Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
BIOLOGY

H

Higher Tier Paper 1H

Friday 10 May 2024 Morning 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.

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

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.

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

Do not write outside the box

0 1 A person has coronary heart disease.

0 1 . 1 Which blood vessels are affected by coronary heart disease?

[1 mark]

Tick (✓) **one** box.

Arteries ☐

Capillaries ☐

Veins ☐

A person's heart stops beating.

The person stops breathing.

A first-aider pushes down on the person's chest.

Pushing down on the person's chest puts pressure on the heart.

0 1 . 2 Explain why putting pressure on the heart helps the person.

[2 marks]

Do not write outside the box

0 1 . 3 The first-aider also forces air into the person's lungs by blowing into their mouth.

Describe how forcing air into the person's lungs helps the person.

[1 mark]

0 1 . 4 The person's heart starts to beat again and the person starts breathing.

The person has a high level of cholesterol in their blood.

Name **one** type of drug that would decrease the level of cholesterol in the person's blood.

[1 mark]

0 1 . 5 A doctor decides that the person needs to have a stent fitted.

Explain how a stent works to treat coronary heart disease.

[2 marks]

Question 1 continues on the next page

Do not write outside the box

Table 1 shows the effect of smoking on the risk of developing different cardiovascular diseases.

Table 1

Cardiovascular disease	Percentage (%) increase in risk compared to people who have never smoked
E	14
F	20
G	29
H	70

0 1 . 6 Give **two** conclusions that can be made from the data in **Table 1**.

[2 marks]

1 _____

_____

2 _____

_____

0 1 . 7 Complete **Figure 1**.

You should:

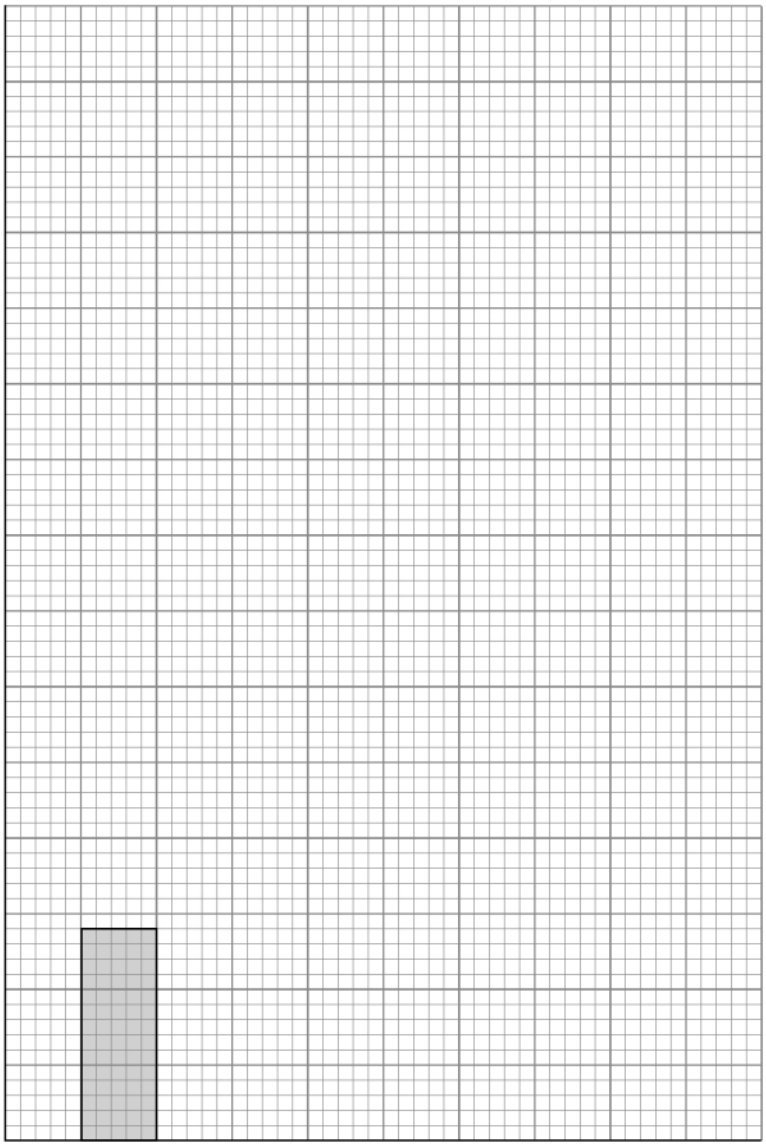
- label the y-axis
- add the correct scale to the y-axis
- plot the data from **Table 1**
- label each bar.

The bar for cardiovascular disease **E** has been plotted for you.

[4 marks]

Do not write outside the box

Figure 1



0 1 . 8 Describe **one** lifestyle factor that can increase the risk of cardiovascular disease.

Do **not** refer to smoking in your answer.

[1 mark]

14

Turn over ►

Do not write outside the box

0 2 Cystic fibrosis (CF) is an inherited disorder caused by a faulty gene.

0 2 . 1 Where in a cell would the CF gene be found?

[1 mark]

Do not write outside the box

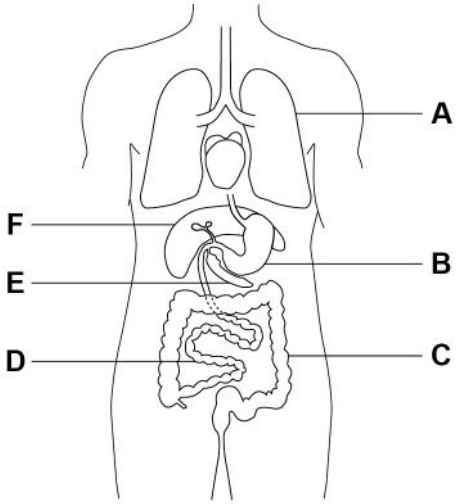
CF affects many organs in the body.

The main organs affected are:

- the lungs
- the pancreas
- the small intestine.

0 2 . 2 **Figure 2** shows organs of the human body.

Figure 2



Which letters in **Figure 2** show the lungs, the pancreas and the small intestine?

[1 mark]

Tick (✓) **one** box.

A, **D** and **E** ☐

A, **E** and **F** ☐

B, **C** and **D** ☐

B, **C** and **F** ☐

Question 2 continues on the next page

Do not write outside the box

0 2 . 3 The pancreas produces several digestive enzymes.

CF reduces the amount of each enzyme that reaches the small intestine.

Explain why a person with CF has:

- difficulty digesting food
- difficulty gaining body mass.

[6 marks]

Do not write outside the box

0 2 . 4 Gas exchange happens in the alveoli in the lungs.

Describe **three** features of the alveoli that help maximise gas exchange.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

0 2 . 5 CF reduces the amount of oxygen that can enter the blood from the alveoli.

Explain how a reduced amount of oxygen entering the blood will affect the human body.

[3 marks]

_____

_____

_____

_____

_____

_____

14

Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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0 3 Cake and bread each contain the same two types of carbohydrate.

0 3 . 1 Describe the chemical tests that could be used to show the presence of the two types of carbohydrate in cake.

Include a risk assessment in your answer.

[6 marks]

Question 3 continues on the next page

Do not write outside the box

A student investigated three types of bread.

For each type of bread, the student:

- put a square piece of bread into their mouth
- did **not** chew the bread
- recorded the time taken for the bread to taste sweet.

Table 2 shows the results.

Table 2

Type of bread	Time taken for bread to taste sweet in seconds
Brown	43
White	35
Wholemeal	57

0 3 . 2 What was the dependent variable in the investigation?

[1 mark]

0 3 . 3 Give **one** control variable the student should have used in the investigation.

[1 mark]

Do not write outside the box

0 3 . 4 During the investigation, the bread began to taste sweet in the student's mouth.

Explain why the bread tasted sweet.

[3 marks]

0 3 . 5 Suggest **one** reason why the results of the investigation were **not** valid.

Do **not** refer to control variables in your answer.

[1 mark]

12

Turn over for the next question

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0 4 Plants contain many different tissues.

0 4 . 1 Complete the sentences.

[3 marks]

The leaf tissue that contains the most chloroplasts is

the _____ .

The leaf tissue that contains many air spaces is

the _____ .

The plant tissue that can differentiate throughout the life of the plant is

the _____ .

0 4 . 2 Xylem tissue transports water through a plant.

The walls of xylem cells contain cellulose.

Name **one other** substance that strengthens xylem tissue.

[1 mark]

_____

0 4 . 3 Phloem tissue transports dissolved sugars around a plant.

Name the process that transports dissolved sugars around a plant.

[1 mark]

_____

Question 4 continues on the next page

Do not write outside the box

Figure 3 shows two plant cells.

Figure 3

Figure 3 cannot be reproduced here due to third-party copyright restrictions.

It is a photograph showing two cells from phloem tissue from page numbers 111-120 of the following publication:

Cytochemical Localization of Adenosine Triphosphatase in the Phloem of Pisum sativum and its Relation to the Function of Transfer Cells, Planta Vol. 2 by B J Bentwood and J Cronshaw

0 4 . 4 Name part **Y** in **Figure 3**.

[1 mark]

Do not write outside the box

0 4 . 5 The phloem tissue transports sugars to other parts of the plant.

The concentration of dissolved sugars in the phloem cell in **Figure 3** is higher than in cell **X**.

Explain how sub-cellular structures help to move dissolved sugars from cell **X** into the phloem cell.

[5 marks]

0 4 . 6 New phloem cells form when unspecialised plant cells differentiate and become specialised.

Describe **one** change in structure that occurs when an unspecialised cell differentiates to form a phloem cell.

Use **Figure 3**.

[1 mark]

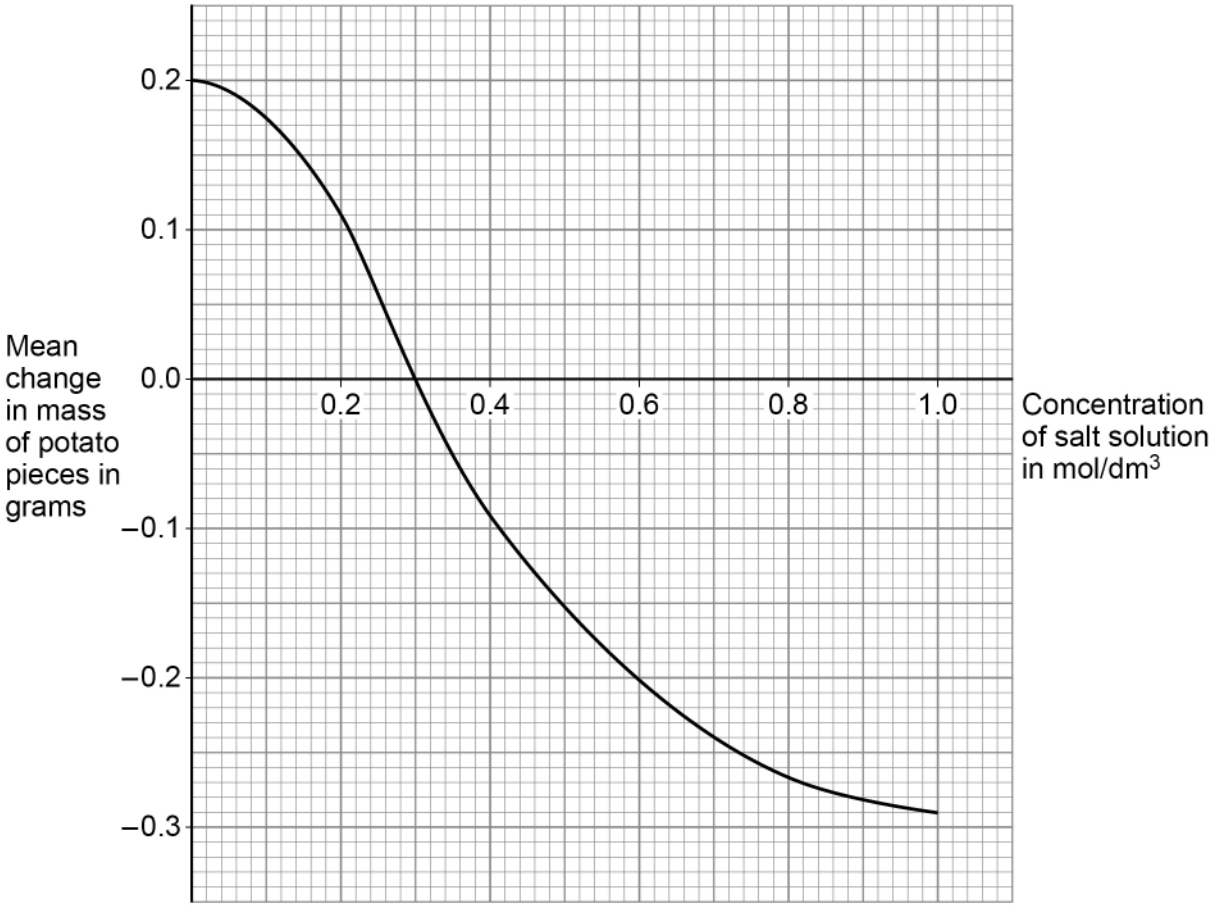
12

Do not write outside the box

0 5 A student investigated the effect of concentration of salt solution on the mass of uncooked potato pieces.

Figure 4 shows the results.

Figure 4



0 5 . 1 Plan a method that could be used to obtain the results in **Figure 4**.

[6 marks]

Do not write outside the box

0 5 . 2 Explain the result for the potato pieces in the 0.6 mol/dm^3 salt concentration.

[3 marks]

0 5 . 3 Explain why the result for the potato pieces at 1.0 mol/dm^3 was different from the result at 0.6 mol/dm^3.

[2 marks]

11

Do not write outside the box

0 6 This question is about pathogens.

A scientist investigated antibiotic resistance in bacteria.

0 6 . 1 Name **one** antibiotic.

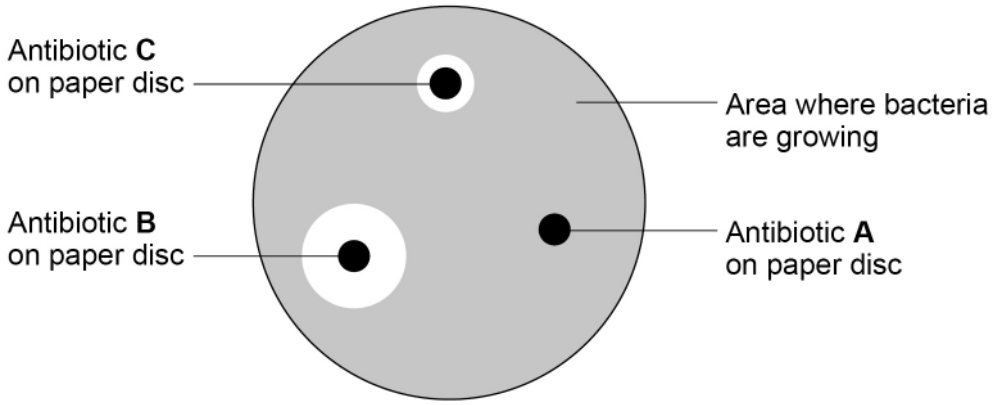
[1 mark]

The scientist grew one type of bacterium on agar in a Petri dish.

The scientist placed paper discs each containing a different antibiotic on the agar.

Figure 5 shows the appearance of the Petri dish after 2 days.

Figure 5



Do not write outside the box

0 6 . 2 A student said:

'The bacterium is resistant to antibiotic **C**.'

Explain how the results in **Figure 5** show that the student is **not** correct.

[2 marks]

0 6 . 3 Suggest why doctors are concerned about antibiotic resistance.

[2 marks]

Question 6 continues on the next page

Do not write outside the box

Diseases caused by viruses **cannot** be treated using antibiotics.

0 6 . 4 Suggest why viruses **cannot** be grown on agar.

[1 mark]

0 6 . 5 Why is it difficult for scientists to develop drugs to destroy viruses?

[1 mark]

0 6 . 6 Which disease is caused by a virus that damages white blood cells?

[1 mark]

Tick (✓) **one** box.

AIDS ☐

Gonorrhoea ☐

Measles ☐

Salmonella ☐

8

Do not write outside the box

0 7 A student investigated the effect of different factors on photosynthesis.

The student used three leaves growing on the same plant.

Each leaf was treated in a different way.

After 48 hours the student tested each leaf for starch.

Table 3 shows the results.

Table 3

Leaf tested	Treatment	Result after 48 hours
1	Upper and lower surfaces covered with black paper	No starch present
2	Upper and lower surfaces covered and sealed with transparent plastic	No starch present
3	**Not** covered	Starch present

0 7 . 1 Explain the results for the three leaves.

[5 marks]

Question 7 continues on the next page

Do not write outside the box

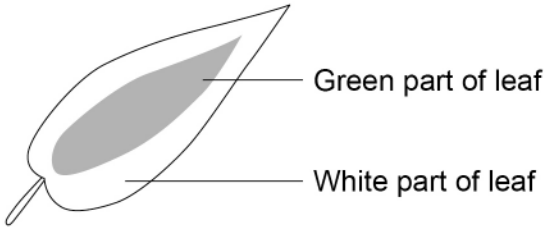
In another investigation the student used a different type of plant.

The plant was left uncovered in the light for 48 hours.

After 48 hours the student tested a leaf from the plant for starch.

Figure 6 shows the leaf before it was tested for starch.

Figure 6



0 7 . 2 Complete **Table 4** to show the results you would expect for the starch test on the leaf in **Figure 6**.

[1 mark]

Table 4

Part of leaf tested	**Result after 48 hours**
Green	
White	

0 7 . 3 Explain the results you gave in Question **07.2**.

[2 marks]

Do not write outside the box

In some leaves, the green parts become yellow because of an ion deficiency.

0 7 . 4 Which ion is deficient in a plant with yellow leaves?

[1 mark]

0 7 . 5 Give the scientific term that describes the yellow colour of the leaves.

[1 mark]

0 7 . 6 The rate of photosynthesis is affected by different factors.

How could the oxygen produced during photosynthesis be used to measure the **rate** of photosynthesis?

[1 mark]

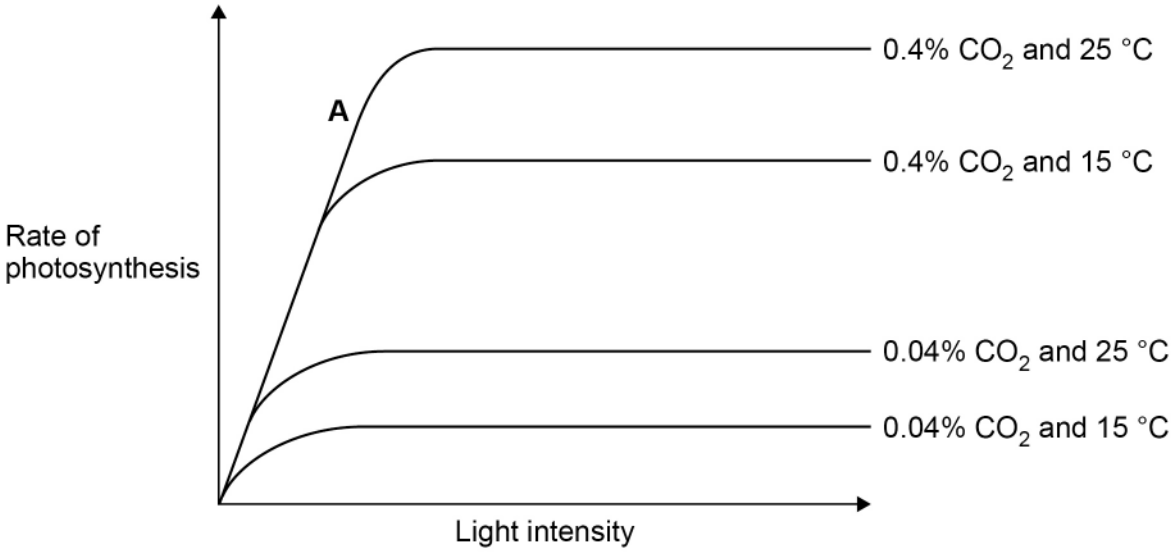
Question 7 continues on the next page

Do not write outside the box

Light, carbon dioxide and temperature are limiting factors of photosynthesis.

Figure 7 shows how the rate of photosynthesis is affected by light, carbon dioxide and temperature.

Figure 7



0 7 . 7 At point **A** on **Figure 7**, light is a limiting factor.

What is meant by a 'limiting factor'?

[1 mark]

Do not write outside the box

0 7 . 8 Explain the effect of increasing temperature and increasing carbon dioxide concentration on the rate of photosynthesis shown in **Figure 7**.

[4 marks]

0 7 . 9 Photosynthesis investigations often use a light source.

The spreading out of light from a source obeys the inverse square law.

The inverse square law links light intensity to distance from the light source.

Which of the following shows the inverse square law?

[1 mark]

Tick (✓) **one** box.

$\text{light intensity} \propto \frac{1}{\text{distance}^2}$ ☐

$\text{light intensity} \propto \text{distance}^2$ ☐

$\frac{1}{(\text{light intensity})^2} \propto \text{distance}^2$ ☐

$\frac{1}{(\text{light intensity})^2} \propto \frac{1}{\text{distance}^2}$ ☐

17

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0 8 Cancer is caused by changes in cells that result in uncontrolled cell division.

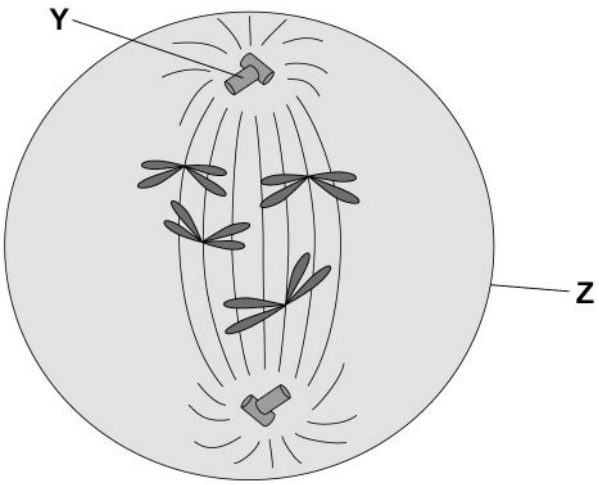
0 8 . 1 Before a cell begins to divide, its DNA replicates to form two copies of each chromosome.

Describe **one other** change that occurs in a cell **before** the cell begins to divide.

[1 mark]

Figure 8 shows a cell during one of the stages of cell division.

Figure 8



0 8 . 2 Name structure **Z** in **Figure 8**.

[1 mark]

Do not write outside the box

0 8 . 3 Structure **Y** in **Figure 8** is a cylinder.

For structure **Y**:

- real volume = 24 500 000 nm^3
- real radius = 125 nm.

The length of a cylinder is calculated using the equation:

$$\text{length} = \frac{\text{volume}}{\pi \times \text{radius}^2}$$

The length of the image of structure **Y** in **Figure 8** is 4 mm.

Calculate the magnification of structure **Y** in **Figure 8**.

Use $\pi = 3.14$

[6 marks]

Magnification = × _____

Question 8 continues on the next page

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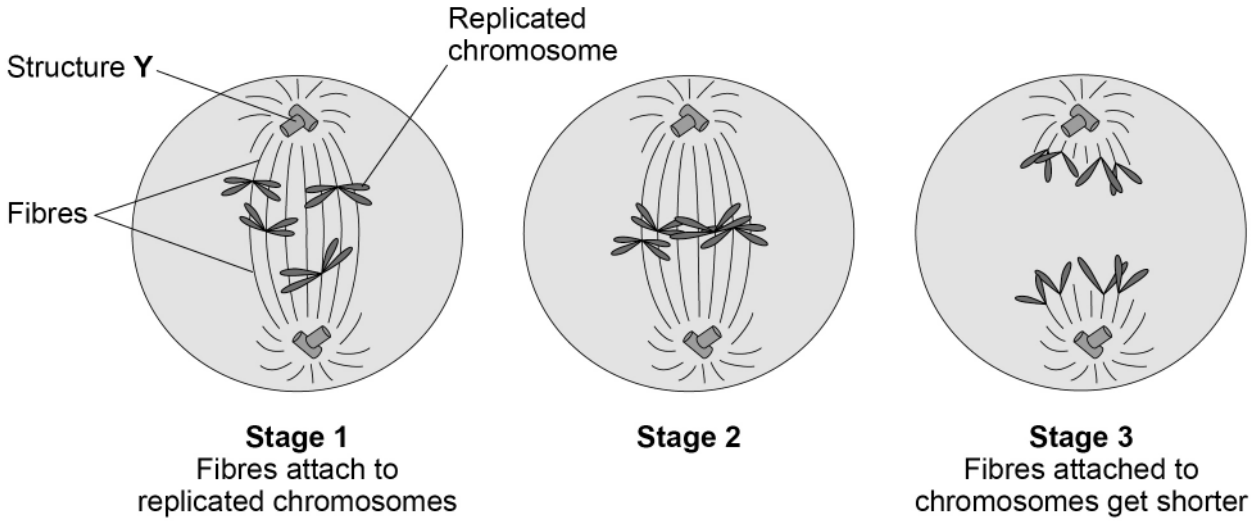
Figure 9 shows some of the stages of cell division.

Figure 9



Some cancer drugs prevent cell division.

Drug **X** prevents the fibres from attaching to the replicated chromosomes in **stage 1**.

0 8 . 4 Explain why a cell **cannot** complete division when affected by drug **X**.

[2 marks]

Do not write outside the box

0 8 . 5 Give the reason why a drug that stops cell division helps to treat cancer.

[1 mark]

0 8 . 6 New cancer drugs are tested in clinical trials.

Preclinical testing happens before clinical trials.

What is involved in preclinical testing of drugs?

[1 mark]

Tick (✓) **one** box.

Testing the drugs for side effects ☐

Testing the drugs on live tissues in a laboratory ☐

Testing the drugs to find the optimum dose ☐

Testing the drugs with chemicals in a laboratory ☐

12

END OF QUESTIONS

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