Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
BIOLOGY

F

Foundation Tier Paper 1F

Tuesday 15 May 2018 Afternoon 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.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- 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
- There are 100 marks available on this paper.
- 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	
TOTAL	

Do not write outside the box

0 1 This question is about the cell cycle.

0 1 . 1 Chromosomes are copied during the cell cycle.

Where are chromosomes found?

[1 mark]

Tick **one** box.

- Cytoplasm ☐
- Nucleus ☐
- Ribosomes ☐
- Vacuole ☐

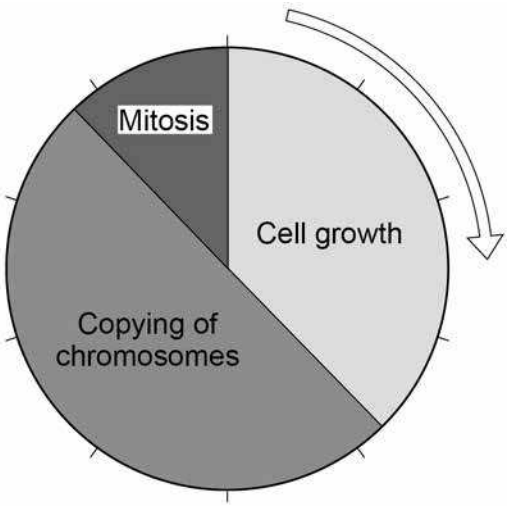
0 1 . 2 What is the name of a section of a chromosome that controls a characteristic?

[1 mark]

_____

Figure 1 shows information about the cell cycle.

Figure 1



Do not write outside the box

0 1 . 3 Which stage of the cell cycle in **Figure 1** takes the most time?

[1 mark]

Tick **one** box.

Cell growth ☐

Copying of chromosomes ☐

Mitosis ☐

0 1 . 4 During mitosis cells need extra energy.

Which cell structures provide most of this energy?

[1 mark]

Tick **one** box.

Chromosomes ☐

Cytoplasm ☐

Mitochondria ☐

Ribosomes ☐

0 1 . 5 The cell cycle in **Figure 1** takes two hours in total.

The cell growth stage takes 45 minutes.

Calculate the time taken for mitosis.

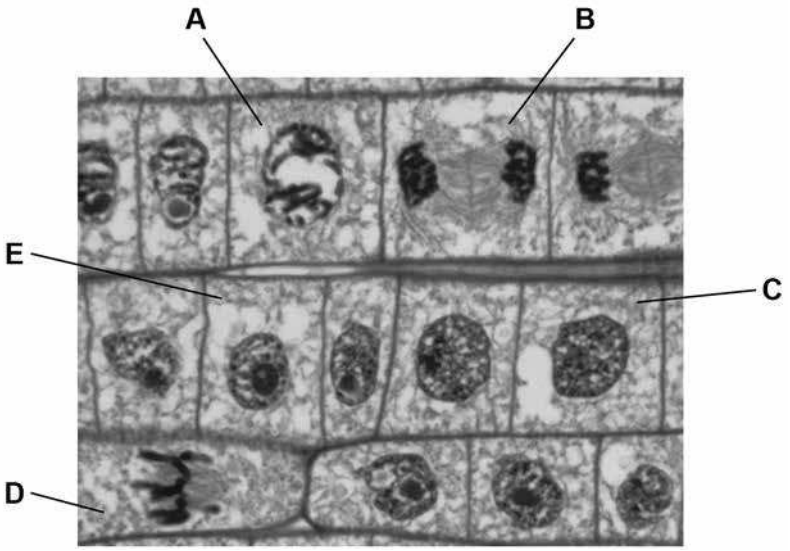
[2 marks]

Time = _____ minutes

Do not write outside the box

Figure 2 shows some cells in different stages of the cell cycle.

Figure 2



0 1 . 6 Which cell is **not** dividing by mitosis?

[1 mark]

Tick **one** box.

A		**B**		**C**		**D**	

Do not write outside the box

0 1 . 7 Cell **E** in **Figure 2** contains 8 chromosomes.

Cell **E** divides by mitosis.

How many chromosomes will each new cell contain?

[1 mark]

Tick **one** box.

2 ☐

4 ☐

8 ☐

16 ☐

0 1 . 8 Why is mitosis important in living organisms?

[1 mark]

Tick **one** box.

To produce gametes ☐

To produce variation ☐

To release energy ☐

To repair tissues ☐

9

Turn over for the next question

Do not write outside the box

0 2 Plants are made up of cells, tissues and organs.

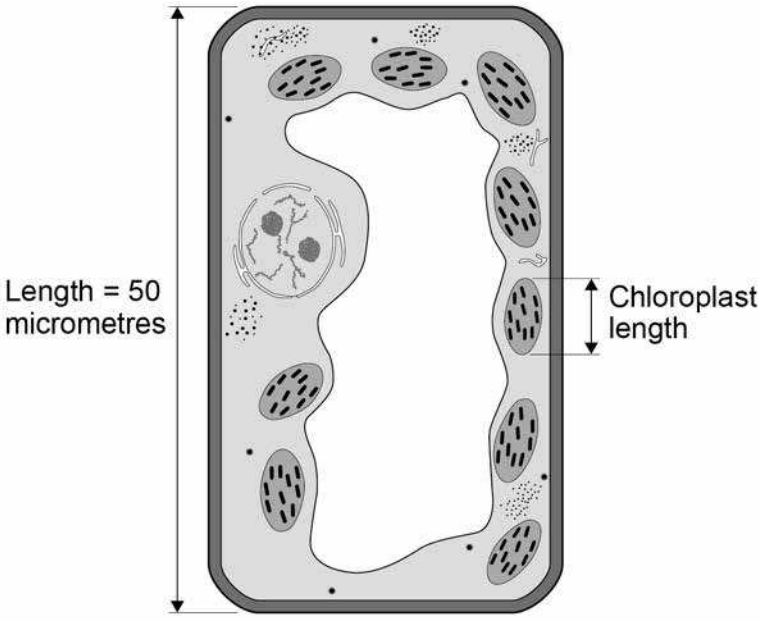
0 2 . 1 Draw **one** line from each level of organisation to the correct plant part.

[2 marks]

Level of organisation	Plant part
	Leaf
Organ	Root hair
	Spongy mesophyll
Tissue	Vacuole
	Xylem cell

Figure 3 shows a plant cell drawn to scale.

Figure 3



Do not write outside the box

0 2 . 2 Where in a plant would the cell in **Figure 3** be found?

[1 mark]

Tick **one** box.

Epidermis ☐

Palisade mesophyll ☐

Phloem ☐

Xylem ☐

0 2 . 3 Calculate the length of the chloroplast labelled in **Figure 3**.

[2 marks]

Length = _____ micrometres

0 2 . 4 Cells in plant roots do **not** photosynthesise.

Give **one** reason why.

[1 mark]

Do not write outside the box

0 2 . 5 As a plant grows, new root hair cells are formed from unspecialised cells.

How does an unspecialised cell become a new root hair cell?

[1 mark]

Tick **one** box.

Differentiation ☐

Metabolism ☐

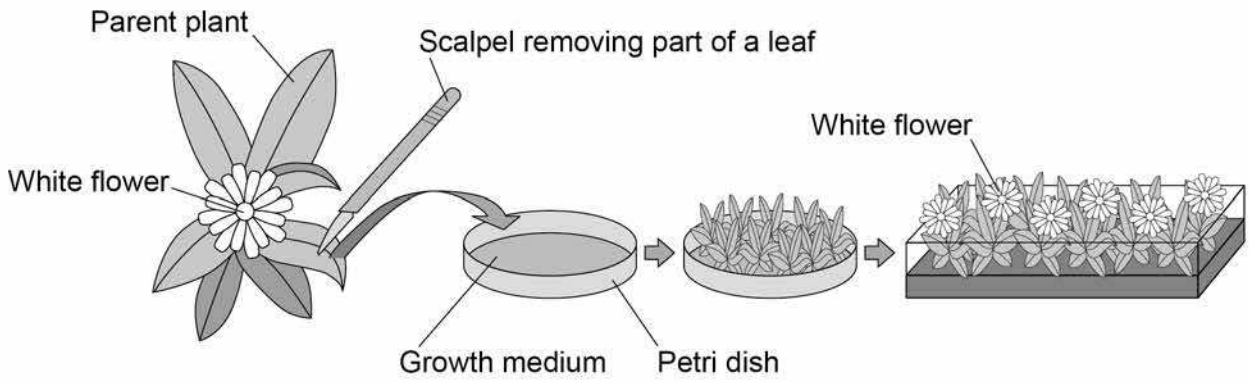
Transpiration ☐

Transport ☐

Scientists can clone plants using tissue culture.

Figure 4 shows the process of tissue culture.

Figure 4



Do not write outside the box

0 2 . 6 Why might scientists want to clone plants?

[1 mark]

Tick **one** box.

To create new species of plants. ☐

To introduce variation into plants. ☐

To protect endangered plants from extinction. ☐

To reduce disease resistance in plants. ☐

0 2 . 7 What is the advantage of cloning plants using tissue culture?

[1 mark]

Tick **one** box.

No special equipment is needed. ☐

Plants can be produced quickly. ☐

The flowers are all different colours. ☐

The offspring are all genetically different. ☐

0 2 . 8 The growth medium in **Figure 4** helps the plants to grow.

Name **one** substance in the growth medium.

[1 mark]

_____

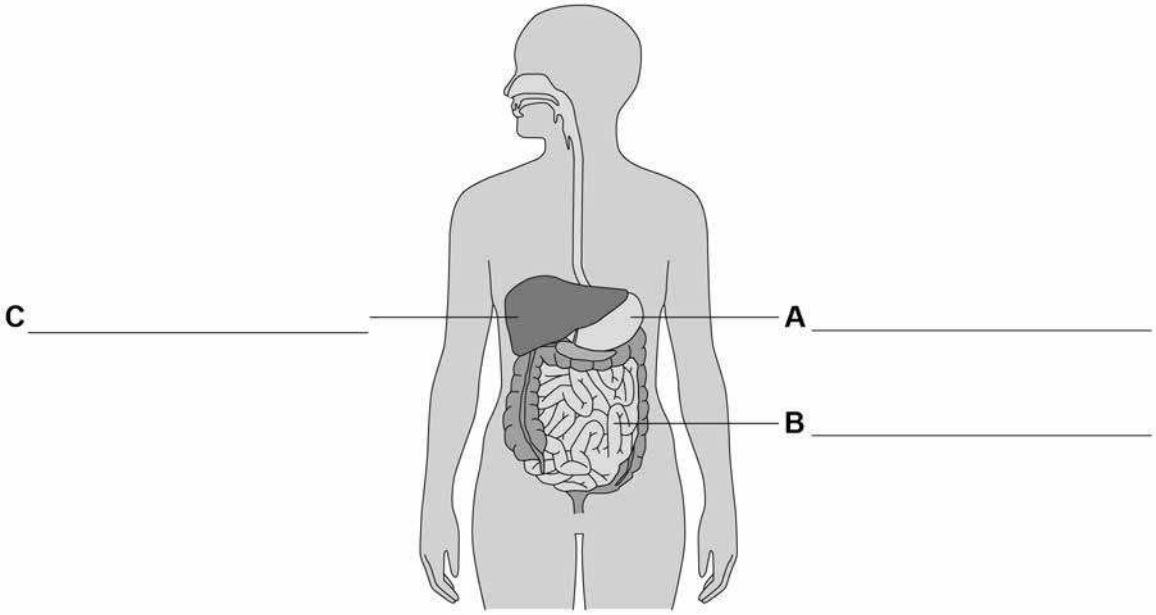
_____

10

Do not write outside the box

0 3 **Figure 5** shows the human digestive system.

Figure 5



0 3 . 1 Label organs **A**, **B** and **C**.

[3 marks]

0 3 . 2 Complete the sentences.

[3 marks]

Choose the answers from the box.

catalyse	**denatured**	**digest**	**energise**
excreted	**ingested**	**insoluble**	**soluble**

Digestion is the process of breaking down large food molecules into smaller molecules that are _____.

Enzymes help to break down food because they _____ chemical reactions.

If the temperature of an enzyme gets too high, the enzyme is _____.

Do not write outside the box

0 3 . 3 Protease is an enzyme.

Protease breaks down protein.

What is protein broken down into?

[1 mark]

Tick **one** box.

- Amino acids ☐
- Fatty acids ☐
- Glucose ☐
- Glycerol ☐

0 3 . 4 Why is protein needed by the body?

[1 mark]

_____

_____

0 3 . 5 Which organ in the human digestive system produces protease?

[1 mark]

Tick **one** box.

- Gall bladder ☐
- Large intestine ☐
- Liver ☐
- Stomach ☐

Do not write outside the box

0 3 . 6 Describe how you would test a sample of food to show it contains protein.

Give the reason for any safety precautions you would take.

[4 marks]

0 3 . 7 Complete the sentence.

[1 mark]

Choose the answer from the box.

fat	**fibre**	**minerals**	**vitamins**

Obesity can be caused by a diet high in _____.

0 3 . 8 Complete the sentence.

[1 mark]

Choose the answer from the box.

skin cancer	**type 1 diabetes**	**type 2 diabetes**

Obesity is a risk factor for _____.

15

Do not write outside the box

0 4 This question is about the circulatory system.

0 4 . 1 Draw **one** line from each blood component to its function.

[3 marks]

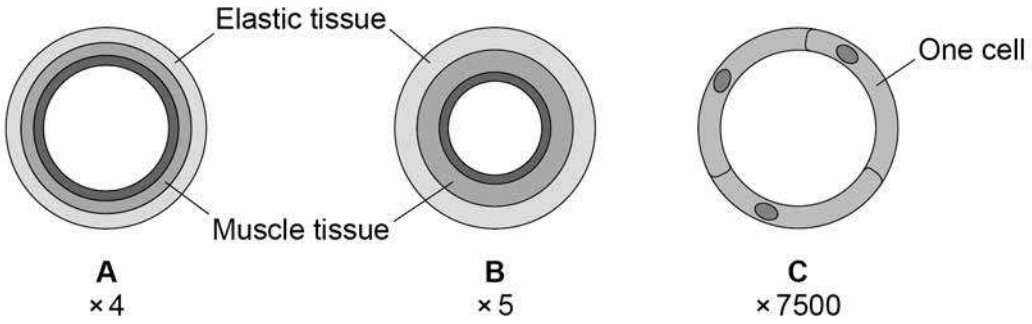
Blood component	Function
Platelet	Destroys microorganisms
Red blood cell	Helps the blood to clot
White blood cell	Transports glucose around the body
	Transports oxygen around the body
	Transports urea

Question 4 continues on the next page

Do not write outside the box

0 4 . 2 **Figure 6** shows cross sections of the three main types of blood vessel found in the human body. Each blood vessel is drawn to the scale shown.

Figure 6



Which blood vessel has the smallest diameter?

[1 mark]

Tick **one** box.

A		B		C	

0 4 . 3 Which blood vessel in **Figure 6** is an artery?

Give **one** reason for your answer.

[2 marks]

Blood vessel: _____

Reason: _____

_____

Do not write outside the box

Table 1 gives information about the blood flow in two people.

Table 1

Person	**Blood flow through the coronary arteries in cm^3/minute**
A - does **not** have coronary heart disease	250
B - has coronary heart disease	155

0 4 . 4 Calculate the difference in blood flow between person **A** and person **B**.

[1 mark]

Difference = _____ cm^3/minute

0 4 . 5 Suggest why blood flow through the coronary arteries is lower in people with coronary heart disease.

[1 mark]

0 4 . 6 Calculate the volume of blood flowing through the coronary arteries of person **A** in 1 hour.

Give your answer in dm^3.

[2 marks]

Volume of blood in 1 hour = _____ dm^3

Turn over ►

Do not write outside the box

Coronary heart disease can be treated by:

- inserting a stent
- using a Coronary Artery Bypass Graft (CABG).

Table 2 gives information about each method.

Table 2

	Stent	**CABG**
Procedure	The patient is awake during the procedure. A small cut is made in the skin. A wire mesh is inserted into the coronary artery via a blood vessel in the arm or leg.	The patient is not awake during the procedure. The chest is cut open. A section of blood vessel from the arm or leg is removed. It is used to create a new channel for blood to bypass the blockage in the coronary artery.
When procedure is recommended	When only one blockage is present	When multiple blockages are present
Time spent in hospital after procedure	2-3 hours	at least 7 days
Recovery time after procedure	7 days	12 weeks
Risk of heart attack during procedure	1%	2%
Chance of failure within one year	40%	5%

0 4 . 7 Give **two** advantages of using a stent instead of CABG.

[2 marks]

1 _____

_____

2 _____

_____

Do not write outside the box

0 4 . 8 Give **two** advantages of using CABG instead of a stent.

[2 marks]

1 _____

_____

2 _____

_____

14

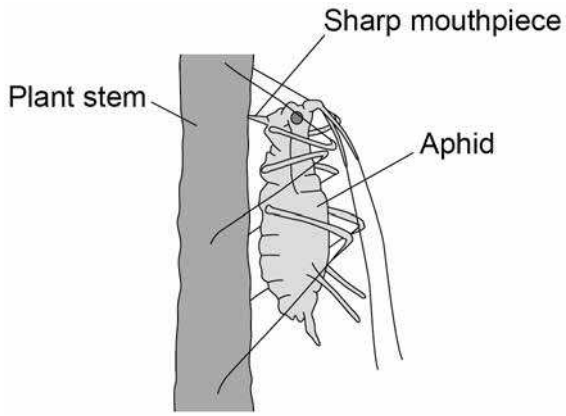
Turn over for the next question

Do not write outside the box

0 5 Aphids are small insects that carry pathogens.

Figure 7 shows an aphid feeding from a plant stem.

Figure 7



0 5 . 1 An aphid feeds by inserting its sharp mouthpiece into the stem of a plant.

After feeding, the mouthpiece of an aphid contains a high concentration of dissolved sugars.

Which part of the plant was the aphid feeding from?

[1 mark]

Tick **one** box.

- Palisade layer ☐
- Phloem ☐
- Stomata ☐
- Xylem ☐

Do not write outside the box

0 5 . 2 What is the process that transports dissolved sugars around a plant?

[1 mark]

Tick **one** box.

Filtration ☐

Respiration ☐

Translocation ☐

Transpiration ☐

0 5 . 3 Plants infected with aphids have stunted growth.

Explain **one** way the removal of dissolved sugars from the stem of the plant causes stunted growth.

[2 marks]

0 5 . 4 Most aphids do not have wings when they hatch. After several generations, some aphids hatch which have wings and can fly.

Explain the advantage to the aphid of being able to fly.

[2 marks]

Do not write outside the box

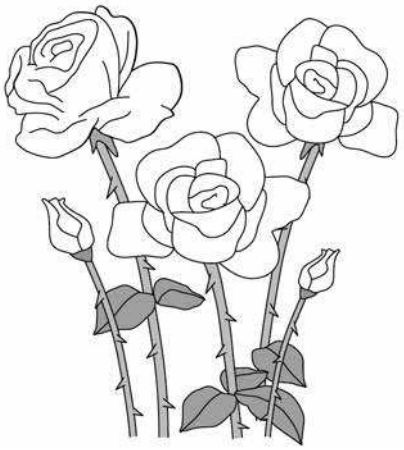
0 5 . 5 The leaves of some plants release oils onto their surface.

Suggest how the production of oil on the surface of a leaf may protect the plant from aphids.

[1 mark]

Figure 8 shows part of a rose plant.

Figure 8



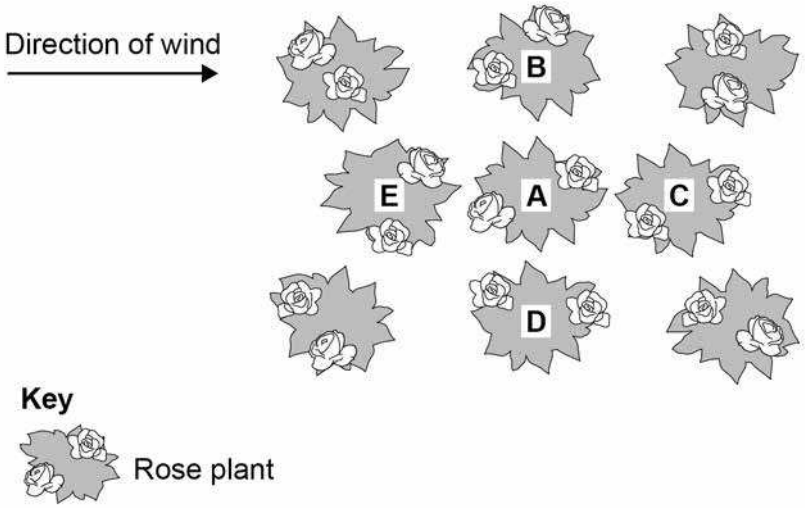
0 5 . 6 Give **one** adaptation shown in **Figure 8** that helps the rose plant defend itself.

[1 mark]

Do not write outside the box

Figure 9 shows a plan of a garden containing rose plants.

Figure 9



0 5 . 7 Plant **A** has the fungal disease rose black spot.

Which plant in **Figure 9** is the fungus likely to spread to first?

Give a reason for your answer.

[2 marks]

Plant _____

Reason _____

0 5 . 8 Suggest **one** way the gardener could reduce the spread of rose black spot to the other plants in the garden.

[1 mark]

11

Turn over ►

Do not write outside the box

0 6 Earthworms are small animals that live in soil. Earthworms have no specialised gas exchange system and absorb oxygen through their skin.

0 6 . 1 What is the name of the process in which oxygen enters the skin cells?

[1 mark]

Tick **one** box.

Active transport ☐

Diffusion ☐

Osmosis ☐

Respiration ☐

Table 3 shows information about four skin cells of an earthworm.

Table 3

Cell	Percentage of oxygen	
	Outside cell	**Inside cell**
A	9	8
B	12	8
C	12	10
D	8	12

0 6 . 2 Which cell has the smallest difference in percentage of oxygen between the outside and the inside of the cell?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

Do not write outside the box

0 6 . 3 Which cell will oxygen move **into** the fastest?

[1 mark]

Tick **one** box.

A		B		C		D	

0 6 . 4 Earthworms have a large surface area to volume ratio.

Suggest why a large surface area to volume ratio is an advantage to an earthworm.

[1 mark]

0 6 . 5 The earthworm uses enzymes to digest dead plants.

Many plants contain fats or oils.

Which type of enzyme would digest fats?

[1 mark]

Question 6 continues on the next page

Do not write outside the box

0 6 . 6 Earthworms move through the soil.

This movement brings air into the soil.

Dead plants decay faster in soil containing earthworms compared with soil containing **no** earthworms.

Explain why.

[3 marks]

0 6 . 7 When earthworms reproduce, a sperm cell from one earthworm fuses with an egg cell from a different earthworm.

Name the process when an egg cell and a sperm cell fuse.

[1 mark]

0 6 . 8 Some types of worm reproduce by a process called fragmentation.

In fragmentation, the worm separates into two or more parts. Each part grows into a new worm.

What type of reproduction is fragmentation?

[1 mark]

10

Do not write outside the box

0 7 Eating food containing *Salmonella* bacteria can cause illness.

0 7 . 1 Two symptoms of infection by *Salmonella* are vomiting and diarrhoea.

What causes these symptoms?

[1 mark]

0 7 . 2 Give **two** ways a person with a mild infection of *Salmonella* can help prevent the spread of the bacteria to other people.

[2 marks]

1

2

0 7 . 3 In very serious infections of *Salmonella*, a doctor can prescribe drugs to kill the bacteria.

What type of drug can the doctor prescribe to kill the bacteria?

[1 mark]

0 7 . 4 A person with AIDS may take longer than a healthy person to recover from a *Salmonella* infection.

Explain why.

[2 marks]

Do not write outside the box

0 7 . 5 *Salmonella* bacteria can be transmitted from chickens to humans. Chickens can be vaccinated to prevent the transmission of *Salmonella* bacteria to humans.

Suggest **one** other way farmers could prevent the transmission of *Salmonella* from chickens to humans.

[1 mark]

A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

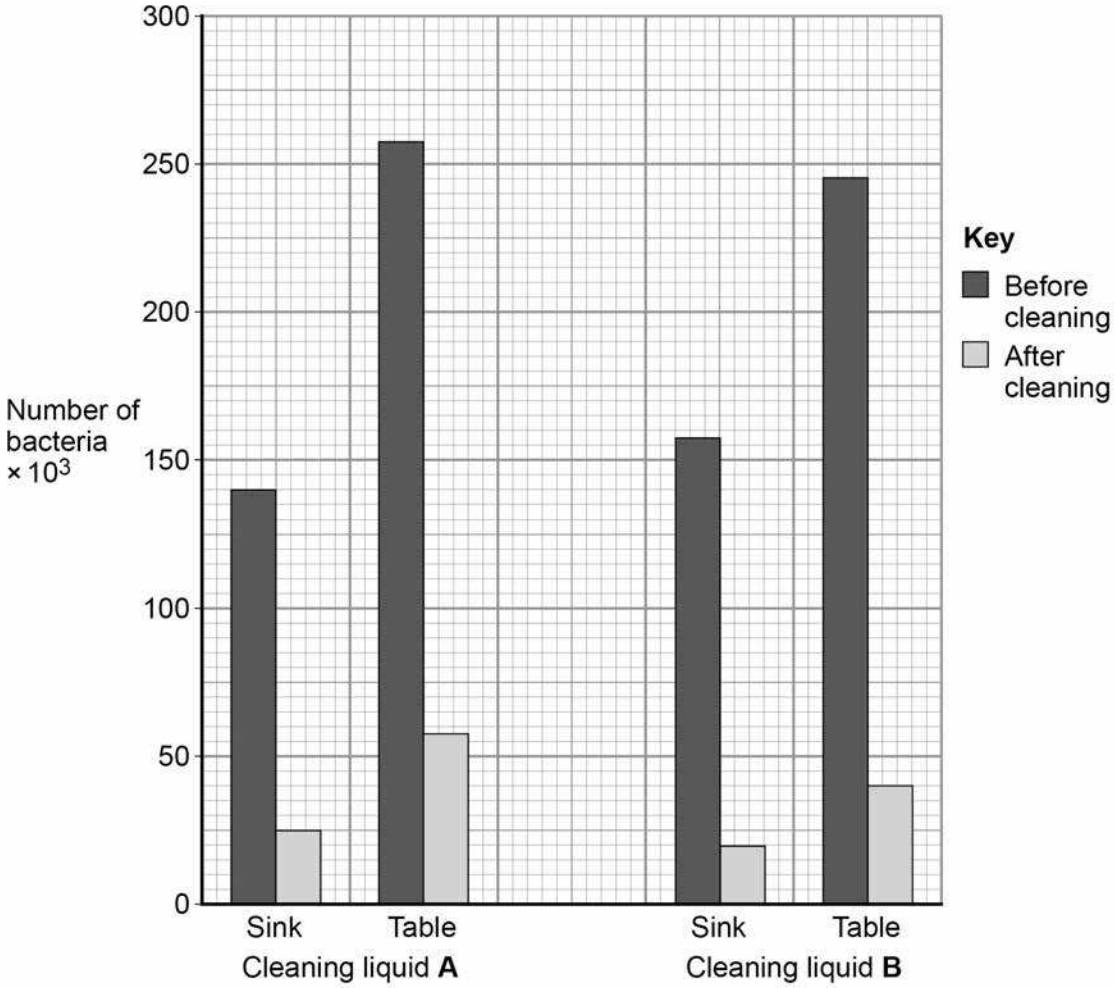
The scientist took samples from two work surfaces:

- before the surfaces had been cleaned with the cleaning liquids
- after the surfaces had been cleaned with the cleaning liquids.

The samples were then analysed for the number of bacteria they contained.

The results are shown in **Figure 10**.

Figure 10



Do not write outside the box

0 7 . 6 Which cleaning liquid is the more effective?

Give a reason for your answer.

[1 mark]

Cleaning liquid _____

Reason _____

_____

_____

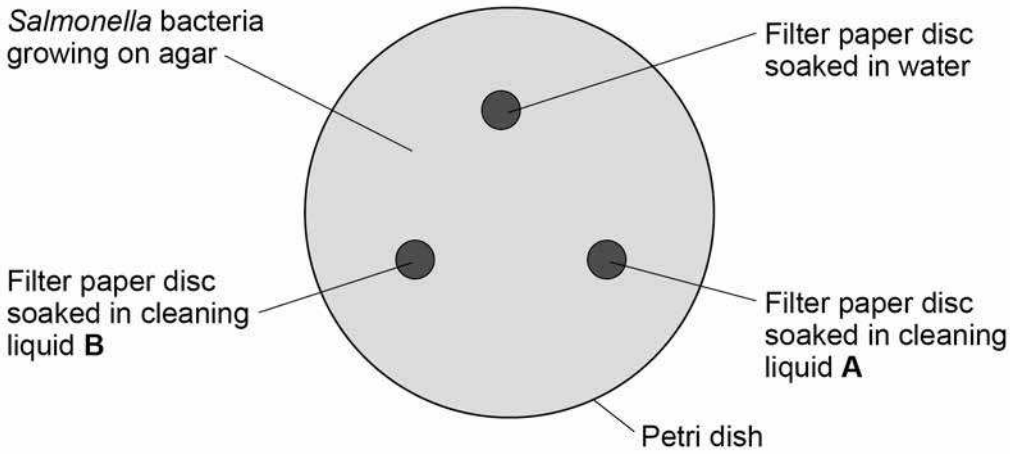
Question 7 continues on the next page

Do not write outside the box

The scientist investigated the effect of cleaning liquid **A** and cleaning liquid **B** on *Salmonella* bacteria grown in a laboratory.

Figure 11 shows the way the investigation was set up.

Figure 11



The Petri dish was placed in an incubator at 25 °C for 48 hours.

After 48 hours, the scientist calculated the area around each paper disc where no bacteria were growing.

The results are shown in **Table 4**.

Table 4

Filter paper disc	**Area around disc with no bacteria growing in cm^2**
Water	0
Cleaning liquid **A**	11
Cleaning liquid **B**	13

0 7 . 7 What measurement would the scientist need to take to calculate the area where no bacteria were growing?

[1 mark]

Do not write outside the box

0 7 . 8 Give **one** change to the investigation that would allow the scientist to check if the results are repeatable.

[1 mark]

0 7 . 9 The scientist showed the results to the restaurant owner.

Both cleaning liquids cost the same per dm^3.

Suggest **one** other factor the restaurant owner should consider when choosing which cleaning liquid to use.

[1 mark]

11

Turn over for the next question

Do not write outside the box

0 8 Metabolism is the sum of all the chemical reactions in the cells of the body.

One metabolic reaction is the formation of lipids.

0 8 . 1 Give **one** other metabolic reaction in cells.

[1 mark]

Table 5 shows the mean metabolic rate of humans of different ages.

Table 5

Age in years	Mean metabolic rate in kJ/m^2/hour	
	Males	Females
5	53	53
15	45	42
25	39	35
35	37	35
45	36	35

0 8 . 2 What **two** conclusions can be made from the data in **Table 5**?

[2 marks]

Tick **two** boxes.

- As age increases, mean metabolic rate of males and females increases. ☐
- Males have a higher metabolic rate than females after five years of age. ☐
- The mean metabolic rate of females decreases faster than males up to 25 years of age. ☐
- The mean metabolic rate of males and females decreases more quickly after the age of 35. ☐
- There is no relationship between age and mean metabolic rate. ☐

Do not write outside the box

0 8 . 3 Calculate the percentage decrease in the mean metabolic rate of males between 5 years and 45 years of age.

Use the equation:

$$\text{percentage decrease} = \frac{\text{decrease in metabolic rate}}{\text{original metabolic rate}} \times 100$$

Give your answer to 3 significant figures.

[3 marks]

Percentage decrease= _____

Question 8 continues on the next page

Do not write outside the box

Regular exercise can increase metabolic rate.

Two people did five minutes of gentle exercise from rest.

Table 6 shows the effect of the exercise on their heart rates.

Table 6

Time in minutes	Heart rate in beats per minute	
	Person R	Person S
0 (at rest)	60	78
1	76	100
2	85	110
3	91	119
4	99	129
5	99	132

0 8 . 4 Describe **two** differences in the response of person **R** and person **S** to the exercise.

Use information from **Table 6**.

[2 marks]

1 _____

_____

2 _____

_____

0 8 . 5 Complete the line graph in **Figure 12** for person **S**.

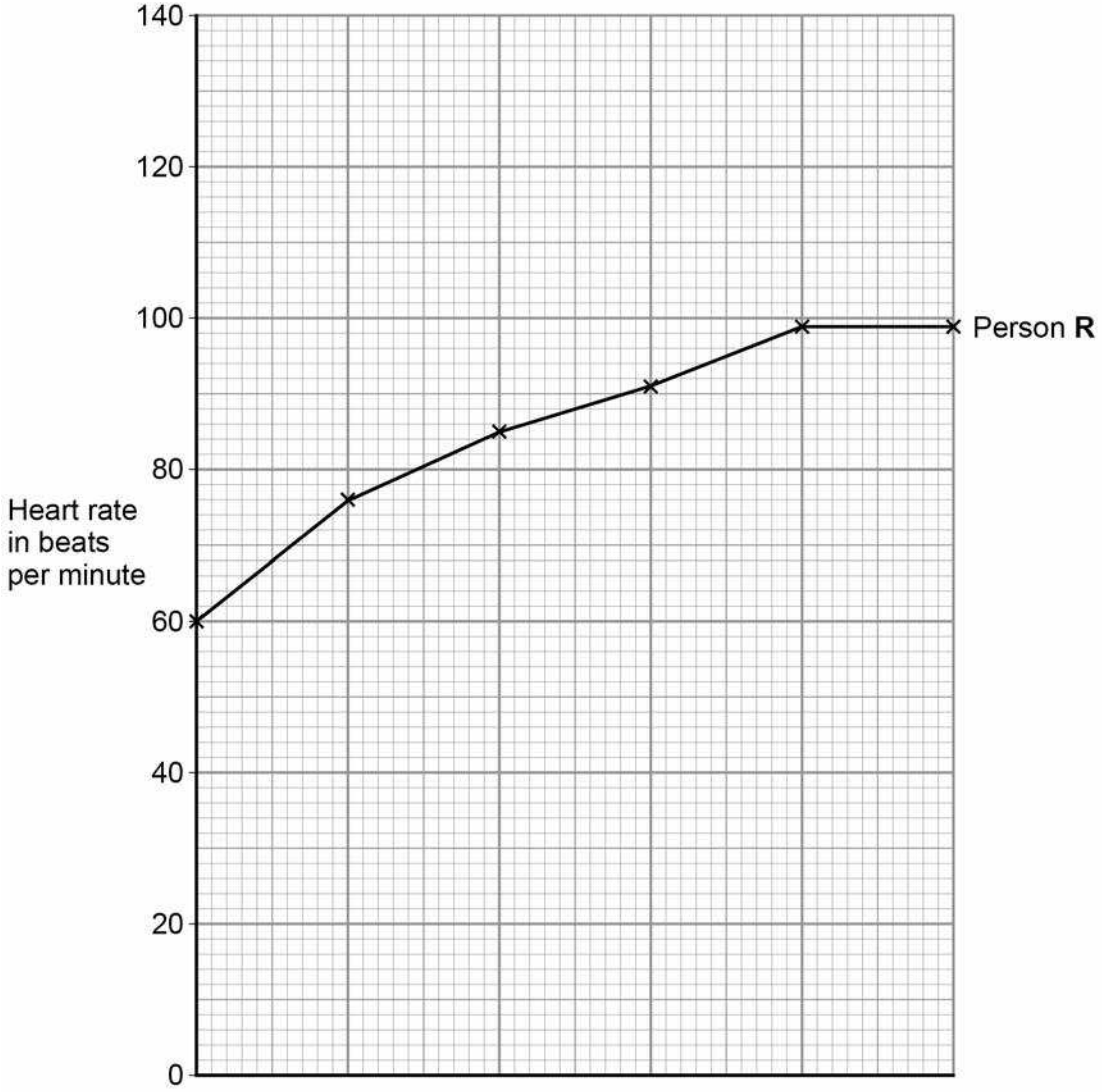
You should:

- add the scale to the x axis
- label the x axis.

[4 marks]

Do not write outside the box

Figure 12



0 8 . 6 After five minutes of exercise, the heart rate of person **S** was 132 beats per minute. When person **S** rested, his heart rate decreased steadily at a rate of 12 beats every minute.

Calculate how much time it would take the heart rate of person **S** to return to its resting rate.

[2 marks]

Time = _____ minutes

Question 8 continues on the next page

Do not write outside the box

0 8 . 7 A student made the following hypothesis about the heart rate of smokers and non-smokers during exercise.

"During exercise, the heart rate of smokers increases more than the heart rate of non-smokers."

Design an investigation that would allow you to test this hypothesis.

[6 marks]

20

END OF QUESTIONS

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