Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____
I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

H

Higher Tier
Biology Paper 1H

Tuesday 12 May 2020 Afternoon Time allowed: 1 hour 15 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 70.
- 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	
TOTAL	

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ANSWER IN THE SPACES PROVIDED

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0 1 A student investigated the effect of different concentrations of sugar solution on pieces of potato.

This is the method used.

1. Cut five pieces of potato.
2. Record the starting mass of each piece of potato.
3. Place each piece of potato in a different concentration of sugar solution.
4. After 24 hours remove the pieces of potato from the solutions.
5. Record the final mass of each piece of potato.
6. Calculate the change in mass for each piece of potato.

0 1 . 1 What is the independent variable?

[1 mark]

Tick (✓) **one** box.

- [ ] Change in mass of the pieces of potato
- [ ] Concentration of the sugar solution
- [ ] Length of time the pieces of potato are in the solution
- [ ] Starting mass of the pieces of potato

Question 1 continues on the next page

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Table 1 shows the results.

Table 1

Concentration of sugar solution in mol/dm^3	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	–0.40
0.4	7.93	7.18	–0.75
0.5	7.95	7.00	–0.95

0 1 . 2 Explain why the potato in 0.0 mol/dm^3 sugar solution increased in mass.

[2 marks]

Do not write outside the box

0 1 . 3 Complete **Figure 1**.

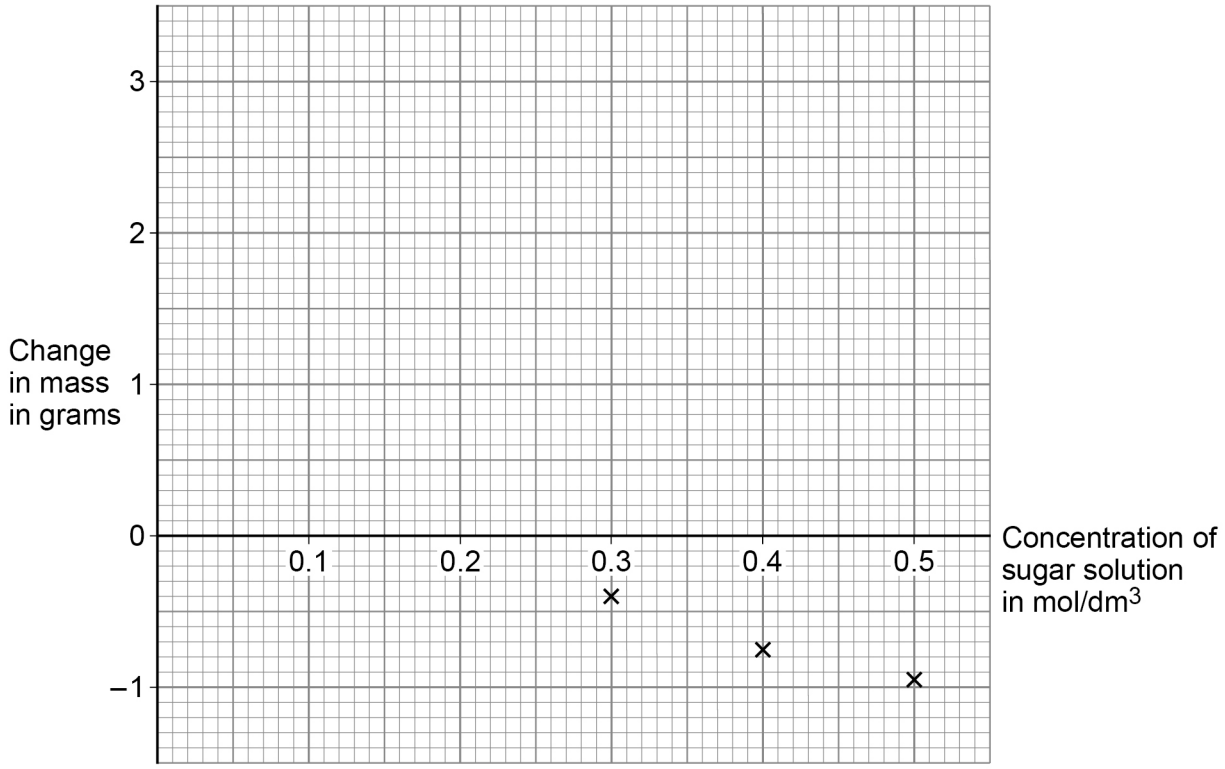
Some of the results have been plotted for you.

You should:

- plot the data from **Table 1**
- draw a line of best fit through all the points.

[2 marks]

Figure 1



0 1 . 4 The mass of a piece of potato does **not** change when:

concentration of solution inside cells = concentration of solution outside cells

Determine the concentration of sugar solution inside the potato cells.

Use **Figure 1**.

[1 mark]

Concentration = _____ mol/dm^3

Turn over ►

Do not write outside the box

Table 1 is repeated below.

Table 1

Concentration of sugar solution in mol/dm^3	Mass of potato at start in grams	Mass of potato after 24 hours in grams	Change in mass in grams
0.0	7.94	10.14	2.20
0.1	7.95	9.10	1.15
0.2	7.96	8.21	0.25
0.3	7.93	7.53	–0.40
0.4	7.93	7.18	–0.75
0.5	7.95	7.00	–0.95

0 1 . 5 Calculate the percentage change in mass for the potato in 0.2 mol/dm^3 sugar solution.

Use **Table 1**.

Use the equation:

$$\text{percentage change in mass} = \frac{\text{change in mass}}{\text{mass of potato at start}} \times 100$$

Give your answer to 3 significant figures.

[3 marks]

Percentage change in mass (3 significant figures) = _____ %

9

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0 2 Starch is digested to form sugar molecules in the digestive system.

0 2 . 1 What is the name of the enzyme that digests starch?

[1 mark]

_____

0 2 . 2 Where are most food molecules absorbed?

[1 mark]

Tick (✓) **one** box.

- Large intestine ☐
- Liver ☐
- Small intestine ☐
- Stomach ☐

Question 2 continues on the next page

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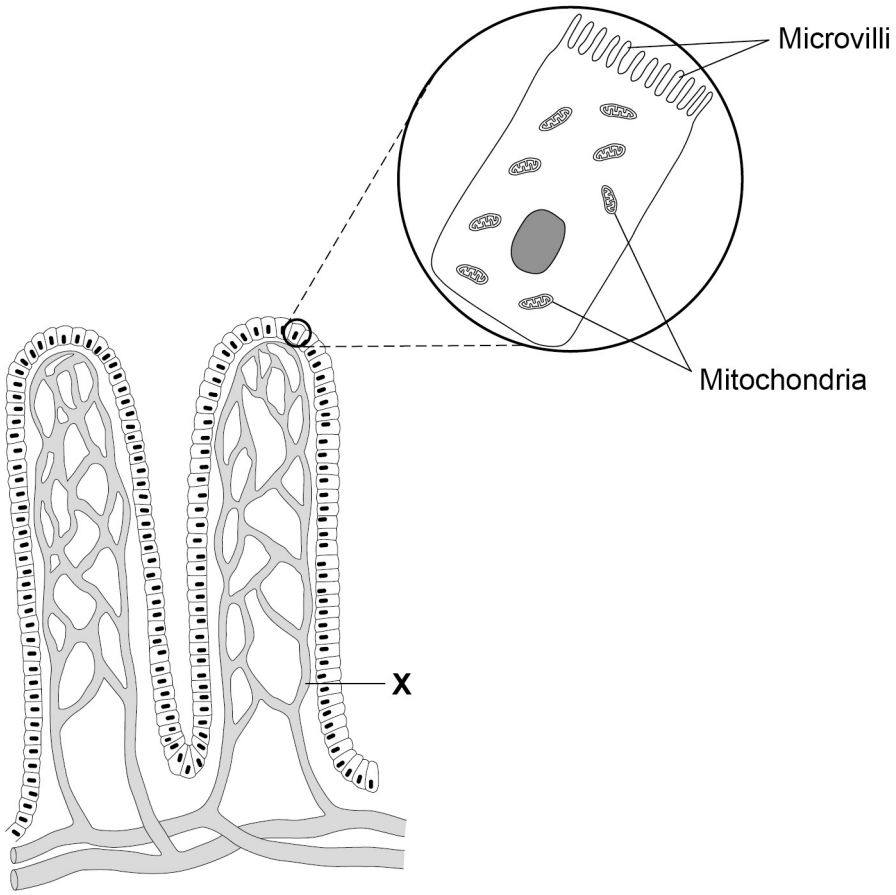
Figure 2 shows two villi.

Figure 2 also shows one cell on the surface of a villus as seen using an electron microscope.

Figure 2



0 2 . 3 Give **one** advantage of using an electron microscope compared with using a light microscope.

[1 mark]

_____

_____

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0 2 . 4 What type of blood vessel is labelled **X**?

[1 mark]

Tick (✓) **one** box.

Artery ☐

Capillary ☐

Vein ☐

0 2 . 5 The real length of one villus is 0.8 mm

Calculate the image length if the villus is viewed at a magnification of ×20

Use the equation:

$$\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$$

[3 marks]

_____

_____

_____

_____

Image length = _____ mm

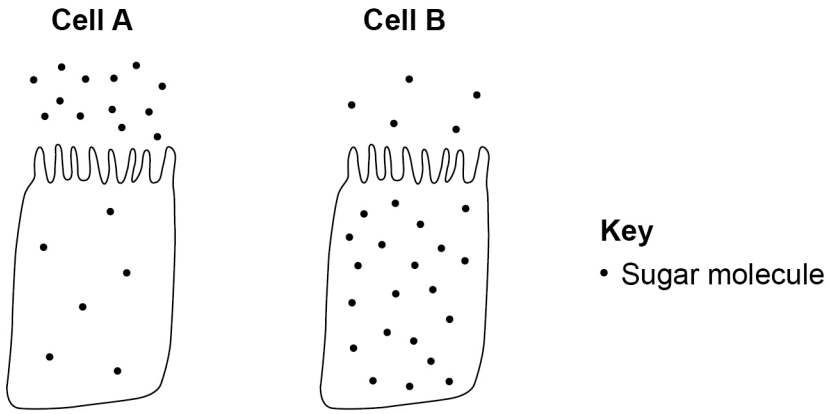
Question 2 continues on the next page

Do not write outside the box

Figure 3 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.

Figure 3



0 2 . 6 Name the process by which sugar moves into cell **A**.

[1 mark]

_____

0 2 . 7 Name the process by which sugar moves into cell **B**.

[1 mark]

_____

0 2 . 8 Give **one** use of sugar in the body.

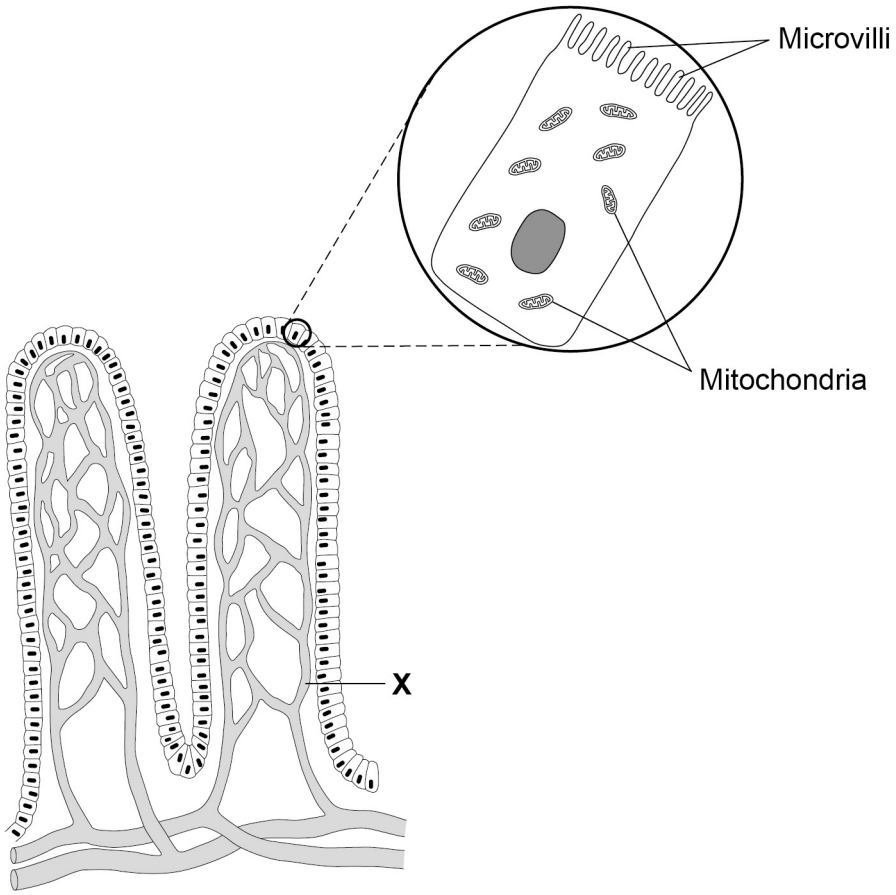
[1 mark]

_____

Do not write outside the box

0 2 . 9 **Figure 2** is repeated below.

Figure 2



Explain how villi are adapted for efficient absorption of sugar molecules.

[4 marks]

14

Turn over ►

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0 3 Being overweight can affect the health and life expectancy of a person.

0 3 . 1 Give **one** disease related to being overweight.

[1 mark]

_____

0 3 . 2 Body mass index (BMI) helps to show if a person has a healthy body mass for their height.

BMI is calculated using the equation:

$$\text{BMI} = \frac{\text{body mass in kg}}{(\text{height in m})^2}$$

A woman has a BMI of 27 and a body mass of 68.1 kg

Calculate the woman's height in metres.

[3 marks]

_____

_____

_____

_____

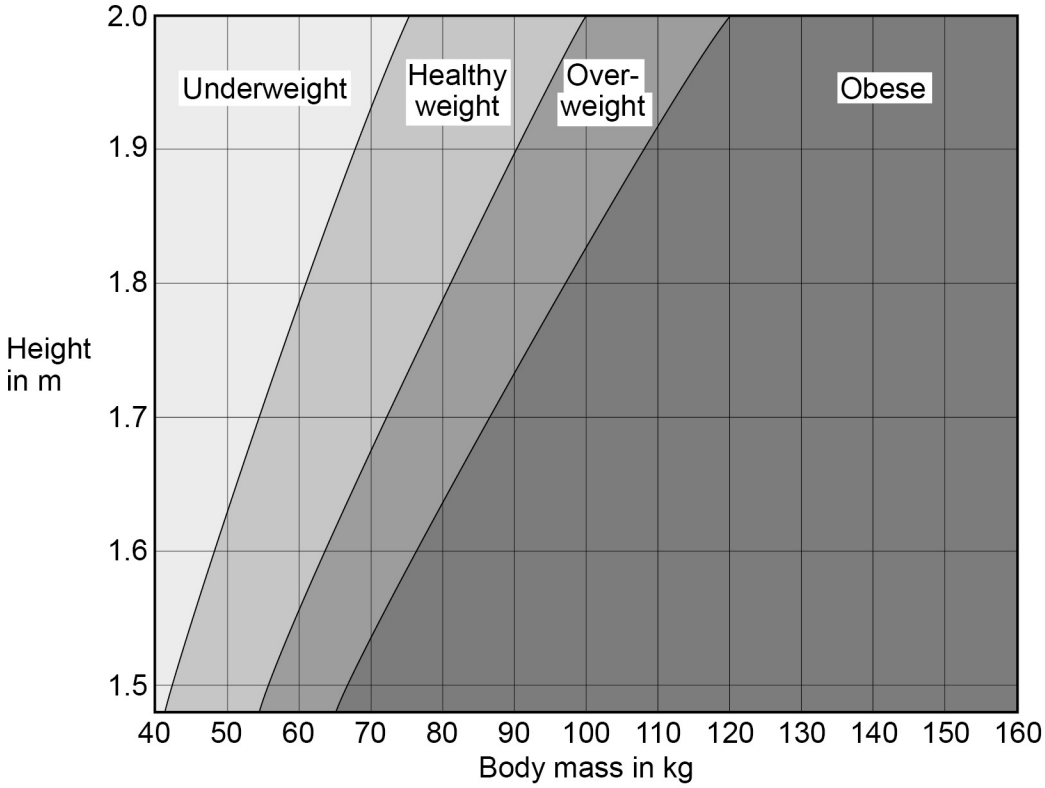
_____

Height = _____ m

Do not write outside the box

0 3 . 3 **Figure 4** shows a height-body mass chart for adults.

Figure 4



Which weight category describes the woman in Question **03.2**?

[1 mark]

Tick (✓) **one** box.

Underweight ☐

Healthy weight ☐

Overweight ☐

Obese ☐

Turn over ►

Do not write outside the box

0 3 . 4 People are encouraged to control their body mass with diet and exercise.

Describe how the balance between the mass of food eaten and the amount of exercise a person does controls body mass.

[3 marks]

Do not write outside the box

0 3 . 5 During long periods of vigorous exercise the body respires anaerobically.

Explain the changes that happen in the body during **and** after vigorous exercise.

[6 marks]

14

Turn over for the next question

Do not write outside the box

0 4 Cells are the basic units of all forms of life.

0 4 . 1 Describe **four** differences between a bacterial cell and a plant cell.

[4 marks]

1 _____

_____

2 _____

_____

3 _____

_____

4 _____

_____

0 4 . 2 Gonorrhoea is a bacterial disease.

A new vaccine is being developed against gonorrhoea.

Describe how a vaccine would work to prevent gonorrhoea.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

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Another disease caused by bacteria is salmonella food poisoning.

In the UK, chickens are vaccinated against *Salmonella* bacteria to reduce the number of cases of food poisoning in humans.

0 4 . 3 Explain how vaccinating chickens reduces the number of cases of salmonella food poisoning.

[2 marks]

0 4 . 4 Give **one** way that the spread of salmonella food poisoning from one human to another is controlled.

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

[1 mark]

0 4 . 5 The number of cases of salmonella food poisoning is usually higher in summer than in winter.

Suggest **one** reason why.

[1 mark]

12

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0 5 This question is about photosynthesis and food production.

0 5 . 1 How can oxygen production be used to show the **rate** of photosynthesis?

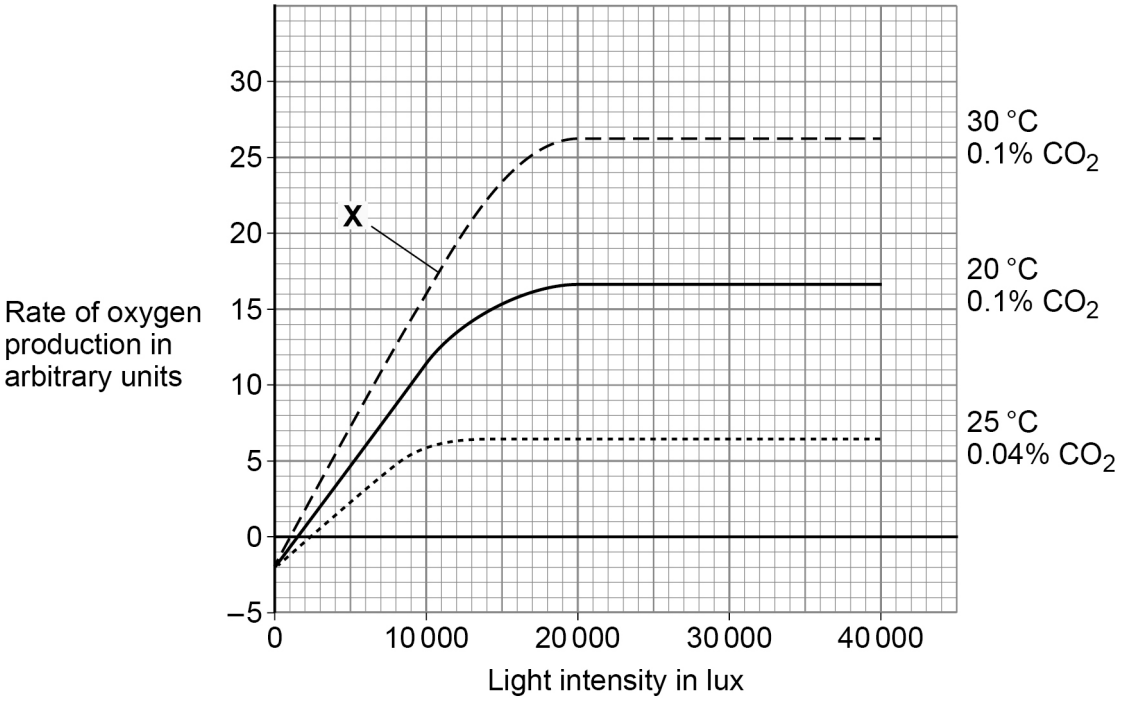
[1 mark]

Scientists investigated factors affecting the rate of photosynthesis in tomato plants.

The tomato plants were growing in a commercial greenhouse in the UK during winter.

Figure 5 shows the results.

Figure 5



The percentage of carbon dioxide in the Earth's atmosphere is 0.04%

0 5 . 2 Name the factor that is limiting the rate of photosynthesis at point **X**.

[1 mark]

Do not write outside the box

Farmers growing tomatoes commercially try to control the rate of photosynthesis and make maximum profit.

A farmer can control the temperature and carbon dioxide concentration in a greenhouse.

0 5 . 3 What is the **minimum** light intensity a farmer should use to get the maximum rate of photosynthesis shown in **Figure 5**?

[1 mark]

Light intensity = _____ lux

0 5 . 4 The light intensity you gave in Question **05.3** may **not** give the farmer maximum profit.

Explain why.

[3 marks]

_____

_____

_____

_____

_____

_____

0 5 . 5 Explain the results when the light intensity was 0 lux.

Use **Figure 5**.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

10

Turn over ►

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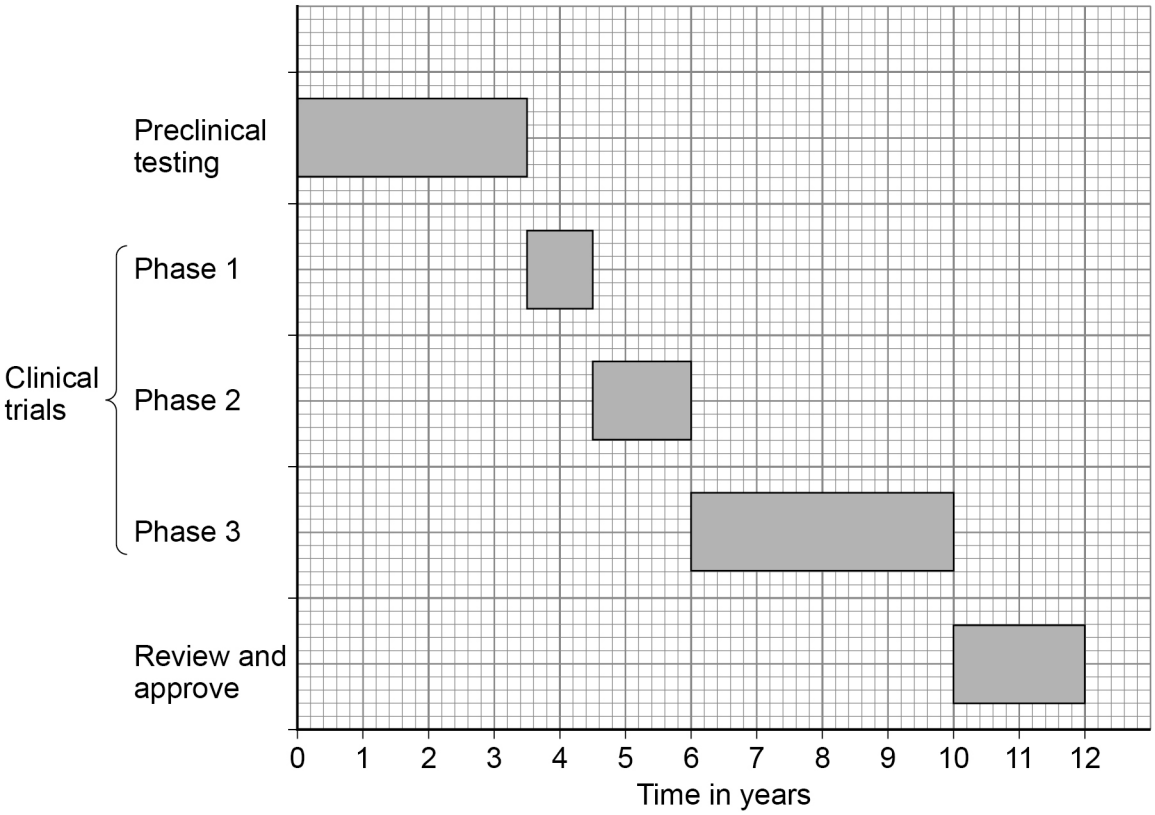
0 6 New drugs are tested and trialled before they can be licensed to treat patients.

Figure 6 shows how much time the different stages of testing took for one new drug.

Figure 6



0 6 . 1 How much more time did the clinical trials take compared with the preclinical testing?

[1 mark]

Tick (✓) **one** box.

3 years ☐

3.5 years ☐

5 years ☐

6.5 years ☐

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During Phase 1 clinical trials low doses of the drug are tested on healthy volunteers.

0 6 . 2 Suggest **one** reason why **low doses** of the drug are used in Phase 1 clinical trials.

[1 mark]

_____

_____

0 6 . 3 Suggest **two** reasons why **healthy** volunteers are used in Phase 1 clinical trials.

[2 marks]

1 _____

_____

_____

2 _____

_____

_____

0 6 . 4 The results of clinical trials can only be published after peer review by other scientists.

Suggest **one** reason why the results must be reviewed by other scientists.

[1 mark]

_____

_____

Question 6 continues on the next page

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0 6 . 5 A drug is only licensed for the medical conditions it was tested to treat in the clinical trials.

Drug regulations:

- control what drugs a doctor can prescribe
- ensure doctors can prescribe a drug with confidence
- protect patients.

AMD is an eye condition that can result in very poor vision.

Doctors treat approximately 40 000 new cases of AMD each year.

Two drugs licensed to treat AMD in the UK are drug **A** and drug **B**.

In many other countries drug **C** is used to treat AMD. Drug **C** is only licensed in the UK to treat cancer.

The cost per injection for each drug is:

- drug **A** £561
- drug **B** £800
- drug **C** £28

The number of injections required to treat AMD is the same for each drug.

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In 2018 the High Court in the UK gave permission for drug **C** to be used to treat AMD.

Evaluate the decision to allow the use of drug **C** to treat AMD in the UK.

[6 marks]

11

END OF QUESTIONS

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