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	

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

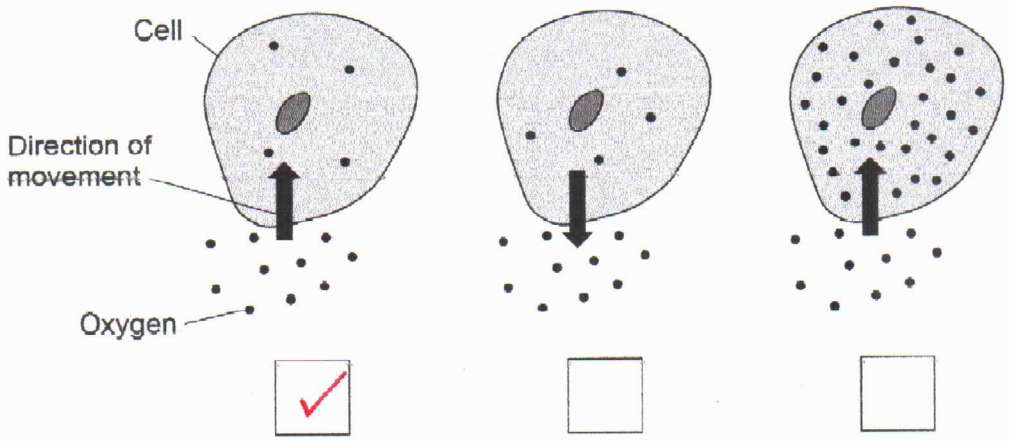
Do not write outside the box

0 1 This question is about cells.

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

[1 mark]

Tick (✓) **one** box.



✓ ☐ ☐

Diffusion - Spreading of molecules down their concentration gradient

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.

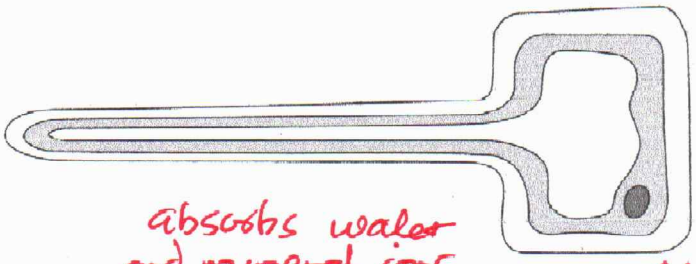
Plant cells use active transport to absorb mineral ions.

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



absorbs water and mineral ions from the soil

- Thin
- Large surface
- Lots of mitochondria

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]

Large surface area to increase the area where is absorbed

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.

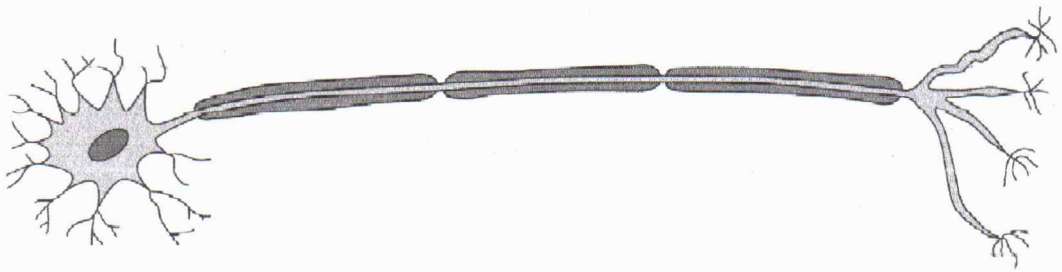
[2 marks]

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

Feature of the cell long; branched and has insulation

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 ☑ – disease causing organisms

Predators ☐ – will prey for food

Prokaryotes ☐ – dont have nucleus

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

[1 mark]

Tick (✓) **one** box.

Viruses engulf white blood cells, destroying them. ☐

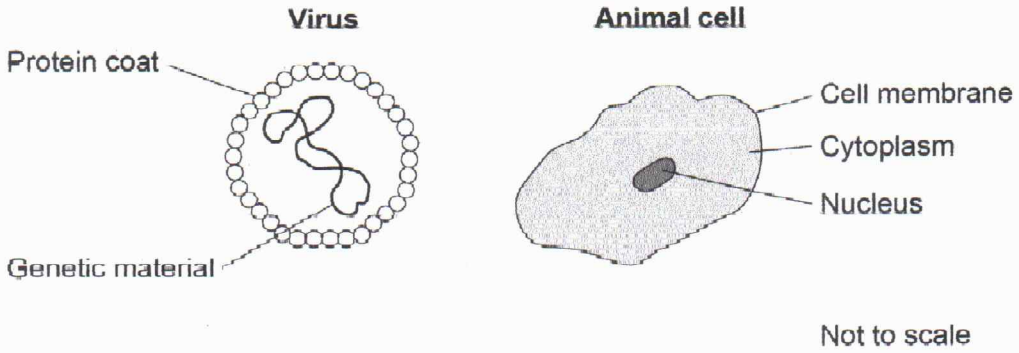
Viruses produce antibodies that damage tissues. ☐

Viruses reproduce inside cells, damaging them. ☑

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]

They dont have a cell membrane, 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	✓ - attenuated virus
An active form of a virus	☐ - may cause disease

Question 2 continues on the next page

Do not write outside the box

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

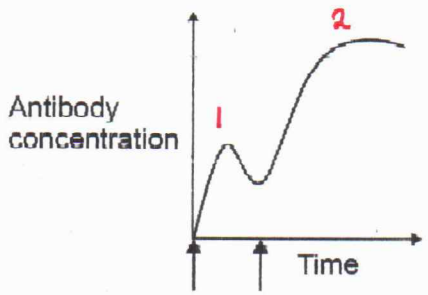
0 2 . 5 Which graph shows how the concentration of antibodies in a person's blood changes after the first and second vaccinations?

[1 mark]

Tick (✓) **one** box.

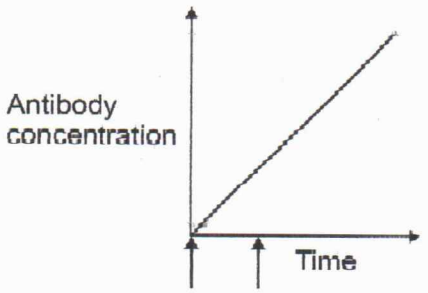
Key

↑ Vaccination given

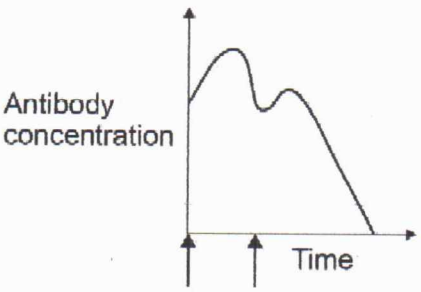


✓

– secondary response is rapid



☐



☐

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?

[1 mark]

Tick (✓) **one** box.

Flower ☐

Leaf ☑

Root ☐

Question 2 continues on the next page

Do not write outside the box

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

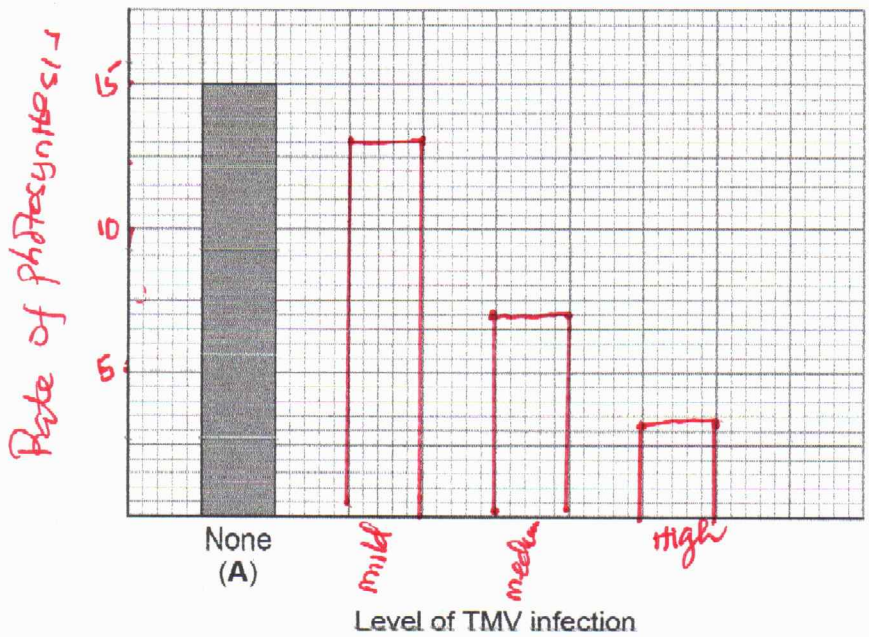
0 2 . 7 Complete **Figure 5**.

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]

As the level of infection with TMV increases the rate of photosynthesis decreases.

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

[2 marks]

There is less chlorophyll available in the leaf. This reduces amount of glucose made in the leaf by photosynthesis

14

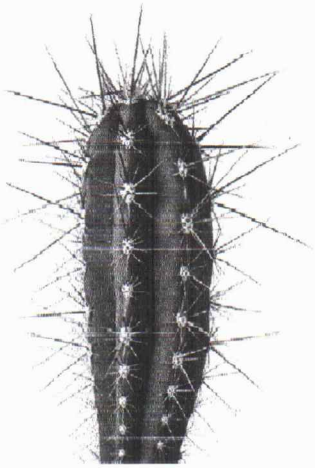
Turn over for the next question

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]

it has spikes so that it is not eaten by the herbivores

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.	☐

- plants loose water through the stomata in the leaves

The stem of a cactus is green.

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

[1 mark]

chlorophyll

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

[1 mark]

This allows it to make sugar by photosynthesis

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?

[1 mark]

Tick (✓) **one** box.

Organ ✓

Organism – groups of organ systems

Organ system – groups of organs

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

[1 mark]

water and mineral ions

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

[1 mark]

phloem

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.

$C_6H_{12}O_6$ ✓

CO_2 – carbon dioxide

H_2O – water

O_2 – oxygen gas

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

[1 mark]

Tick (✓) **one** box.

Carbohydrase ✓

Lipase – fats/oils

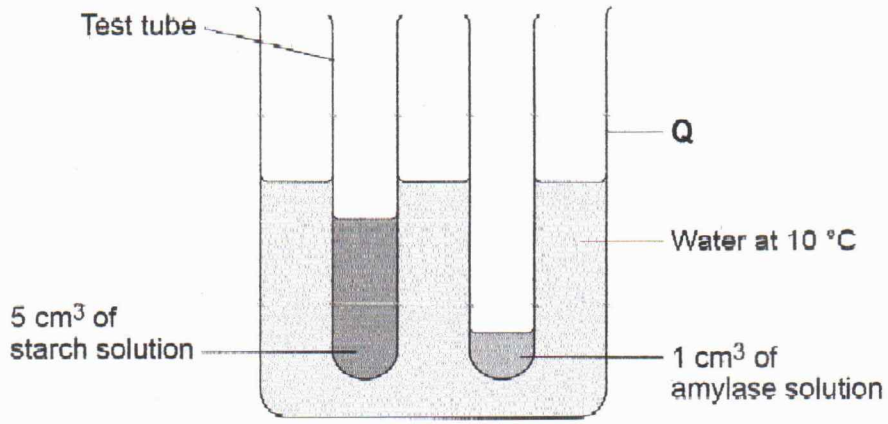
Protease – proteins

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

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.

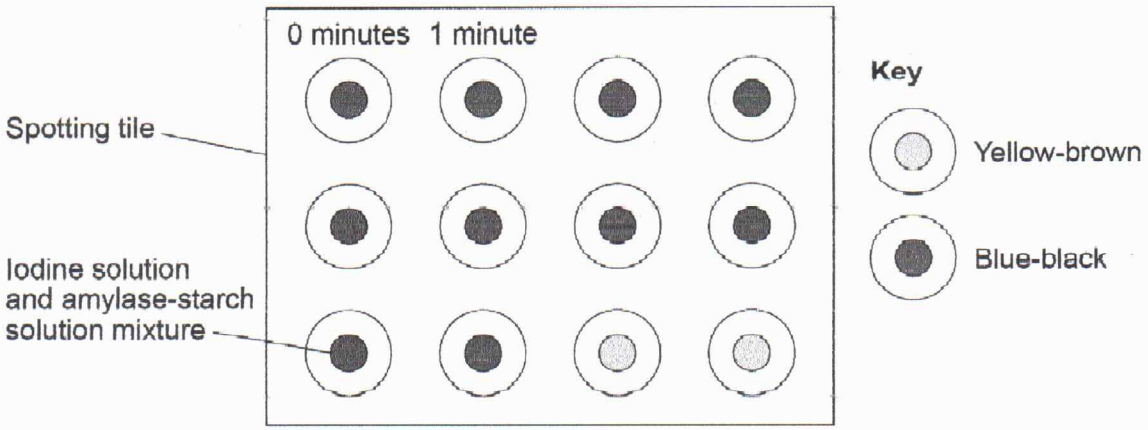
- So that both solutions could reach 10 °C ☑
- So that the student could calculate a mean ☐
- So that the student could repeat the investigation ☐
- So that the student had time to draw a table of results ☐

Question 4 continues on the next page

Do not write outside the box

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. ☐

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 ☑ – took the shortest time for Iodine solution and mixture to turn yellow

50 °C ☐

65 °C ☐

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

[2 marks]

The amylase enzyme was denatured. So starch was not broken down into glucose molecules

9

Turn over ▶

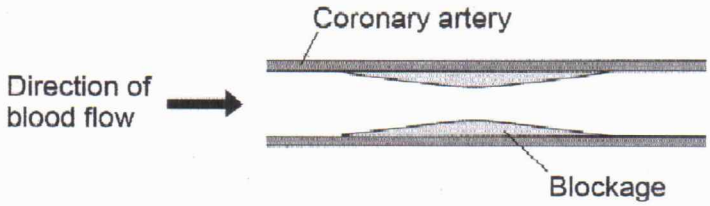
Do not write outside the box

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]

Blockage reduces the amount of blood flowing the coronary artery. Therefore less oxygen reaches the heart muscle. Less Oxygen reduces energy generation with heart muscle cells.

Question 5 continues on the next page

Doctors can measure the concentration of cholesterol in the blood.

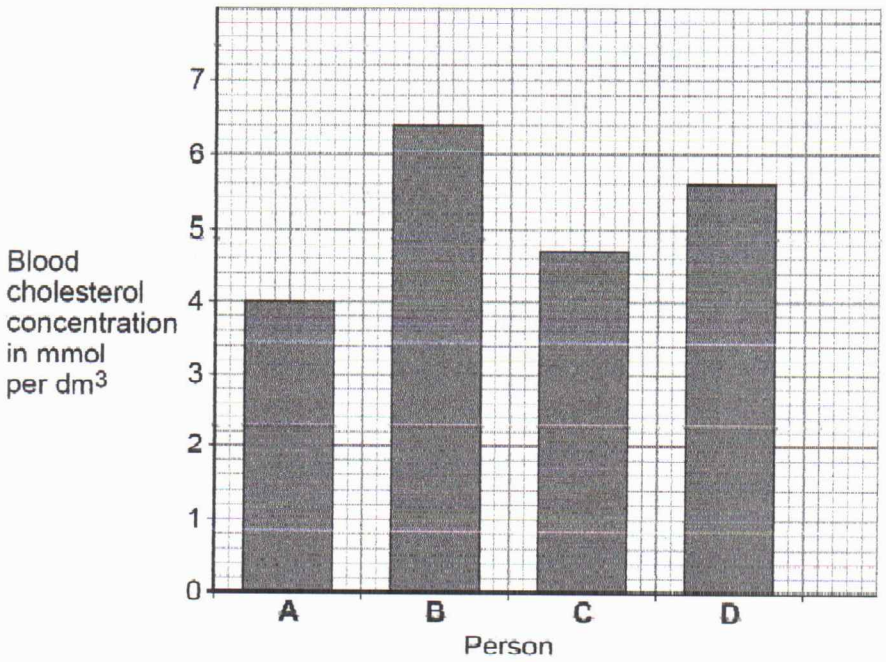
Table 3 shows four different blood cholesterol categories.

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 ☐

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

[1 mark]

There is high cholestrol in B. So there is high chance of blockage

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]

Using values 4 and 5.6

$\frac{5.6}{4} = 1.4$

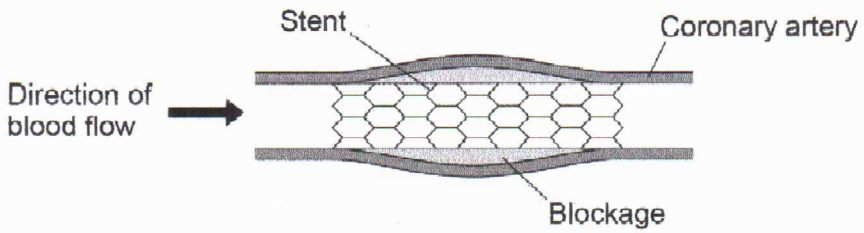
Number of times greater = 1.4

Question 5 continues on the next page

Do not write outside the box

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]

It widens artery so that more blood can flow through the Coronary artery.

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	☐	- neutralize/destroy antigens
Plasma	☐	- transport dissolved molecules in blood
Platelets	✓	- clotting
Red blood cells	☐	- transport oxygen gas

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]

Patients have to take the tablet once a day. This is easy and the drugs are effective. So there is less chance of a blood clot. The drugs are cheap and so many people can afford them. This reduces the burden on the NHS. Anti-clotting drugs have been used for 60 years. So they must be safe. - However, patients must ensure they have a supply of drugs. Patients could forget to take the drugs everyday. The patients may still get clots in the first week. The patients must restrict their lifestyle so as to have a blood test every few weeks - The patients may get a clot if they eat wrong food

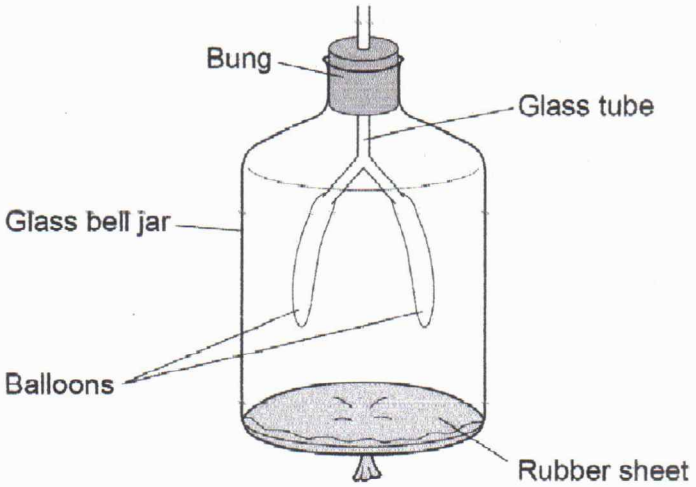
14

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 ☑

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 There was only one air space per baloon
Rib cage contains muscles

2 Blood vessels are not represented
Ribs have gaps between them

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]

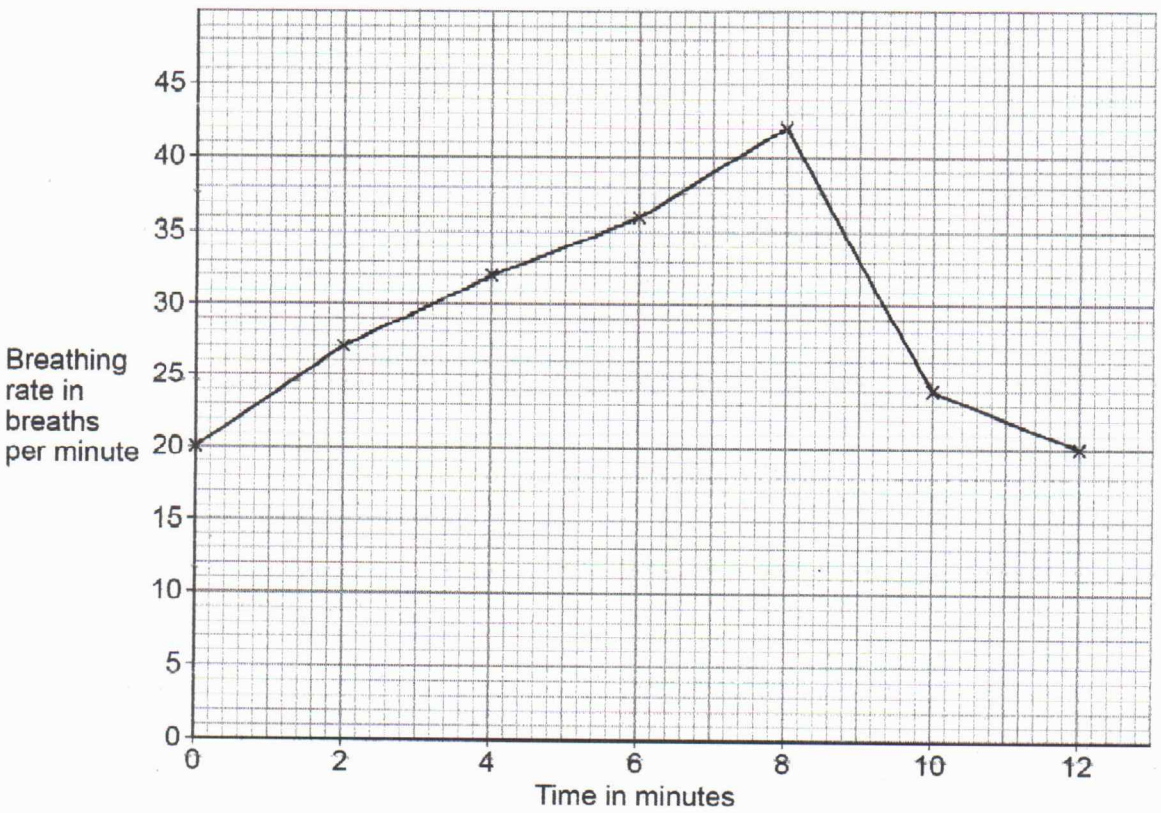
1 Speed of treadmill

2 time spent running

type of exercise

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 0 minutes, breathing rate = 20

At 8 minutes, breathing rate = 42

42 − 20 = 22

% increase = $\frac{22}{20}$ × 100 = 110 %

Percentage increase = 110 %

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

[2 marks]

- To get more oxygen into the blood for respiration. Respiration is the breakdown of food molecules in cells to produce energy.
- Breathing rate also increase to remove CO_2 generated within the cells

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]

Pulse 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]

lung cancer

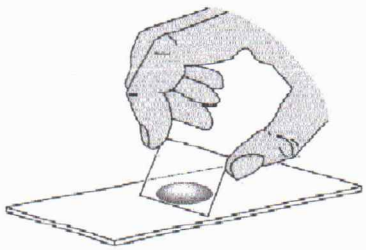
12

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]

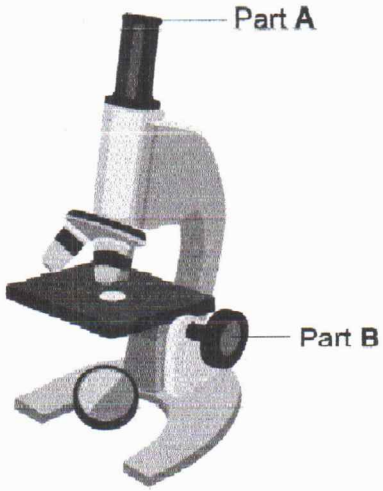
1 Stain , microscopic slide

2 Cover slip

Do not write outside the box

Figure 15 shows the student's light microscope.

Figure 15



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

[1 mark]

eyepiece

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

[1 mark]

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]

There were no cells in the field of view

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]

- Red blood cell has no nucleus while a plant cell has a nucleus. Plant cell has a cell wall and cell membrane while red blood cell has a cell membrane only.
- Red blood cells have haemoglobin but the plant cells (may) have chlorophyll.
- In terms of size, a red blood cell is smaller than a plant cell.
- Plant cell may have different shapes but a red blood cell is biconcave.
- A red blood cell does not have a vacuole while plant cell has a permenent vacuole

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]

The cells absorb water by osmosis and starts to swell. Plant cells have a cell wall that prevent them from bursting. Red blood cell has no cell membrane. So it bursts

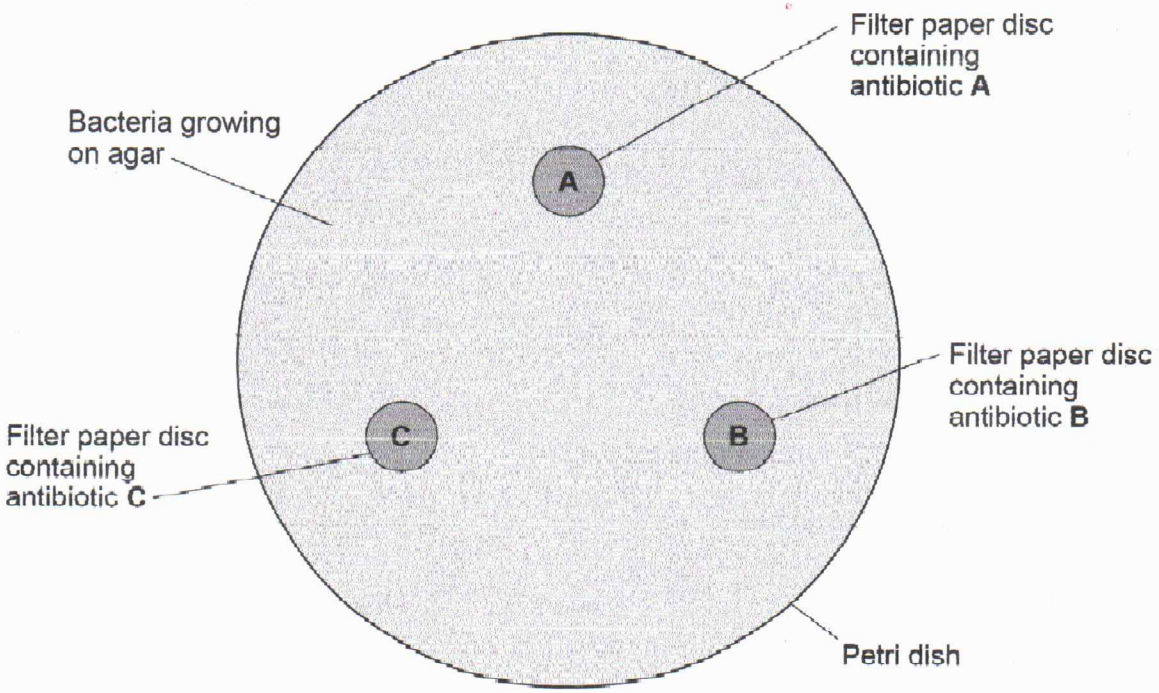
13

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 Sterilize the equipment before use

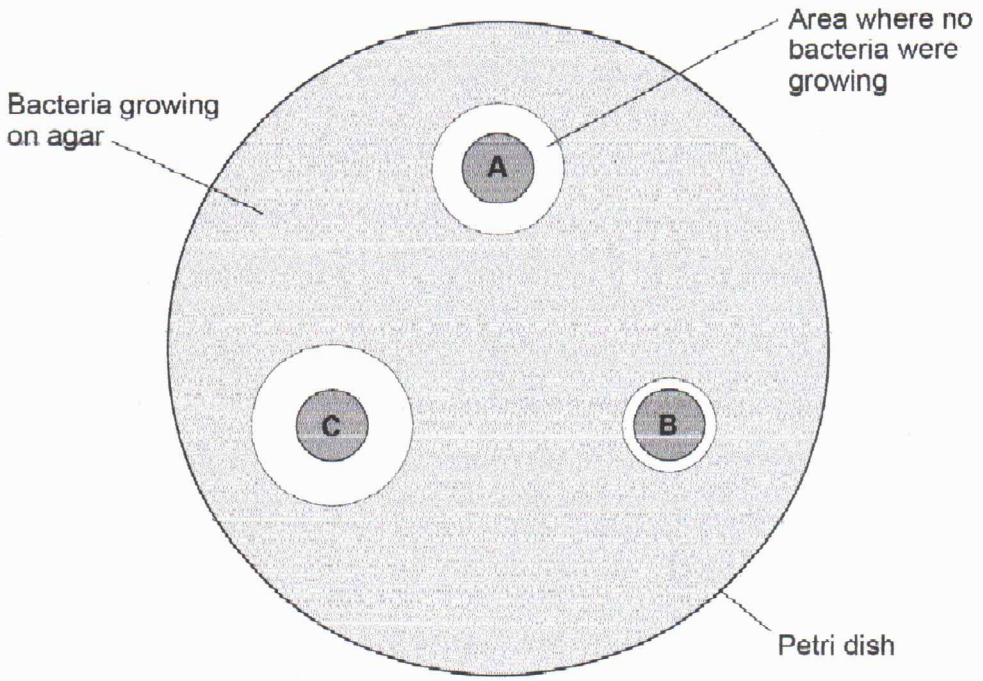
2 Use steri lised agar

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 It kills the fewest bacteria

Do not write 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]

d = 2.2 cm r = 1.1 cm

Area of Circle = πr^2

Area of circle = $(3.14 \times 1.1 \times 1.1)\,cm^2$

$\Rightarrow 3.7994$

Area = _____ Unit _____

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

[1 mark]

Use a control disc

Repeat and calculate mean

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.

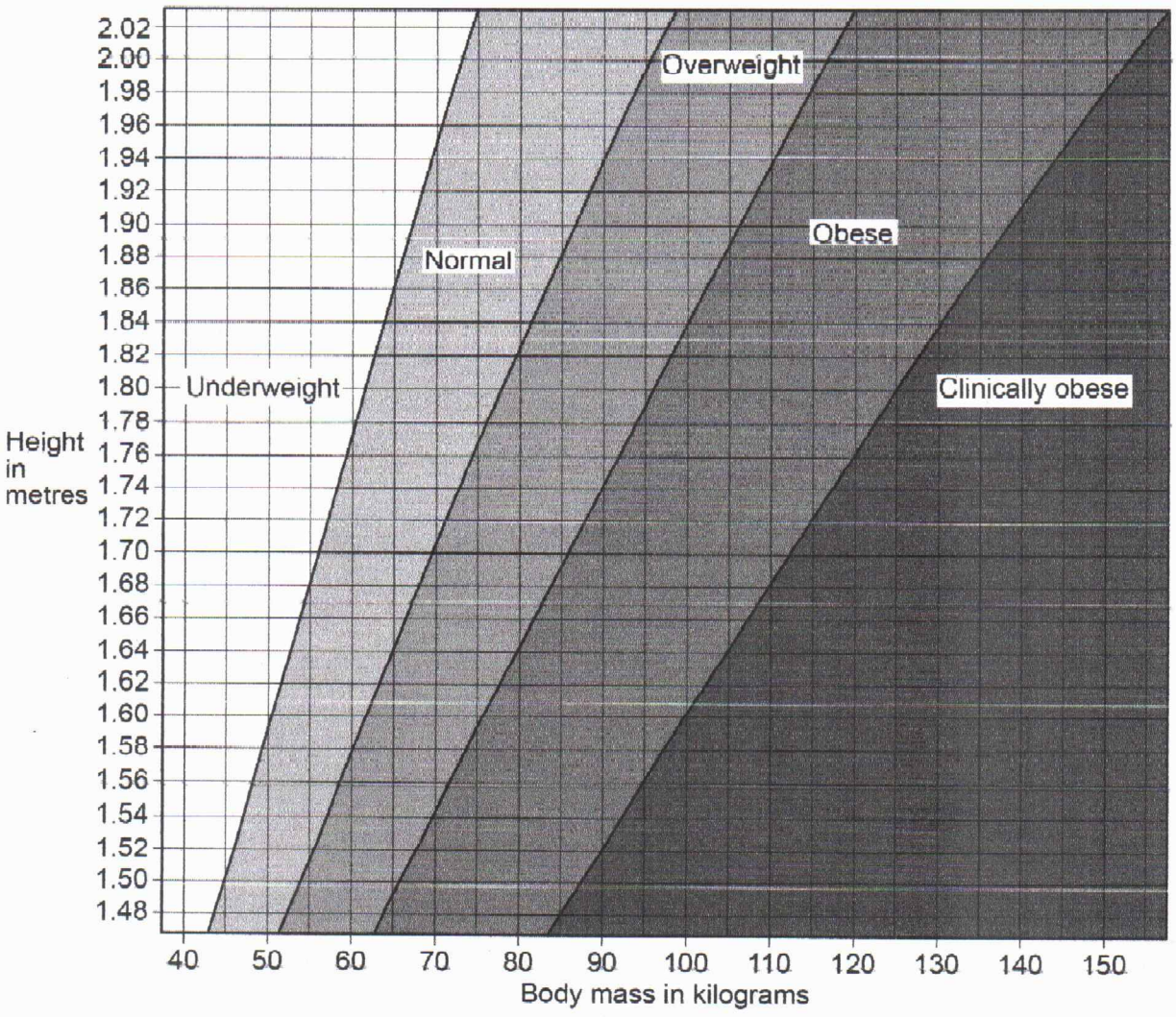
Table 4 shows information about two people.

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 ☑

~~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]

$92 \div 1.71^2$

$\Rightarrow 31.46$

X = 31.5 kg/m²

Question 9 continues on the next page

Do not write outside the box

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 living in good health

2 The higher the BMI category, the lower the total life expectancy

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]

It will cost the gouvernment more money to pay for their medication. They are more likely to suffer stroke, that is expensive to manage. This reduces their effectiveness at work

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]

Makes it hard for patients to move. This reduces their effectiveness at work

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 Stroke

2 heart attack

11

END OF QUESTIONS