clotting drugs:

- are very effective
- can take a week to begin working fully
- have been used for over 60 years
- cost very little to make
- do not work effectively if the patient eats certain types of food.

The patient must have their blood tested every few weeks to check that the anti-clotting drugs are working.

Evaluate the use of anti-clotting drugs in patients who have had a stent fitted.

[4 marks]

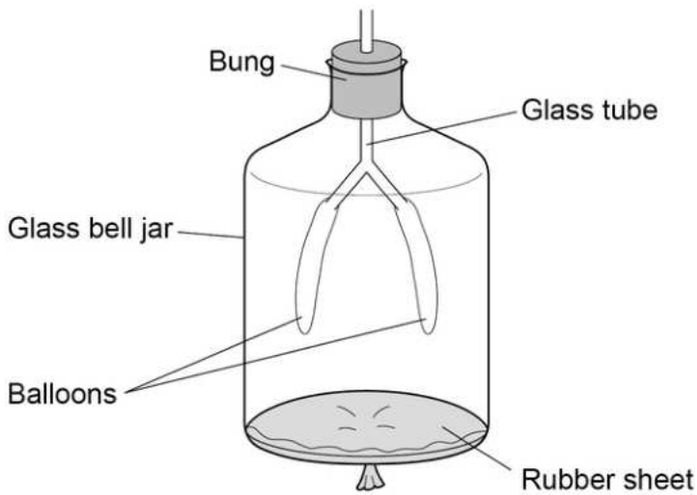
14

Turn over for the next question

Do not write outside the box

0 6 Figure 12 shows a model used to demonstrate human breathing.

Figure 12



0 6 . 1 Which part of the breathing system is represented by the glass tube? Tick (✓) one box. [1 mark]

- Alveoli ☐
- Capillaries ☐
- Lung ☐
- Trachea ☐

Do not write outside the box

The model in Figure 12 represents the human breathing system.

A teacher said:

"The model does not represent the human breathing system very well."

0 6 . 2 Give two reasons why the teacher is correct.

[2 marks]

1 _____

_____

2 _____

_____

Question 6 continues on the next page

Do not write outside the box

A scientist investigated the effect of exercise on breathing rate.

This is the method used.

1. Record the breathing rates of 10 male non-smokers at rest.

2. Tell each man to run on a treadmill at the same speed for 8 minutes.

3. Record the breathing rate of each man every 2 minutes.

4. Continue to record the breathing rate of each man for 4 minutes after he stops running.

0 6 . 3 Give two variables the scientist controlled in the investigation.

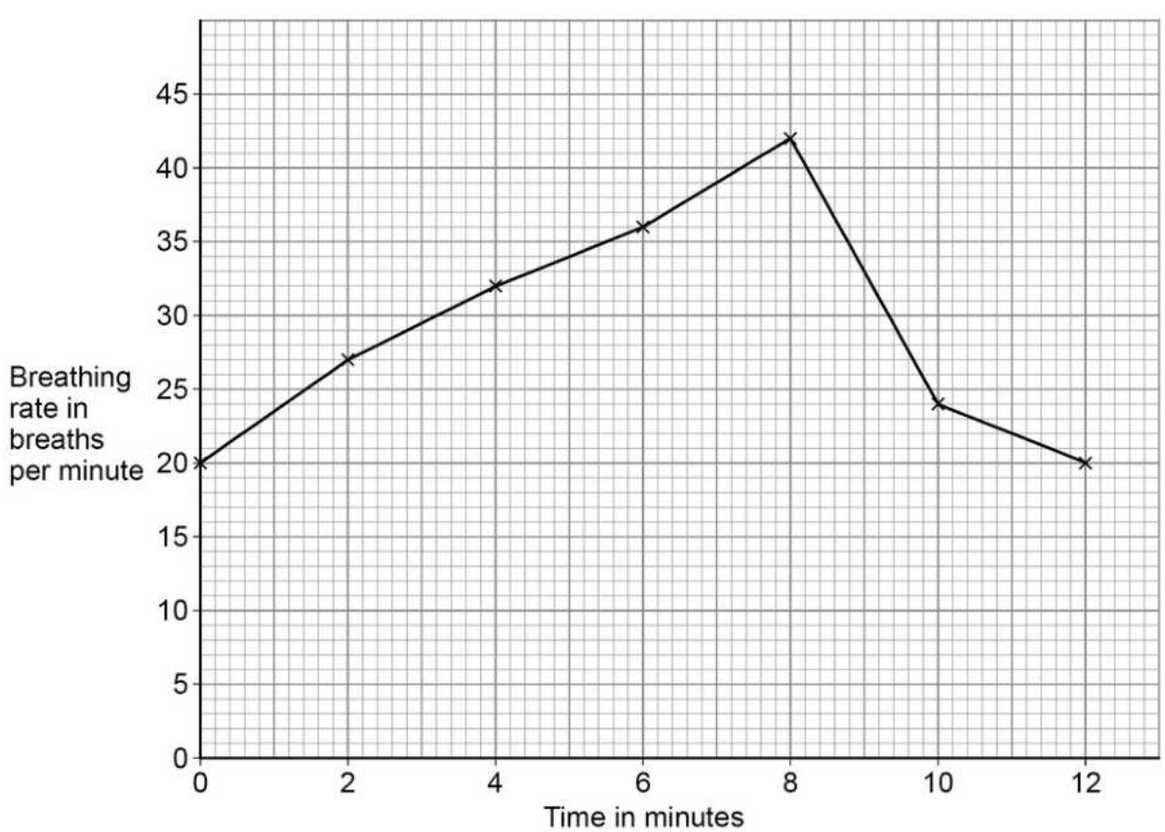
[2 marks]

1

2 _____

Figure 13 shows the data collected from one of the men.

Figure 13



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0 6 . 4 Calculate the percentage increase in the man's breathing rate between 0 minutes and 8 minutes.

[3 marks]

Use the equation:

$$\text{percentage increase} = \frac{(\text{breathing rate at 8 minutes} - \text{breathing rate at 0 minutes})}{\text{breathing rate at 0 minutes}} \times 100$$

Percentage increase = _____ %

0 6 . 5 Explain why the man's breathing rate increased when he was running.

[2 marks]

Question 6 continues on the next page

Do not write outside the box

0 6 . 6 Give one measurement that could be taken to show a different effect of exercise on the body.

Do not refer to breathing rate in your answer.

[1 mark]

0 6 . 7 The men in the investigation were all non-smokers. Give

one effect that smoking can have on the body.

[1 mark]

12

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Turn over for the next question

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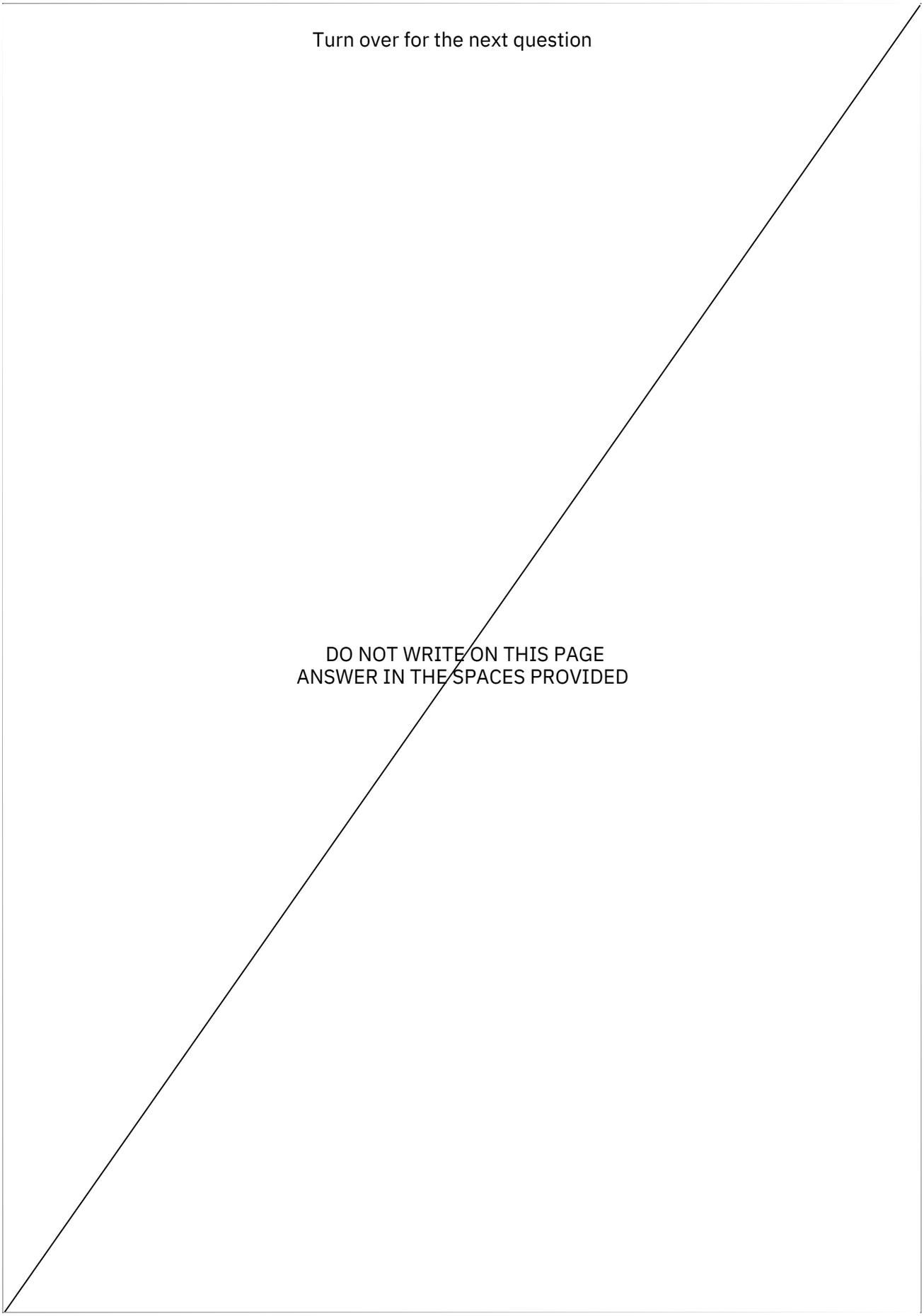
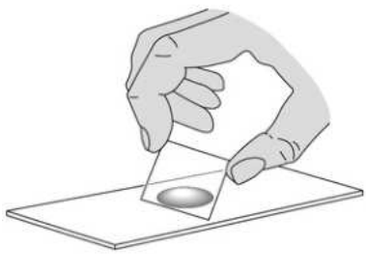
ANSWER IN THE SPACES PROVIDED



0 7 A student prepared some animal cells to view using a microscope.

Figure 14 shows the student preparing the cells.

Figure 14



0 7 . 1 Name two pieces of laboratory equipment the student could have used to cellsprepare to view using a microscope.

[2 marks]

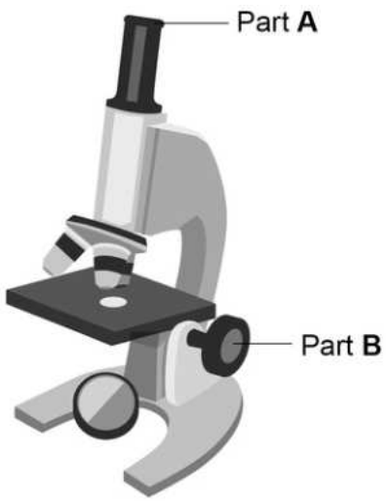
1

2 _____

Do not write outside the box

Figure 15 shows the student's light microscope.

Figure 15



0 7 . 2 Name part A.

[1 mark]

0 7 . 3 What is the function of part B?

[1 mark]

0 7 . 4 The student tried to look at the cells using the microscope.

Suggest one reason why the student could not see any cells when looking through part A.

[1 mark]

Question 7 continues on the next page

Do not write outside the box

0 7 . 5 Red blood cells are specialised animal cells.

Compare the structure of a red blood cell with the structure of a plant cell.

[6 marks]

0 7 . 6 When placed into a beaker of water:

- a red blood cell bursts
- a plant cell does not burst.

Explain why the red blood cell bursts but the plant cell does not burst.

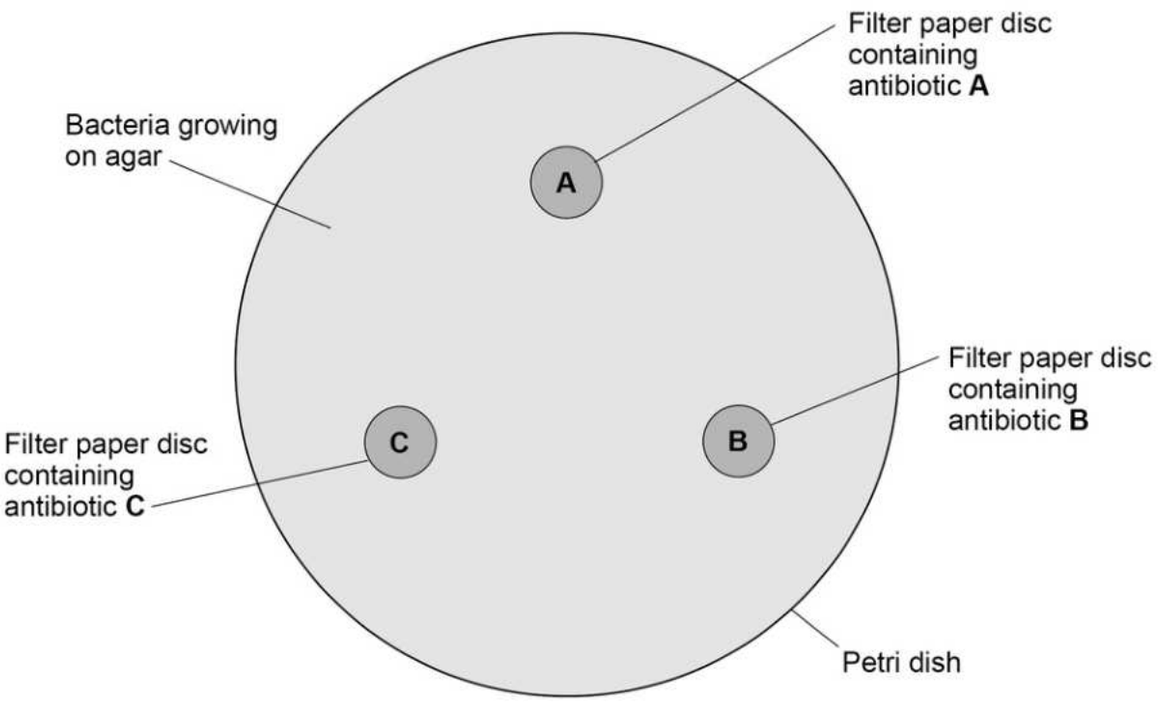
[2 marks]

13

0 8 A student investigated the effectiveness of three different antibiotics.

Figure 16 shows how the student set up an agar plate.

Figure 16



The student used aseptic techniques to make sure that only one type of bacterium was growing on the agar.

0 8 . 1 Describe two aseptic techniques the student should have used.

[2 marks]

1 _____

_____

_____

2 _____

_____

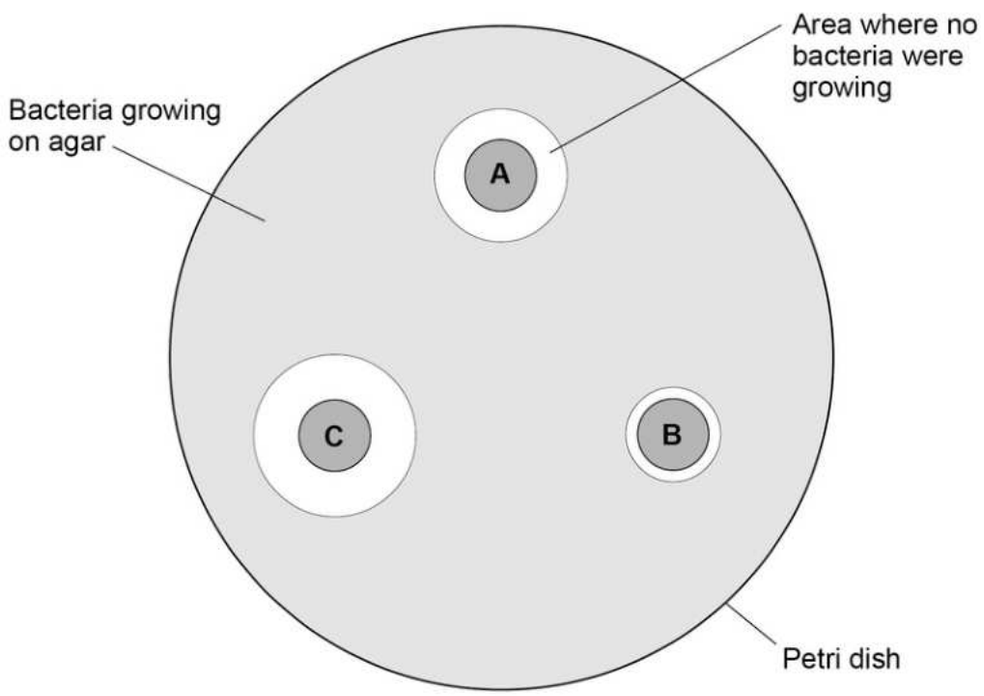
_____

Question 8 continues on the next page

The student placed the agar plate in an incubator at 25 °C for 48 hours.

Figure 17 shows the agar plate after 48 hours.

Figure 17



0 8 . 2 Which antibiotic is the least effective?

Give a reason for your answer.

[1 mark]

Least effective antibiotic

Reason _____

_____

_____

Do not write outside the box

0 8 . 3 Calculate the area where no bacteria were growing for antibiotic Use C.

$\pi\pi$= 3.14

Give the unit.

[5 marks]

Area = _____ Unit _____

0 8 . 4 Suggest one way the student could improve the investigation.

[1 mark]

_____

_____

9

Turn over for the next question

0 9

Body Mass Index (BMI) is a way of finding out if a person's body mass falls within a healthy range for their height.

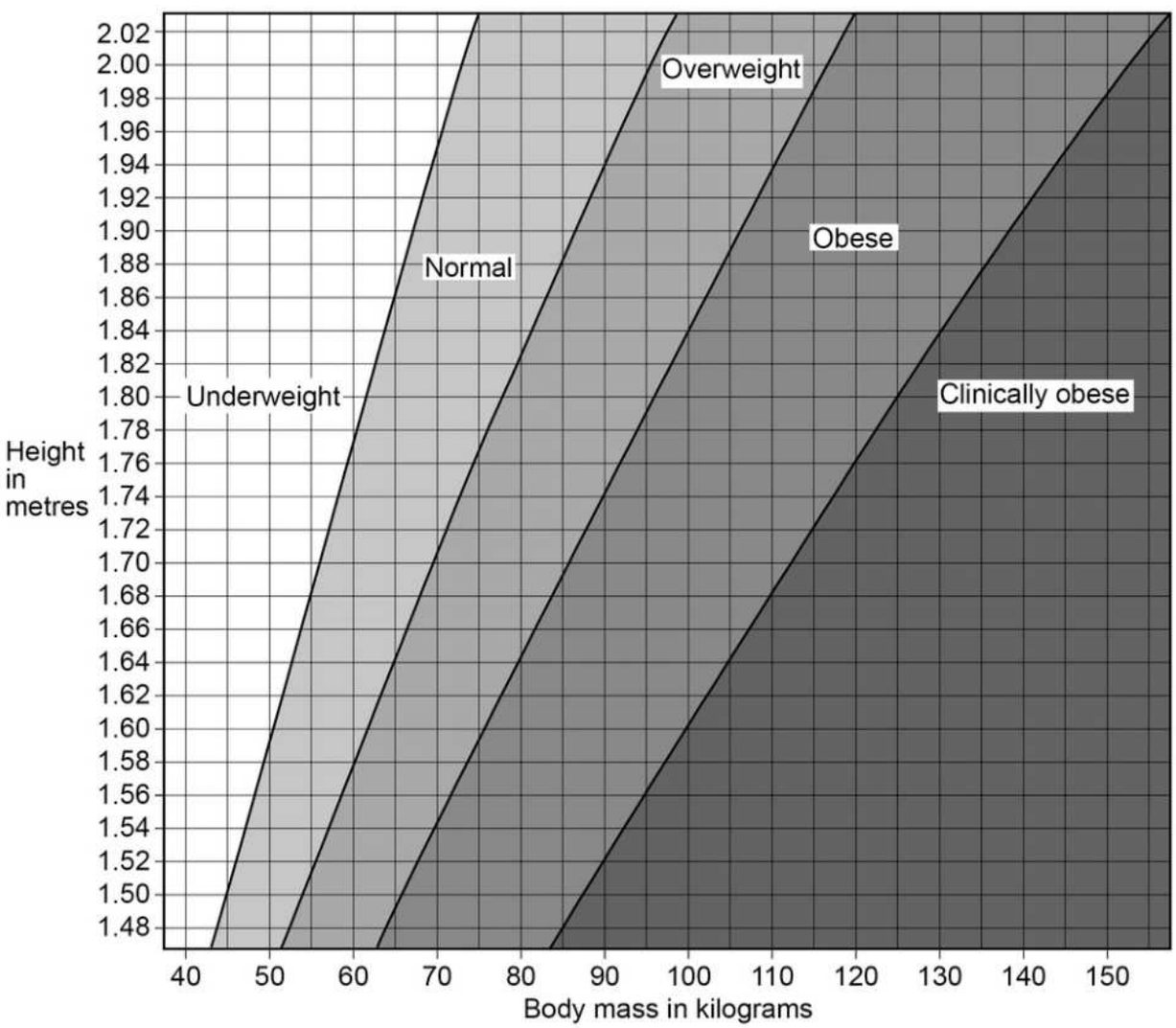
Table 4 shows information about two people.

Table 4

Person	Body mass in kg	Height in m	BMI in kg/m2
A	63	1.65	23.1
B	92	1.71	X

Figure 18 shows five BMI categories for adults.

Figure 18



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0 9 . 1 Which is the BMI category of person A in Table 4?

[1 mark]

Tick (☒) one box.

Clinically obese ☐

Normal ☐

Obese ☐

Overweight ☐

Underweight ☐

0 9 . 2 Calculate value X in Table 4.

Use the equation:

$$\text{BMI} = \frac{\text{body mass}}{\text{height}^2}$$

Give your answer to 3 significant figures.

[3 marks]

X = _____ kg/m2

Question 9 continues on the next page

Scientists think there is a link between BMI and life expectancy.

Table 5 shows information about predicted life expectancy of men after the age of 50.

Table 5

BMI Category	Predicted number of years living in good health after the age of 50	Predicted number of years living in bad health after the age of 50
Normal	19.06	4.98
Overweight	18.68	5.32
Obese	16.37	7.08
Clinically obese	13.07	10.10

0 9 . 3 Describe two patterns shown in Table 5 about the effects of BMI category.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

Do not write outside the box

The number of people who are obese in the UK is increasing.

0 9 . 4 Explain the financial impact on the UK economy of an increasing number of people who are obese.

[2 marks]

0 9 . 5 A person who is obese is more at risk of arthritis.

Arthritis is a condition that damages joints.

Suggest how arthritis could affect a person's lifestyle.

[1 mark]

0 9 . 6 A person who eats a diet high in saturated fat might become obese.

Name two health conditions that might develop if a person eats a diet high in saturated fat.
Do not refer to arthritis in your answer.

[2 marks]

1

2

11

END OF QUESTIONS

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ANSWER IN THE SPACES PROVIDED

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