AQA

Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE BIOLOGY

F

Foundation Tier Paper 1F

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

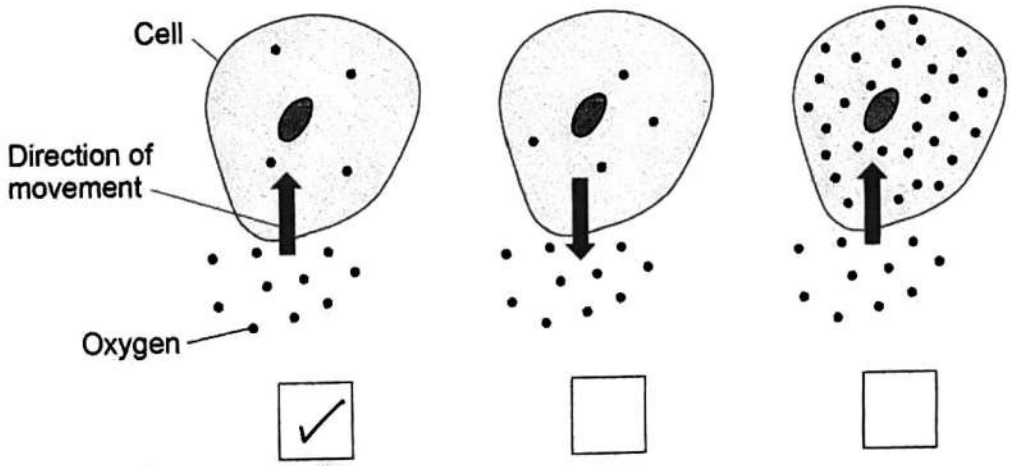
Answer **all** questions in the spaces provided.

0 1 This question is about cells.

0 1 . 1 Which diagram shows oxygen moving by diffusion?

[1 mark]

Tick (✓) **one** box.



✓

movement from a high concentration to lower concentration

0 1 . 2 Complete the sentences.

[3 marks]

Choose answers from the box.

carbon dioxide	**chlorophyll**	**energy**
light	**mineral ions**	**water**

Plant cells absorb substances from the soil.

Plant cells use osmosis to absorb water.

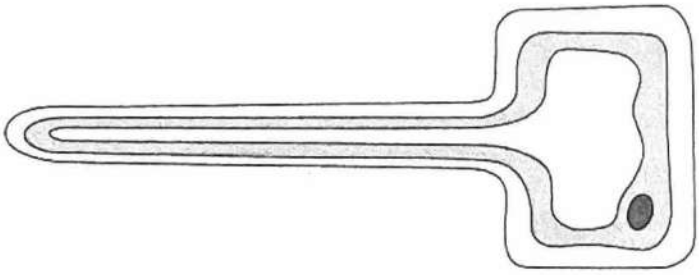
Plant cells use active transport to absorb mineral ions.

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

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]

root hair cell

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

[1 mark]

long projetion from cell significantly ~~increases~~ increases its surface over which absorption can occur.

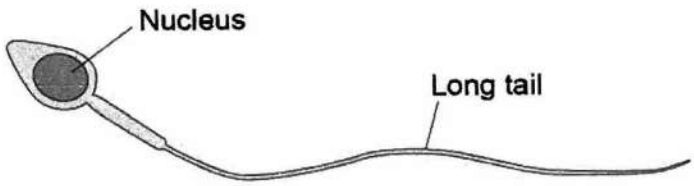
Question 1 continues on the next page

Do not write outside the box

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

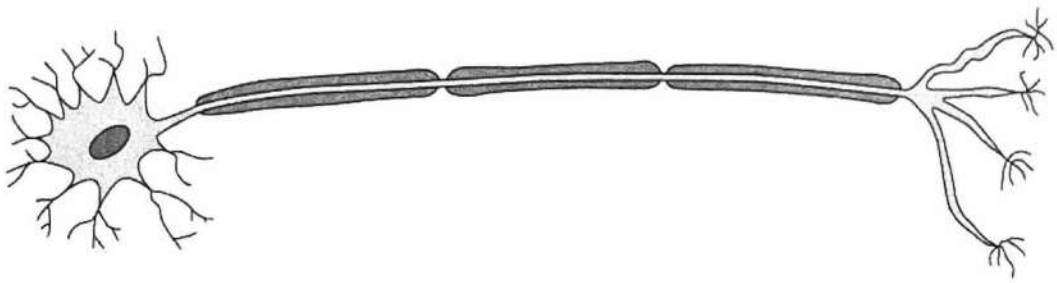
Nucleus contains genetic information of the cell.

'wiggling' of tail propells it forward

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 nerve cell

Feature of the cell long and highly branched to connect with other neurones around the body.

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?

[1 mark]

Tick (✓) **one** box.

Pathogens ✓

Predators

Prokaryotes

0 2 . 2 How do viruses cause the symptoms of disease?

[1 mark]

Tick (✓) **one** box.

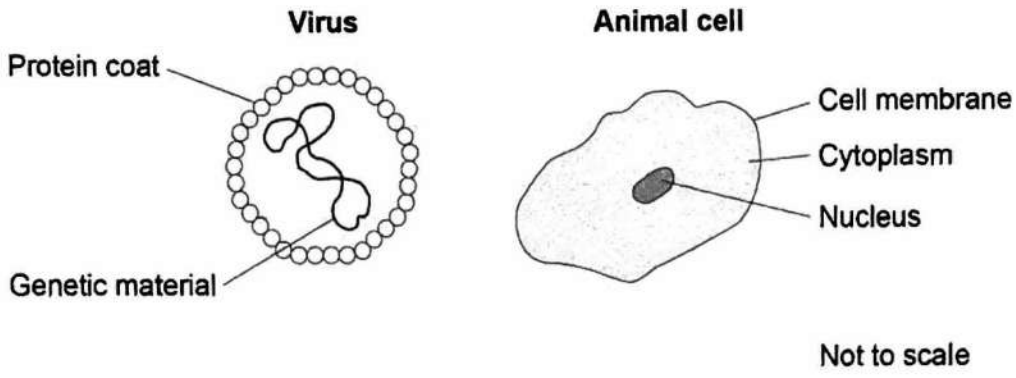
Viruses engulf white blood cells, destroying them.

Viruses produce antibodies that damage tissues.

Viruses reproduce inside cells, damaging them. ✓

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]

They don't have several parts cell have, like a cytoplasm or a cell membrane or ribosomes.

A vaccine can protect humans from a viral disease.

0 2 . 4 What does the vaccine contain?

[1 mark]

Tick (✓) **one** box.

A toxic form of a virus ☐

A weakened form of a virus ☑ So it won't cause damage by full on infection, but still expose immune system to its antigens

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.

Key

↑ Vaccination given

Antibody concentration

Time

☑

We see two peak after the two points when vaccination happens.

Antibody concentration

Time

☐

Antibody concentration

Time

☐

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?

[1 mark]

Tick (✓) **one** box.

Flower ☐

Leaf ☑ causes discolowation on the leaves.

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

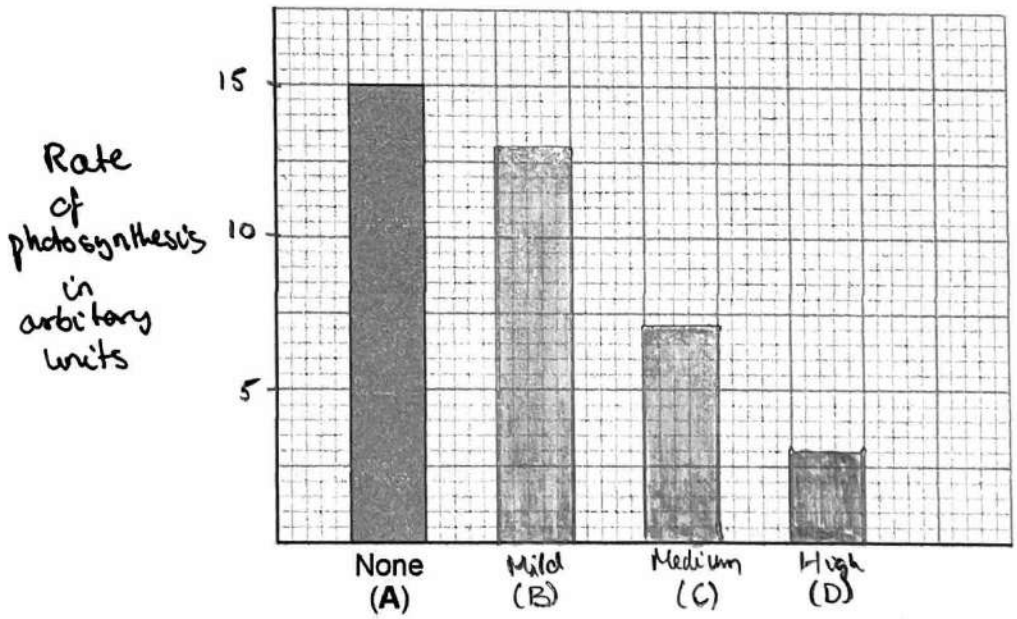
0 2 . 7 Complete **Figure 5**.

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



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

[1 mark]

As the level of infection of the leaf by TMV increases (gets higher) the rate of photosynthesis decreases.

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

[2 marks]

TMV attacks photosynthetic tissue in the leaf, especially chlorophyll. This decreased number of chloroplast leads to less photosynthesis. So the plant produces less glucose (sugar) that it can use for growth and repair.

14

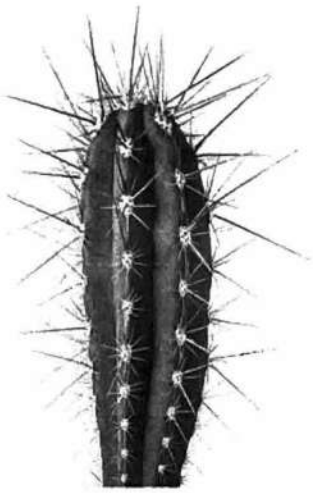
Turn over for the next question

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]

spikes deter animals as it will prick them

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	✓	poisons are chemicals that cause damage
Mechanical		
Physical		

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. ☐

Plants loose water mostly through their leaves through the stomata.

The stem of a cactus is green.

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

[1 mark]

Chlorophyll found in the chloroplast

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

[1 mark]

it allows the stem to be able to photosynthesise. plant doesnt need leaves to produce glucose.

Question 3 continues on the next page

The stem of a cactus contains many different tissues.

0 3 . 6 What name is given to a group of tissues working together?

[1 mark]

Tick (✓) **one** box.

- Organ ☑ several tissues form an organ
- Organism ☐
- Organ system ☐

0 3 . 7 Name **one** substance transported through the xylem in the stem of the cactus.

[1 mark]

Water OR mineral ions

0 3 . 8 Name the tissue that transports dissolved sugars through the stem of the cactus.

[1 mark]

phloem

8

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

0 4 . 1 Which formula shows glucose?

[1 mark]

Tick (✓) **one** box.

$C_6H_{12}O_6$ ✓

CO_2

H_2O

O_2

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

[1 mark]

Tick (✓) **one** box.

Carbohydrase ✓ starch is a carbohydrate

Lipase

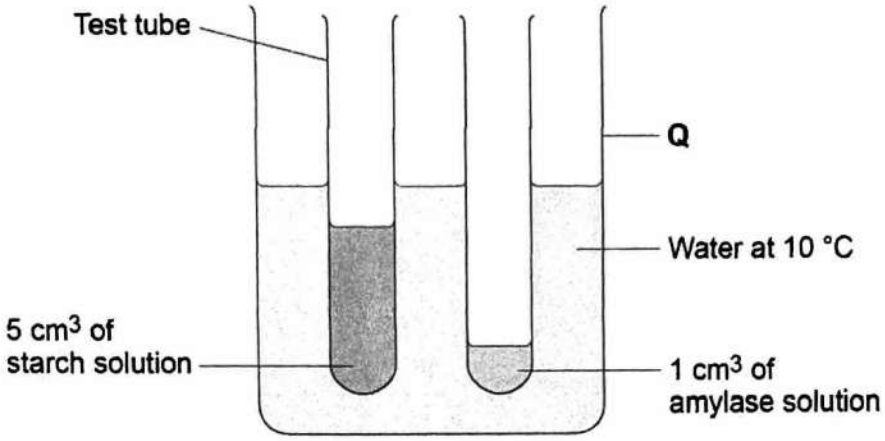
Protease

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]

beaker

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 ☐

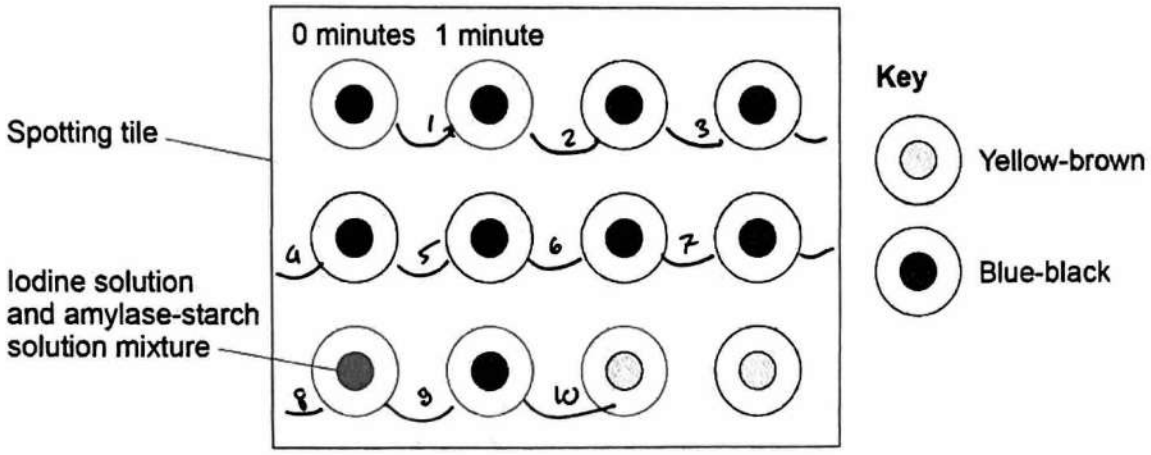
So that the student could repeat the investigation ☐

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]

10 minutes

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

[1 mark]

Tick (✓) **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.

smaller timeframe allows time to closest 0.5 min not to closest 1 min.

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 ☑ lowest time to turn yellow so fastest to change at.

50 °C ☐

65 °C ☐

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

[2 marks]

The temperature is to high for the enzyme as it denatured at such high temperature. So, it can no longer break down starch. As starch is not broken down at all solution remains blue-black.

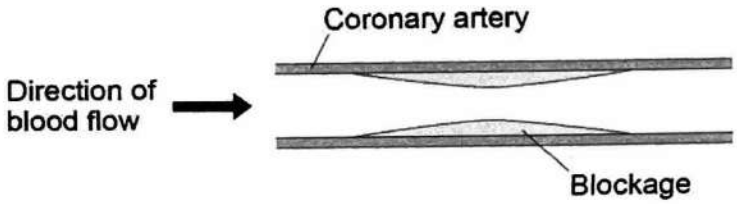
9

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]

Restricts the blood flow to heart muscle, so less oxygen and glucose is supplied to the tissue. If the muscle doesn't get enough oxygen it will start to die.

Question 5 continues on the next page

Doctors can measure the concentration of cholesterol in the blood.

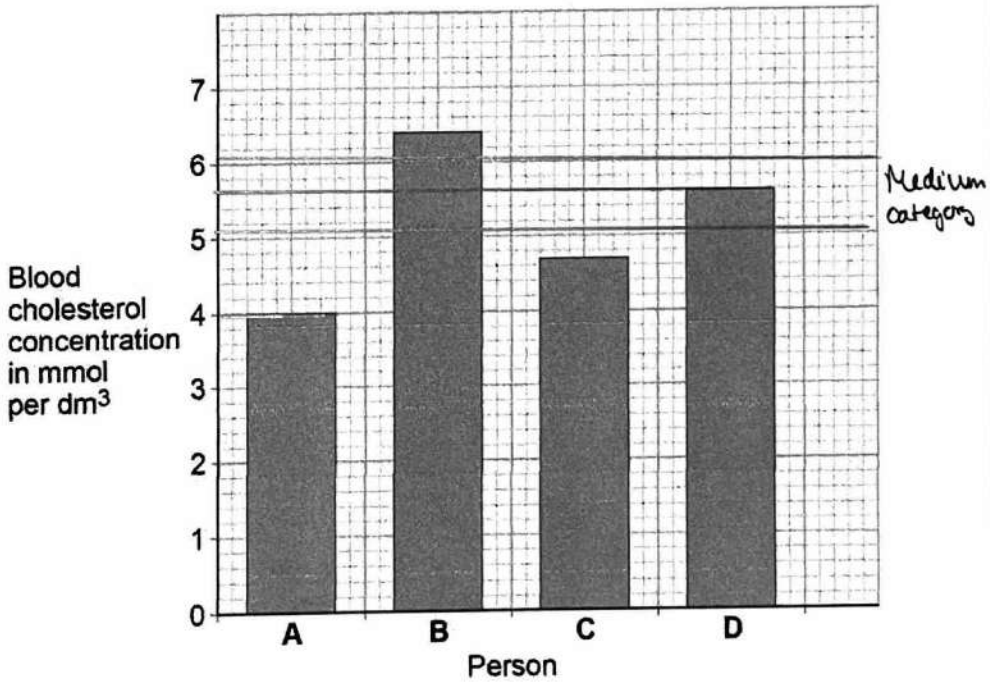
Table 3 shows four different blood cholesterol categories.

Table 3

Blood cholesterol concentration in mmol per dm^3	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?

[1 mark]

Tick (✓) **one** box.

A ☐ B ☐ C ☐ D ☑

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

[1 mark]

Tick (✓) **one** box.

A ☐ B ☑ C ☐ D ☐

Has category high

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

[1 mark]

Has the highest cholesterol concentration, so most likely to get blockage build up leading to a heart attack.

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]

Person A = 4 mmol/dm³ Person D = 5.6 mmol/dm³

Number of times greater = $\frac{\text{Person D value}}{\text{Person A value}} = \frac{5.6 \text{ mmol/dm}^3}{4 \text{ mmol/dm}^3} = 1.4$

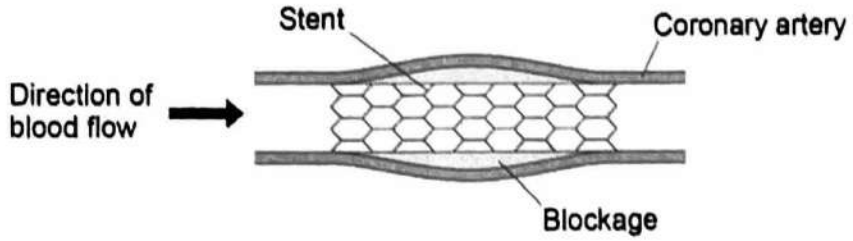
No units as mmol/dm³ cancel out on top and bottom of the fraction.

Number of times greater = 1.4

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]

Forces the coronary artery open and keeps it open for a long time. This allows blood to flow through a wider passage, supplying enough blood to the heart.

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 ☑ platelets are responsible for blood clotting.
- Red blood cells ☐

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]

Having to go for blood test every few weeks and watching what you eat, are quite restrictive for patience. They also have to remember to take their pill every day to not get blood cloths, which could be forgotten and lead to issues.
However, there are advantages. The drug is inexpensive so affordable for most, and have been used for a long time, so can be considered quite safe. A tablet to swallow is not intrucive and easy to take.
Overall, while taking the treatment has its disadvantages, overall avoiding a heart attack and blood clothing seem to outweigh the inconveniences significantly, making the treatment worth while.

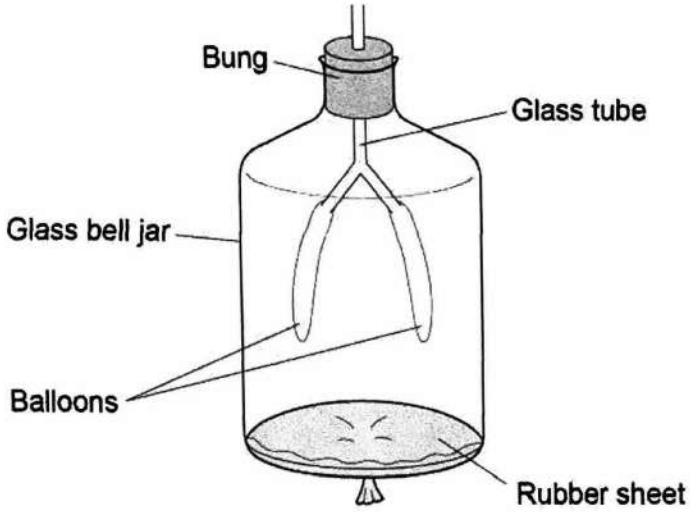
14

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?

[1 mark]

Tick (✓) **one** box.

- Alveoli ☐
- Capillaries ☐
- Lung ☐
- Trachea ☑ tubes providing air to lungs.

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 Lung consists of alveoli as well which are not represented in the model.

2 glass jar is not good model for the ribcage, which also moves with breathing as it has muscles.

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.

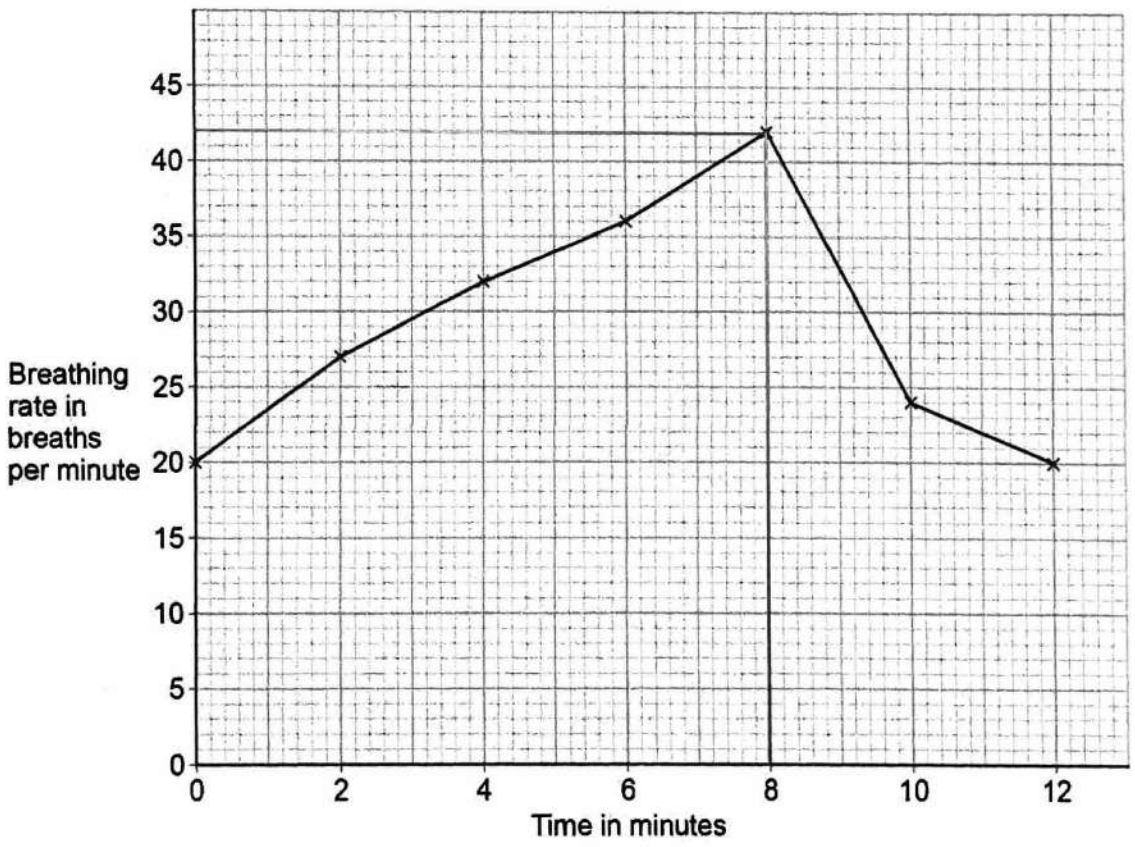
[2 marks]

1 They all run/exercised for the same time length

2 All participants were made controlling for sex.

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

Figure 13



Do not write outside the box

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

[3 marks]

Use the equation:

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

at 8 min = 42 breaths / min

at 0 min = 20 breaths / min

percentage increase = $\frac{42 - 20}{20} \times 100 = 110\%$

Percentage increase = 110 %

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

[2 marks]

As they exercise they respire more to release energy for movement. This requires higher oxygen intake, so to compensate breathing rate is increased.

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]

measure the heart rate

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

Give **one** effect that smoking can have on the body.

[1 mark]

Can lead to lung disease as it damages the lungs.

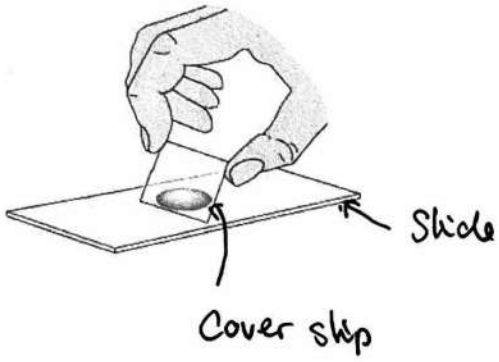
12

Do not write outside the box

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 **prepare** cells to view using a microscope.

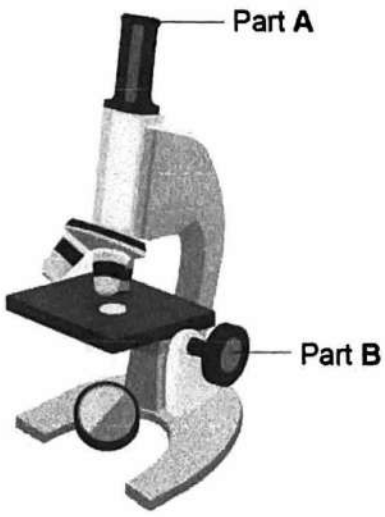
[2 marks]

1 slide (sample is put on it)

2 cover slip

Figure 15 shows the student's light microscope.

Figure 15



0 7 . 2 Name part **A**.

[1 mark]

eyepiece / lens

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

[1 mark]

allows movement of the sample slowly up or down to focus the image.

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]

Microscope may not be focused on the sample OR mirror is not adjusted to shine light onto the sample.

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]

Both cells are eukaryotic cells, containing a cytoplasm and a cell membrane.
However, their similarities stop there as they differ in several other aspects. For instance plant cells have a cell wall, a nucleus and chlorophyll, which are all structures not found in a red blood cell. But, red blood cells do have haemoglobin which plant cells do not have.
In terms of shape and size they also vary. Red blood cells have a biconcave shape and are significantly smaller than plant cells. Plant cells can come in a range of shapes with different functions. All red blood cells have the function of carrying oxygen around the body.

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]

There is a higher concentration of water outside, so water moves into the cells by osmosis. Plant cells have a cell wall that prevents them from bursting, while red blood cells don't, so they burst.

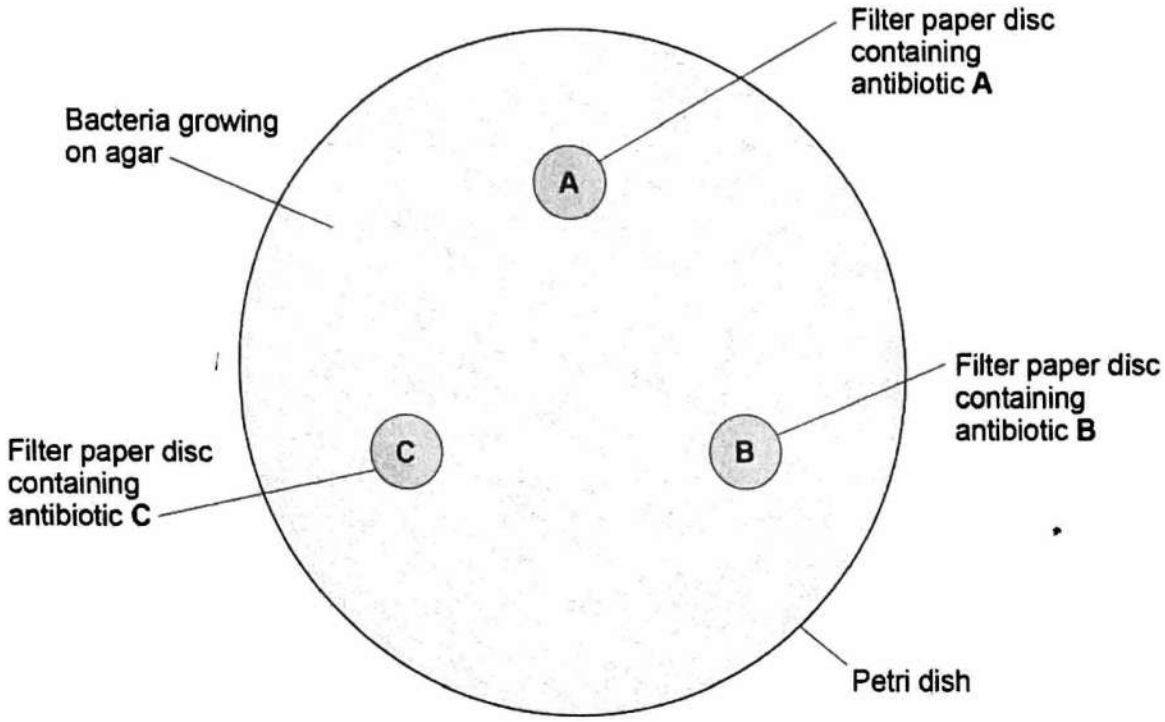
13

Do not write outside the box

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 Should sterilise all equipment used and surfaces worked on before conducting experiment

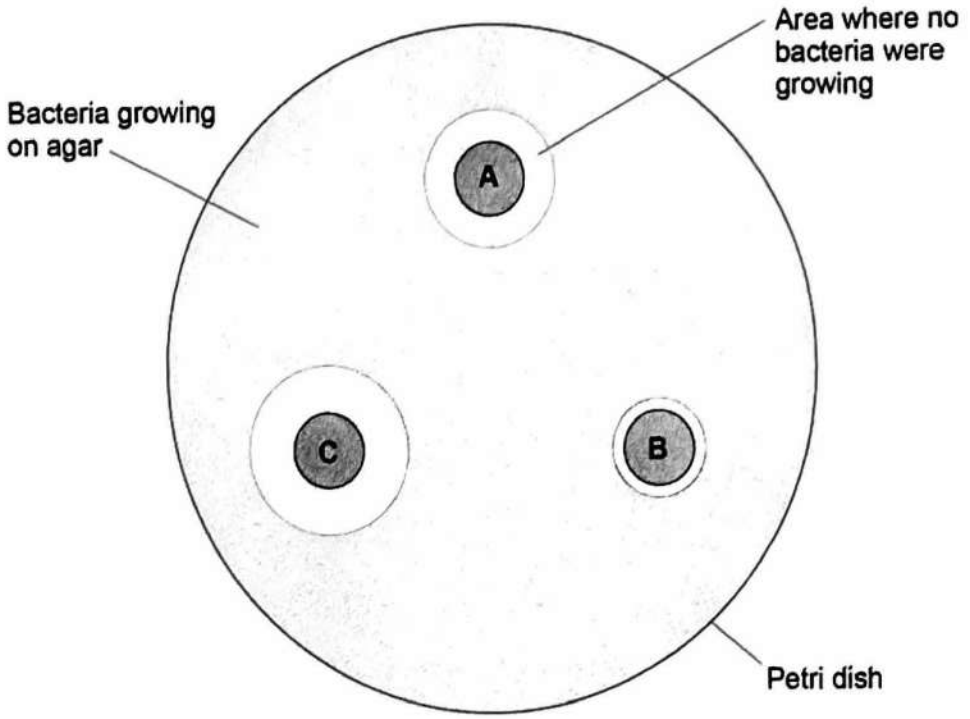
2 He should secure the lid onto the petri dish so no other bacteria can get in. This can be done by taping them.

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 B

Reason Has the smallest zone of inhibition around it. This is the white area in which bacteria is killed by the antibiotic

Do not writ outside the box

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

Use $\pi = 3.14$

Give the unit.

[5 marks]

diameter measured from figure = 22 mm $\Rightarrow r = \frac{22}{2} = 11$

Area of circle = πr^2

Area = $3.14 \times (11 \text{ mm})^2$

$= 3.14 \times 121 \text{ mm}^2$

$= 379.94 \text{ mm}^2$

Area = 379.94 Unit mm^2

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

[1 mark]

They could repeat their investigation and calculate a mean from all repeates.

9

Turn over for the next question

Do not write outside the box

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.

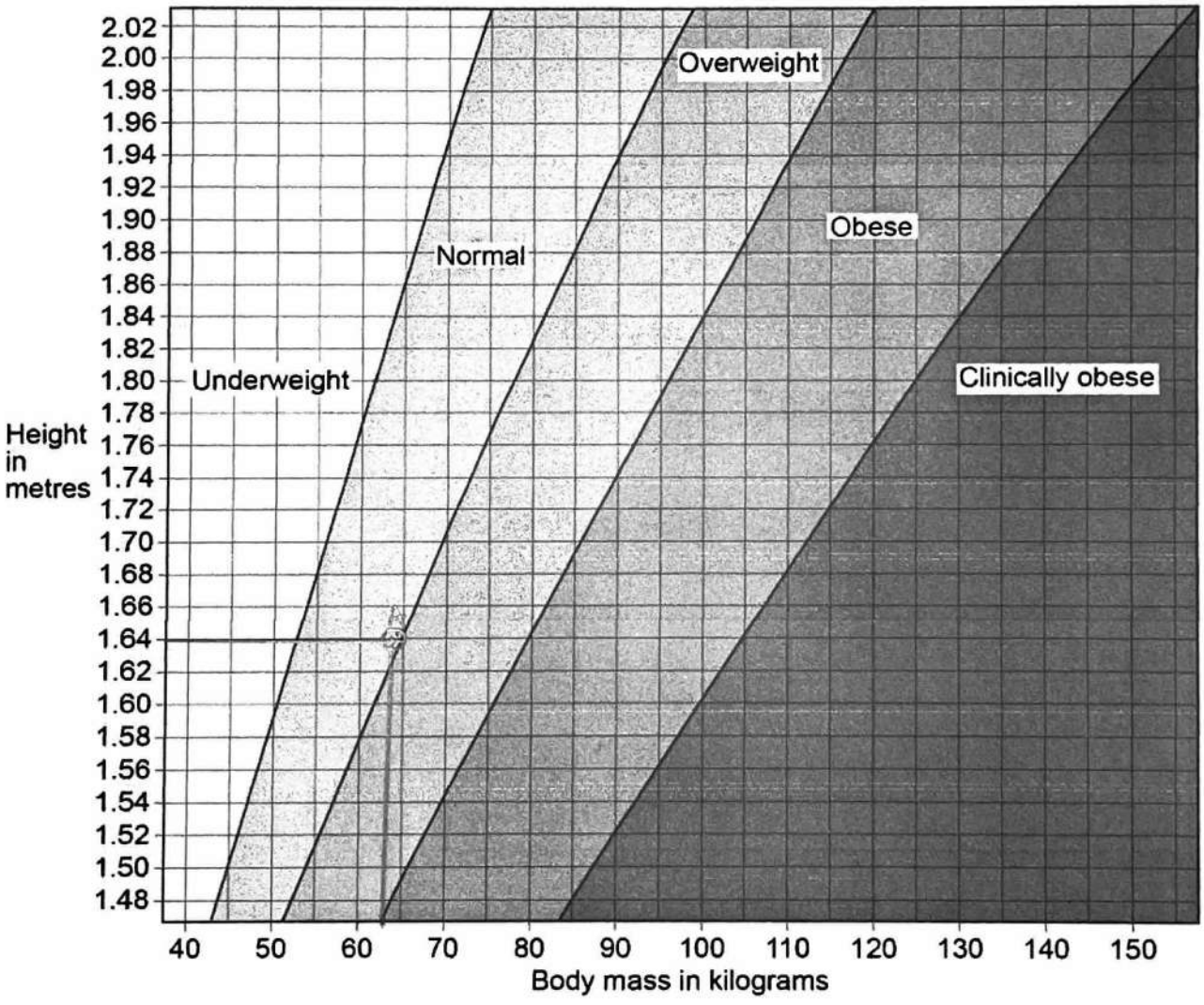
Table 4 shows information about two people.

Table 4

Person	Body mass in kg	Height in m	BMI in kg/m^2
A	63	1.65	23.1
B	92	1.71	X

Figure 18 shows five BMI categories for adults.

Figure 18



Do not write outside the box

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

[1 mark]

Tick (✓) **one** box.

- Clinically obese ☐
- Normal ☑ see graph
- 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]

$\text{BMI} = \frac{92\text{ kg}}{(1.71\text{ m})^2}$

$= \frac{92\text{ kg}}{2.9241\text{ m}^2}$

$= 31.46267228\ldots\text{ kg/m}^2$

3sf $\Rightarrow$ 31.5 kg/m²

X = 31.5 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 The higher the BMI category the lower the number of years they have to live in good health

2 The higher the BMI category the ~~[illegible]~~ higher the number of years they have to live in bad health.

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]

This will put a financial strain of health care systems as it needs to pay for the care of more patience. Obesity can lead to other health issues leading to ~~even~~ costs in treatments and drugs.

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]

Their joints are vital for movement. Damage to joints can lead to mobility issues.

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 CHD (coronary heart disease)

2 type 2 diabetes (develops throughout life)

11

END OF QUESTIONS