AQA

GCSE

COMBINED SCIENCE: SYNERGY

Higher Tier   Paper 1
Life and environmental sciences   **H**

8465/1H

Tuesday 14 May 2019   Afternoon

Time allowed: 1 hour 45 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

For this paper you must have:
- a ruler
- a protractor
- a scientific calculator
- the periodic table (enclosed)
- the Physics Equations Sheet (enclosed).

INSTRUCTIONS

- **Use black ink or black ball-point pen.**

- **Answer ALL questions in the spaces provided. Do not write on blank pages.**

- **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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

Answer ALL questions in the spaces provided.

0	1

Grey wolves ('Canis lupus') can be found in the USA.

0	1	.	1

Give the genus name of the grey wolf. [1 mark]

_____

_____

0 1 . 2

Describe how biological classification systems have changed over time.
[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____
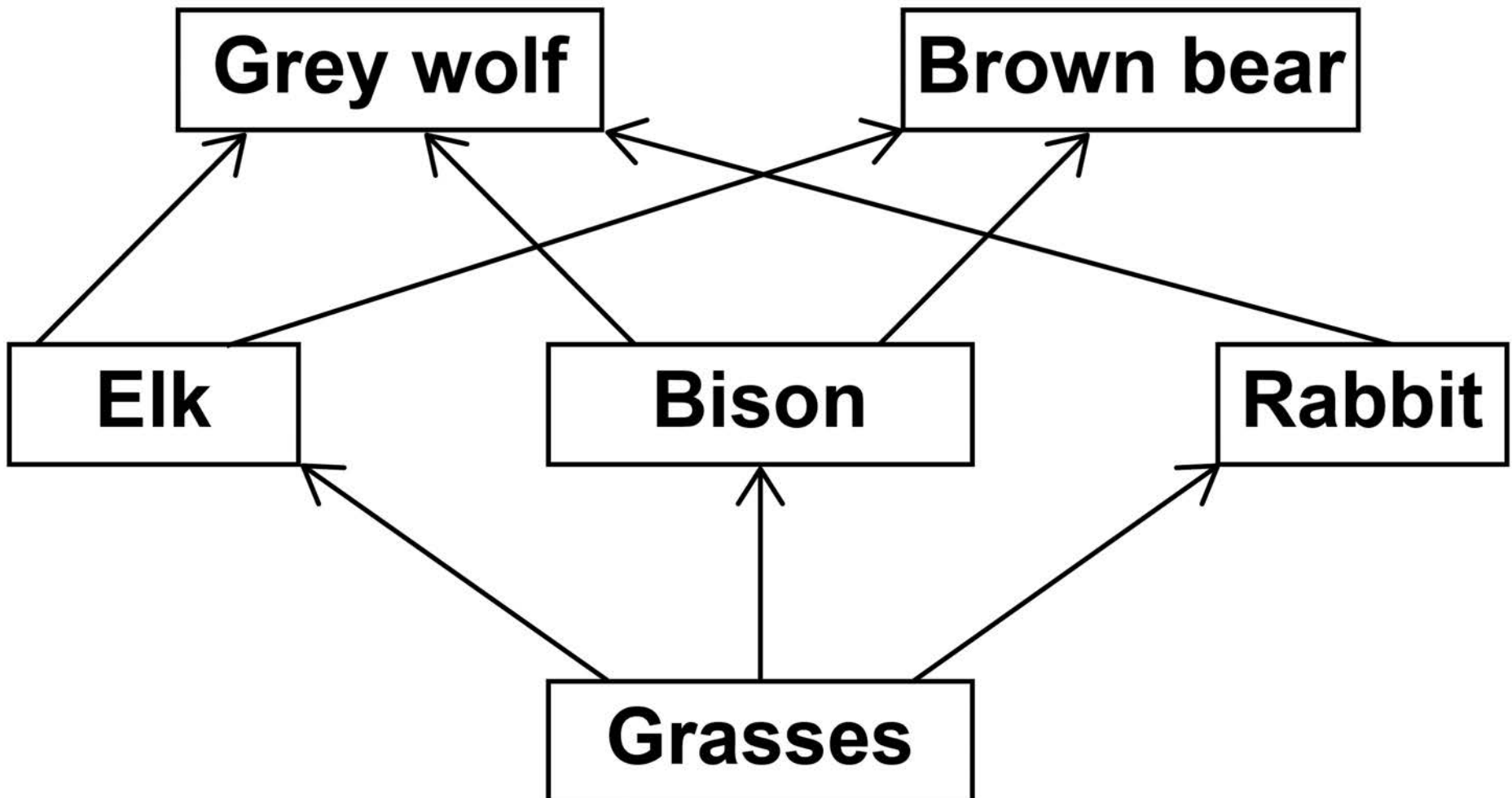
_____

[Turn over]

BLANK PAGE

0 1 . 3

Population and community are terms used to describe the organisms in an area.

Describe the difference between the terms population and community.
[2 marks]

_____

_____

_____

_____

_____

[Turn over]

FIGURE 1 shows part of a food web.

FIGURE 1

| 0 | 1 | . | 4 |

Look at FIGURE 1.

Explain how killing all the grey wolves could affect the populations of the other organisms. [6 marks]

_____

_____

_____

BLANK PAGE

In Yellowstone Park in the USA, grey wolves were hunted and killed until there were none left by 1926.

Grey wolves were reintroduced to Yellowstone Park in 1995.

The wolves came from several family groups in different parts of Canada.

| 0 | 1 | . | 5 |

Why should scientists select animals from more than one area for reintroduction programmes? [1 mark]

Tick (✓) ONE box.

☐　To reduce the effect of inbreeding

☐　To choose similar characteristics

☐　To reduce genetic diversity
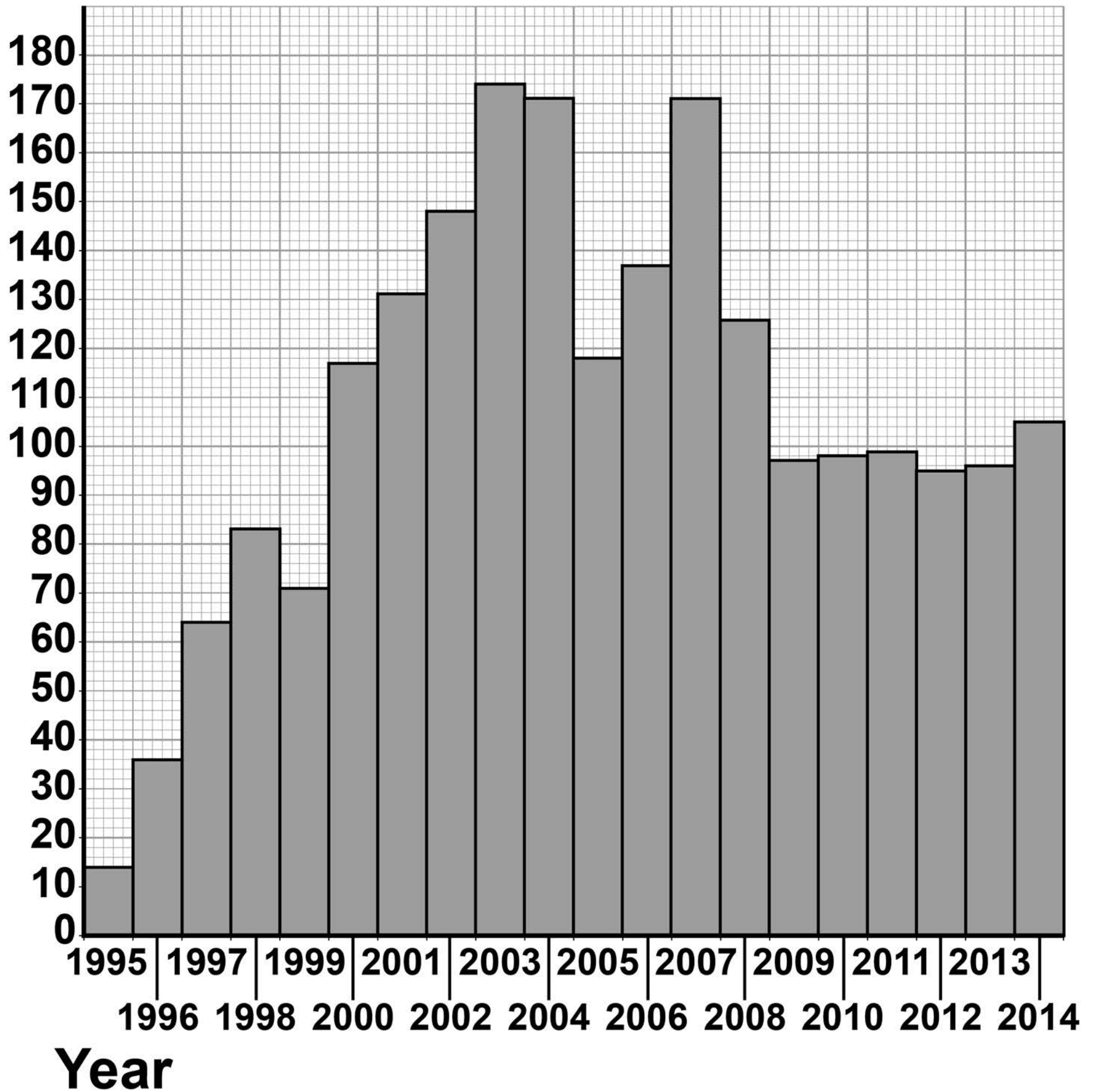
[Turn over]

FIGURE 2

Population of grey wolves

FIGURE 2, on page 12, shows the change in the population of grey wolves in Yellowstone Park since 1995.

| 0 | 1 | . | 6 |

The wolf population in 2014 was greater than the wolf population in 1995.

**Calculate how many times greater.
[1 mark]**

_____

_____

_____

Number of times greater = _____

[Turn over]

BLANK PAGE

0 1 . 7

Scientists now believe the population of wolves in Yellowstone Park is NOT likely to decrease to zero.

Describe how the data since 2009 support this belief. [1 mark]

_____

_____

_____

16

[Turn over]

BLANK PAGE

0 2

Polonium is an element with 33 isotopes.

0 2 . 1

What is the difference between isotopes of the same element?
[1 mark]

Tick (✓) ONE box.

☐ The number of electrons

☐ The number of neutrons

☐ The number of protons

[Turn over]

| 0 | 2 | . | 2 |

An isotope of polonium is $^{210}_{84}$Po (polonium-210).

Polonium-210 emits alpha radiation.

Alpha particles can be represented by the symbol $^{4}_{2}$He

An alpha particle consists of sub-atomic particles.

What are these sub-atomic particles?
[2 marks]
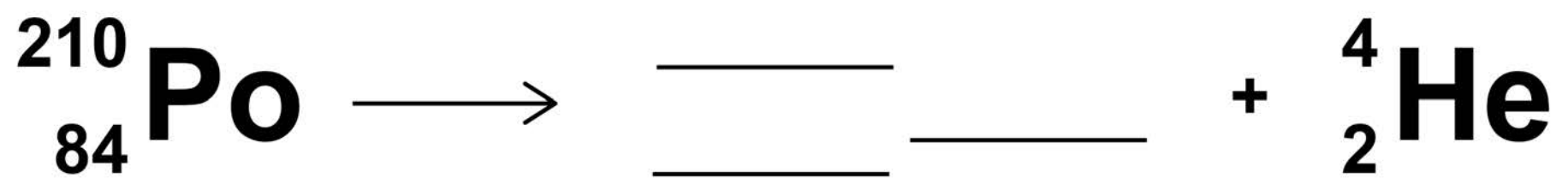
Tick (✓) TWO boxes.

☐ **Electrons**

☐ **Gamma rays**

☐ **Neutrons**

☐ **Protons**

☐ **X-rays**

[Turn over]

| 0 | 2 | . | 3 |

Complete the nuclear equation to show the radioactive decay of polonium-210

Use the periodic table to help you.
[3 marks]

$$^{210}_{84}\text{Po} \longrightarrow \underline{\quad\quad}\underline{\quad\quad} + {}^{4}_{2}\text{He}$$

BLANK PAGE

[Turn over]

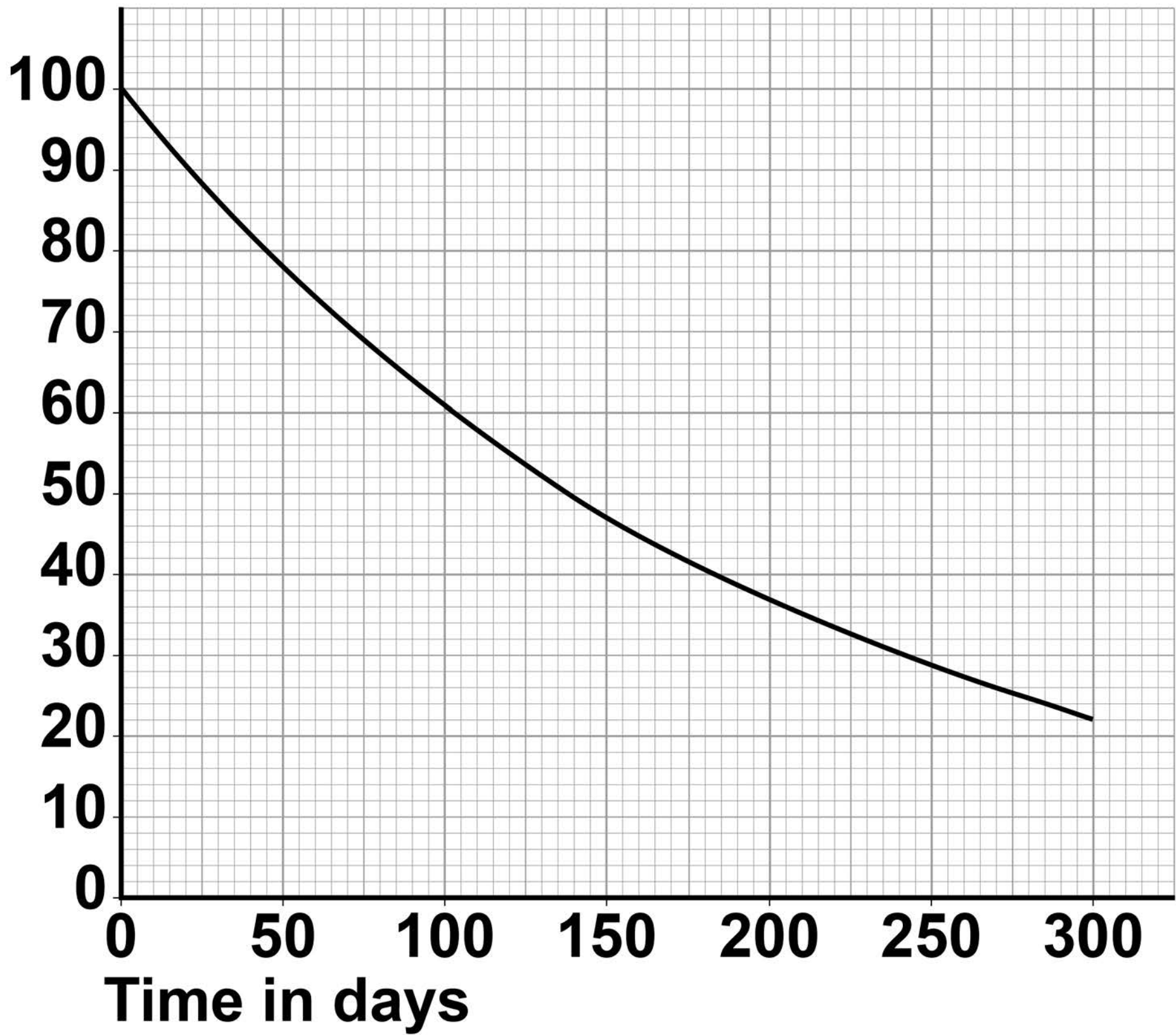| 0 | 2 | . | 4 |

A sample of polonium-210 decays.

FIGURE 3, on the opposite page, shows how the percentage of polonium-210 nuclei remaining varies with time.

**Determine the half-life of polonium-210
[1 mark]**

_____

_____

_____

Half-life = _____ days

FIGURE 3

Percentage of polonium-210 nuclei remaining

[Turn over]

0 2.**5**

Another isotope of polonium, polonium-206, has a half-life of 8.8 days.

A 5.0 mg sample of polonium-206 was left to decay.

Calculate what mass of polonium-206 remained after 44 days. [2 marks]

_____

_____

_____

_____

_____

Mass of polonium-206 after 44 days =

_____ **mg**

0 2 . 6

If polonium-210 were to enter the body, the alpha radiation it emits would cause harm.

Explain why alpha radiation emitted inside the body is harmful. [2 marks]

_____

_____

_____

_____

_____

_____

[Turn over]

0 2 . 7

Isotopes that emit alpha radiation can be transported safely in a glass bottle.

Suggest why. [1 mark]

_____

_____

_____

12

BLANK PAGE

[Turn over]

0 3

Lipids are an essential part of our diet.

0 3 . 1

Describe how a student could test a food for lipids and the positive result for the test. [2 marks]

Test for lipids _____

_____

_____

Positive result for lipids _____

_____

_____

A high concentration of cholesterol in the blood has been linked with coronary heart disease (CHD).

| 0 | 3 | . | 2 |

Name the type of drug used to reduce the concentration of cholesterol in the blood. [1 mark]

_____

_____

[Turn over]

0 3 . 3

A new CHD drug has been trialled to reduce the concentration of cholesterol in the blood.

Patients were given the new CHD drug or a placebo.

One possible side effect of the new CHD drug is an increased risk of diabetes.

TABLE 1, on the opposite page, shows some of the results.

TABLE 1

	Group 1: NEW CHD DRUG	Group 2: PLACEBO
Number of patients	**12 562**	**12 541**
Number of patients developing diabetes during the trial	**636**	**606**

[Turn over]

BLANK PAGE

Calculate the difference between the percentage of patients developing diabetes in group 1 compared to group 2.

Give your answer to 3 significant figures. [4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

Difference = _____ %

[Turn over]

0 3 . 4

The new CHD drug causes liver cells to remove more cholesterol from the blood.

Explain how the drug could reduce the risk of CHD. [4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

0 3 . 5

Give THREE factors doctors should consider when they plan to use a new drug with a patient.

Do NOT refer to cost in your answer.
[3 marks]

1 _____

_____

_____

2 _____

_____

_____

3 _____

_____

_____

14

0 **4**

FIGURE 4, on the opposite page, shows part of the process of sewage treatment.

0 **4** . **1**

Name the TWO processes happening in tank A. [2 marks]

1 _____

_____

2 _____

_____

FIGURE 4

Sewage from homes

Tank A — Metal grid

Effluent

Tank B — Effluent

→ Sludge

Tank C — Effluent

Air bubbles

Tank D — Effluent

→ Sludge
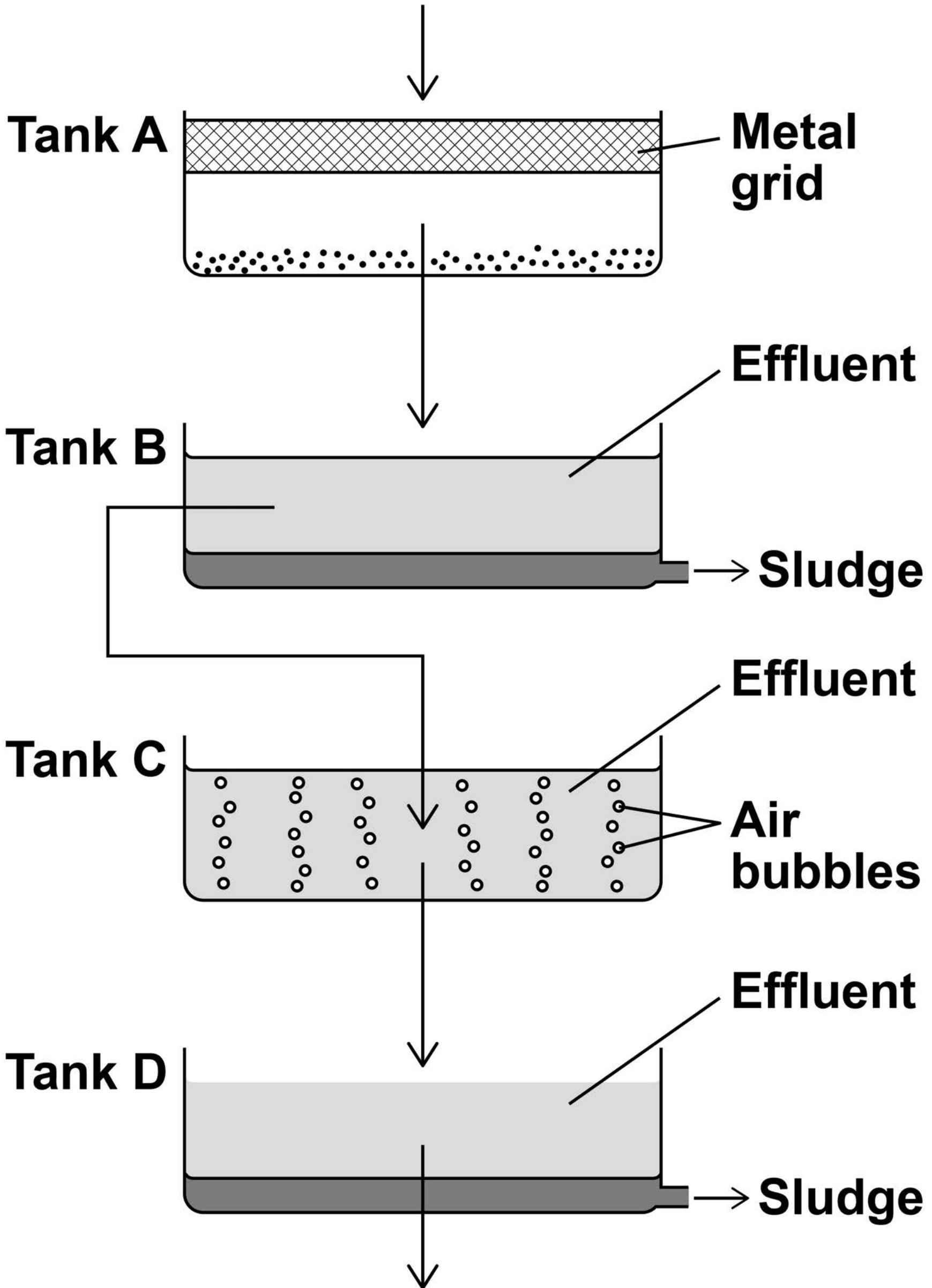
[Turn over]

BLANK PAGE

0 4 . 2

Explain the processes happening in tank C. [4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

Repeat of FIGURE 4

Sewage from homes

Tank A — **Metal grid**

Tank B — **Effluent**

→ **Sludge**

Effluent

Tank C — **Effluent**

Air bubbles

Effluent

Tank D

→ **Sludge**
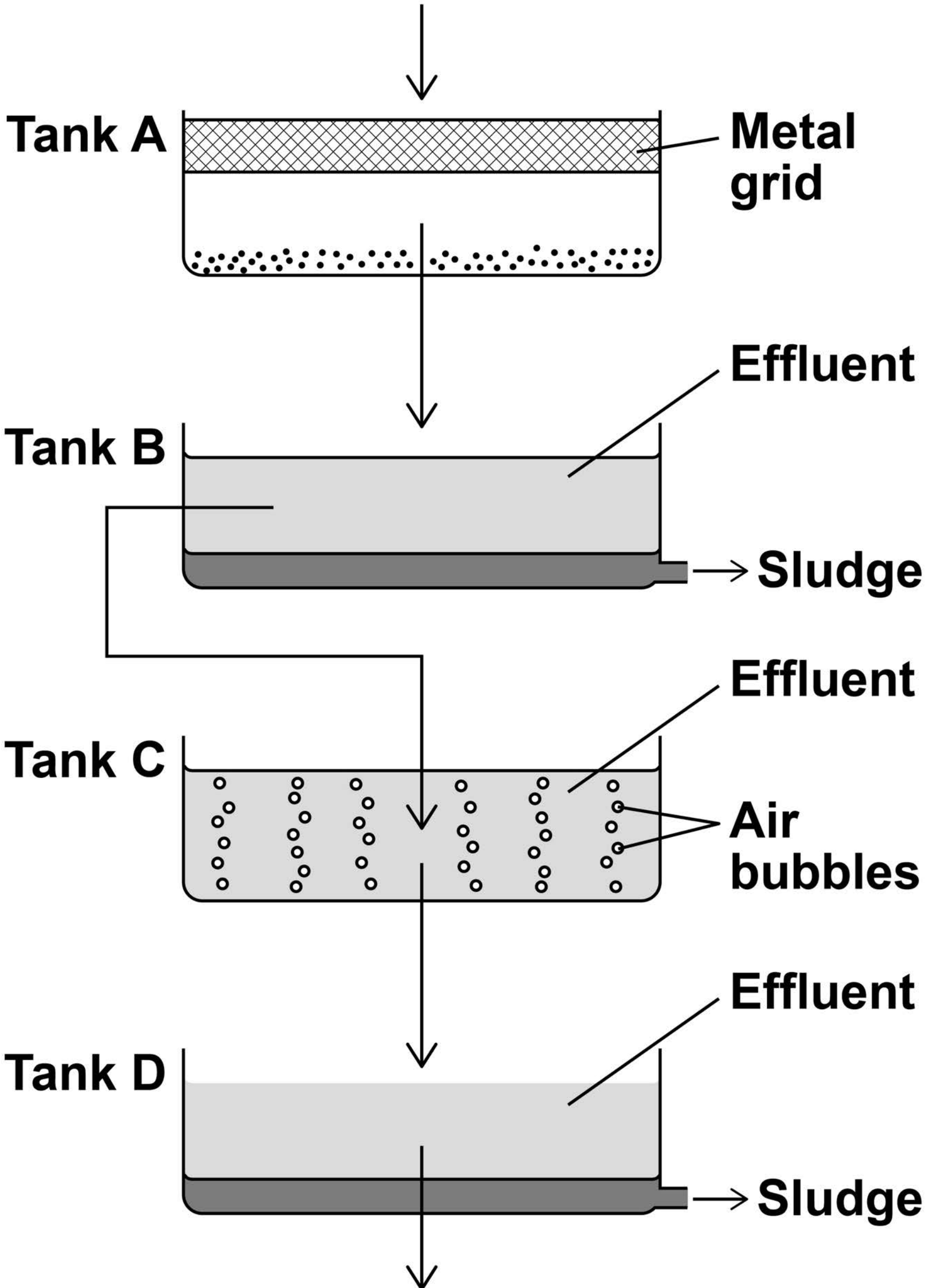
0 4 . 3

The water from tank D is sterilised.

Why is the water from tank D sterilised? [1 mark]

_____

_____

_____

0 4 . 4

Seawater can be desalinated by distillation.

Name ONE other method of desalination. [1 mark]

_____

_____

_____

[Turn over]

0 4 . 5

Describe a method to measure the concentration of dissolved solids in a sample of seawater. [6 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

14

0 5

Scientists investigated the temperature changes when gaseous substances cool.

TABLE 2 shows the results for substance A.

TABLE 2

Time in seconds	Temperature in ºC
0	400
60	357
120	357
180	223
240	92
300	−39
360	−39

BLANK PAGE

[Turn over]

| 0 | 5 | . | 1 |

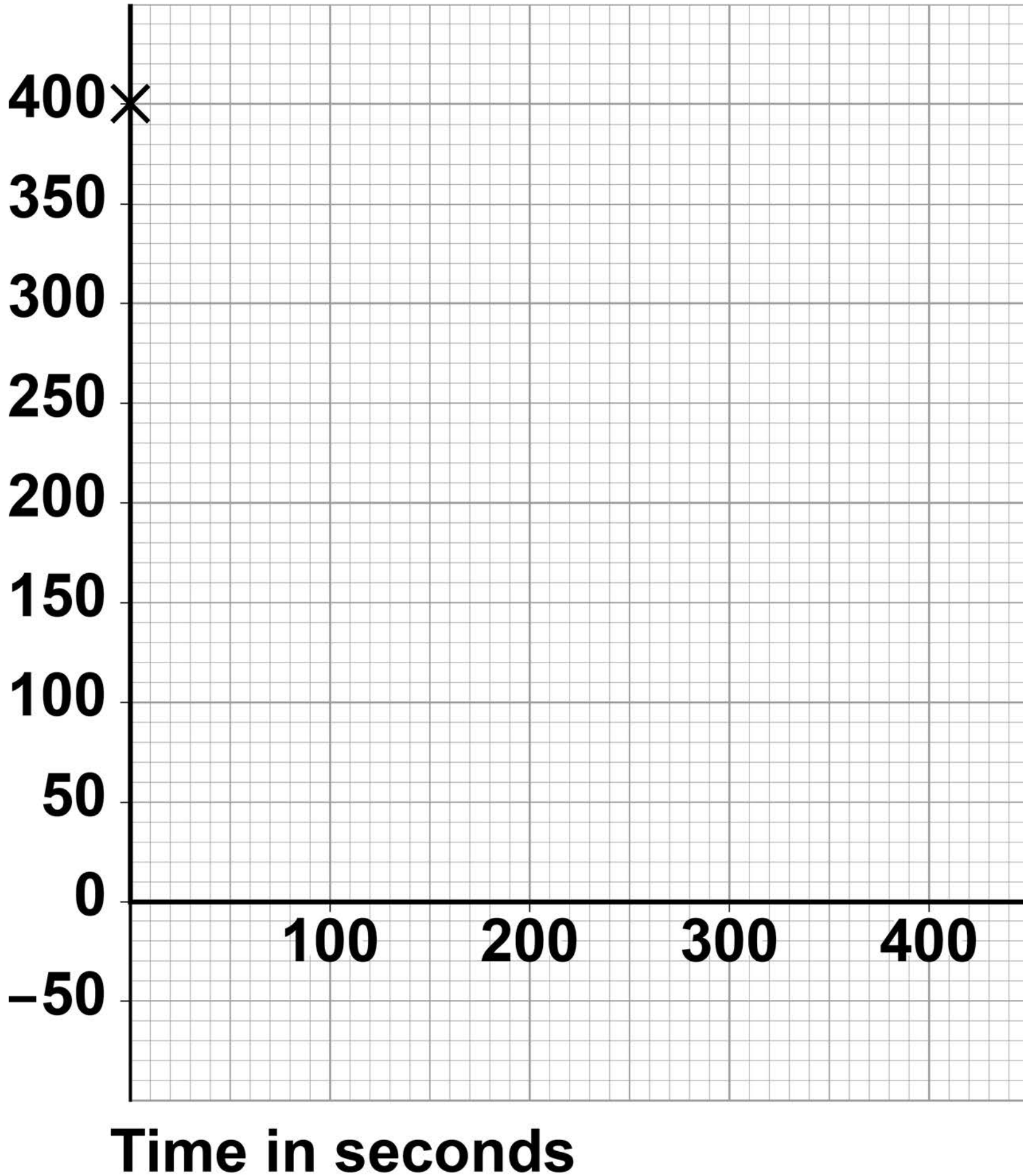**Complete FIGURE 5, on the opposite page.**

You should:

- **plot the data for substance A from TABLE 2 on page 44. The first result has been plotted.**

- **join the data points for substance A with straight lines.**

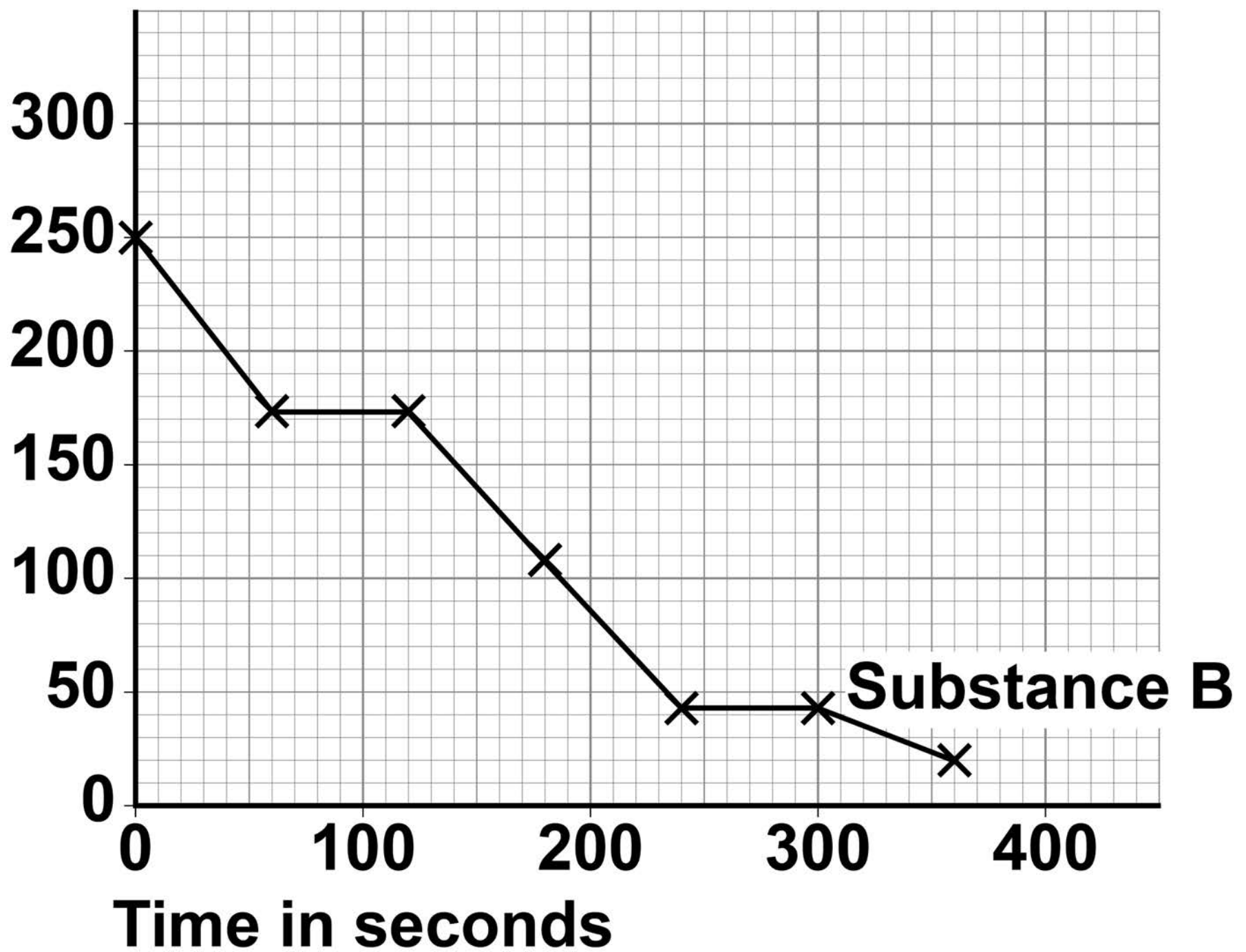**[3 marks]**

FIGURE 5

Temperature in °C vs Time in seconds

FIGURE 6 shows the results for substance B.

FIGURE 6

| 0 | 5 |.| 2 |

How does FIGURE 6, on page 48, show that substance B is a pure substance? [1 mark]

_____

_____

_____

| 0 | 5 |.| 3 |

Determine the melting point of substance B.

Use FIGURE 6. [1 mark]

Melting point = _____ ⁰C

[Turn over]

0 5 . 4

The rate of temperature change can be determined from the gradient of the graph.

At 120 seconds, the temperature of substance B was 173 ºC

Determine the rate of temperature change for substance B between 120 seconds and 240 seconds.

Use FIGURE 6, on page 48. [3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Rate of temperature change =

_____ ºC/s

8

[Turn over]

BLANK PAGE

0 6

Field studies can be used to investigate the abundance and distribution of a species.

0 6 . 1

Define the following biological words. [2 marks]

Abundance _____

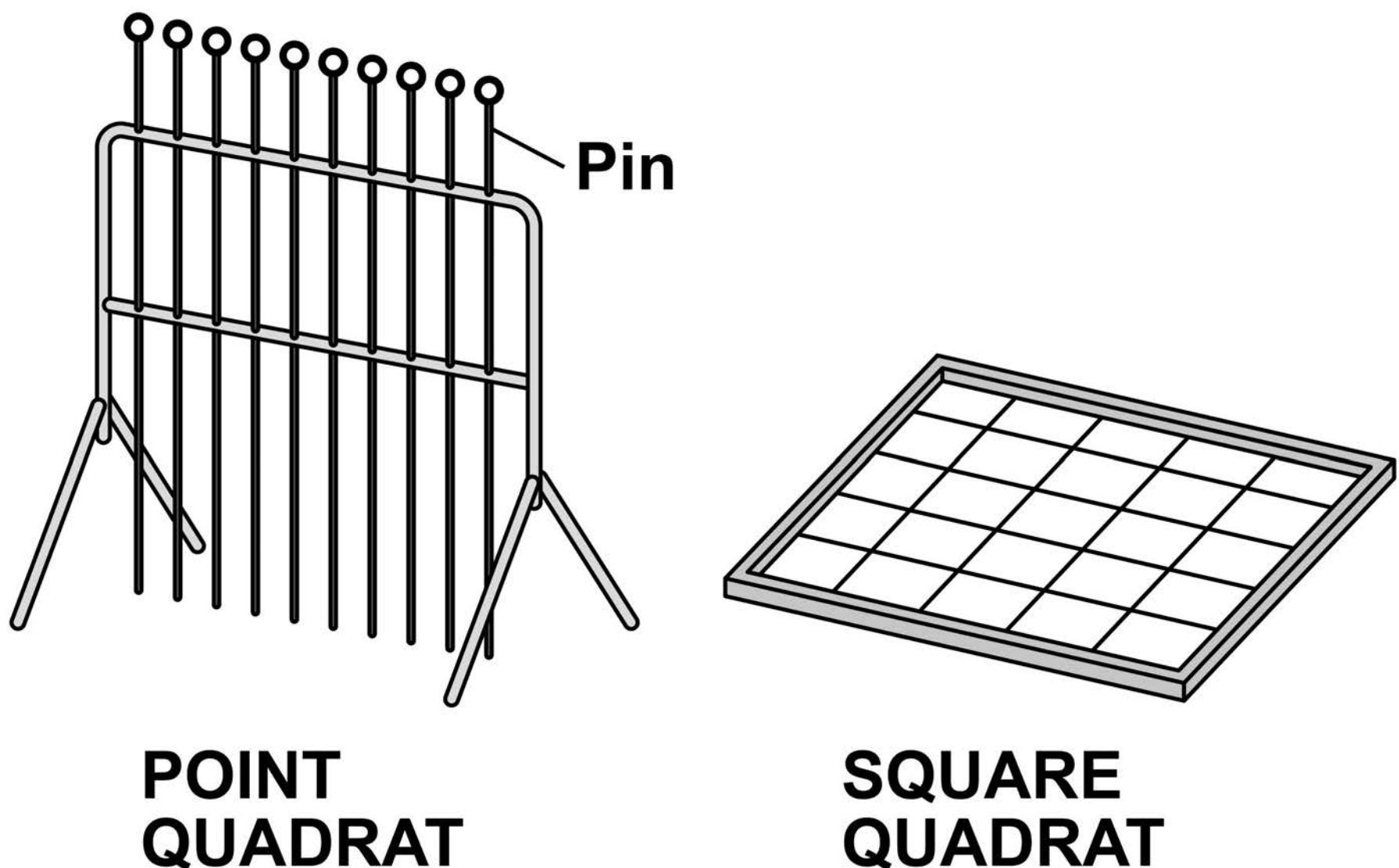_____

_____

Distribution _____

_____

_____

[Turn over]

Quadrats can be used to estimate the percentage cover of plants in an area.

A point quadrat can be used instead of a square quadrat.

FIGURE 7 shows a point quadrat and a square quadrat.

FIGURE 7

POINT QUADRAT

SQUARE QUADRAT

When using a point quadrat, any plant species touching a pin is recorded.

Students investigated the percentage cover of different plant species at increasing distances from a school building.

| 0 | 6 | . | 2 |

Describe how students could collect data for this investigation using a point quadrat. [4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

0 6 . 3

The percentage cover of each species can be estimated using the equation:

percentage cover =

$$\frac{\text{number of times a pin touches a species}}{\text{total number of pins used}} \times 100$$

30 students each collected results from 80 pins. The students then put all their results into one results table.

Dandelions had a mean percentage cover of 6.25%.

Calculate the number of times dandelions touched a pin. [3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Number of times dandelions touched a pin = _____

[Turn over]

| 0 | 6 | . | 4 |

Describe why this investigation would only give an estimate of the percentage cover of dandelions.
[1 mark]

_____

_____

_____

0 6 . 5

Point quadrats give a more accurate estimate of percentage cover than square quadrats.

What is a DISADVANTAGE of using point quadrats rather than square quadrats? [1 mark]

Tick (✓) ONE box.

☐   **Results collected using point quadrats are more biased**

☐   **Plants at all heights are recorded**

☐   **Point quadrats need a judgement of percentage cover**

☐   **Rare species are less likely to be sampled**

[Turn over]

0 6 . 6

Describe the process of evolution by which some plants survive in fields where animals eat the plants.
[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

15

FIGURE 8 shows a sealed balloon containing helium.

FIGURE 8

| 0 | 7 | . | 1 |

The balloon is squashed so its volume decreases.

No helium enters or leaves the balloon.

What happens to the density of the helium in the balloon?   [1 mark]

_____

_____

_____

[Turn over]

0 7.**2**

The volume of the balloon is 14 000 cm^3

The density of the helium in the balloon is 0.180 kg/m^3

Calculate the mass of helium in the balloon.

1 cm^3 = 1 × 10^{-6} m^3 [4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Mass = _____ **kg**

[Turn over]

BLANK PAGE

0 7 . 3

Explain how a decrease in temperature inside the balloon can change the volume of the balloon. [4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

9

0 8

Hormones can have effects on the body far from the gland that releases the hormone.

0 8 . 1

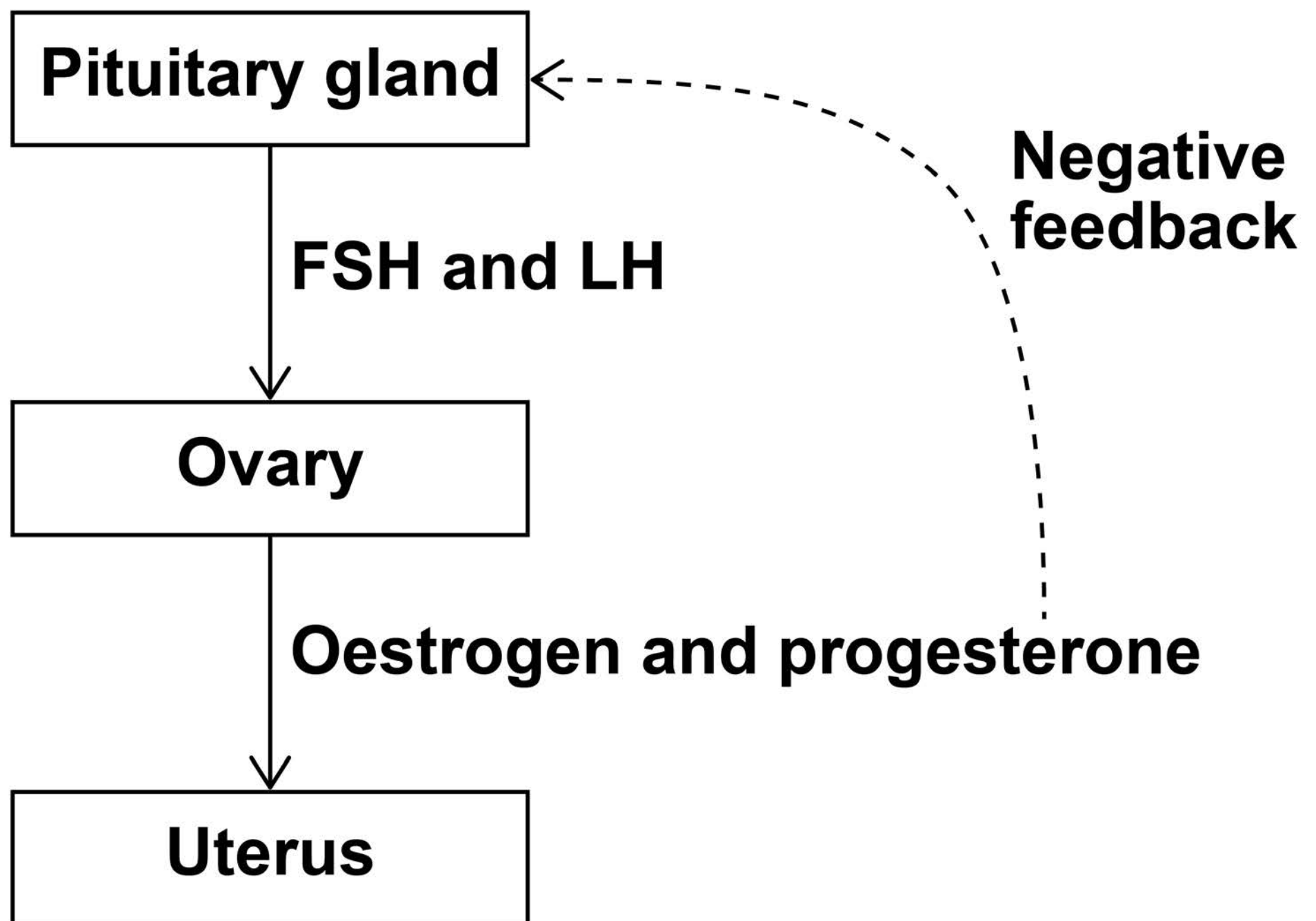**Name the system in the body that releases hormones. [1 mark]**

_____

_____

BLANK PAGE

[Turn over]

FIGURE 9 shows part of the hormonal control of the menstrual cycle.

FIGURE 9

Pituitary gland ← ----- ‖ Negative feedback

↓ FSH and LH

Ovary

↓ Oestrogen and progesterone

Uterus

0 8 . 2

Describe how FSH and LH travel from the pituitary gland to the ovaries.
[1 mark]

_____

_____

[Turn over]

BLANK PAGE

0 8 . 3

Explain how the body regulates the production of oestrogen and progesterone for most of the menstrual cycle.

Use the information shown in FIGURE 9, on page 70. [3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

[Turn over]

0 8 . 4

A woman is most fertile at about day 15 of the menstrual cycle.

From day 12 to day 14 of the menstrual cycle, the negative feedback shown in FIGURE 9 on page 70 stops.

Explain what happens when the negative feedback stops. [3 marks]

_____

_____

_____

_____

_____

_____

_____

_____

BLANK PAGE

[Turn over]

0 8 . 5

A contraceptive injection contains progestin.

Progestin is a synthetic form of progesterone.

Explain how the progestin injection prevents pregnancy. [4 marks]

_____

_____

_____

_____

_____

_____

_____

END OF QUESTIONS

12

BLANK PAGE

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