A

AQA

Surname ______________________

Other Names ______________________

Centre Number ______________________

Candidate Number ______________________

Candidate Signature ______________________

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

Foundation Tier
Chemistry Paper 2F

F

8464/C/2F

Wednesday 10 June 2020 **Morning**

Time allowed: 1 hour 15 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]

JUN208464C2F01

For this paper you must have:
- **a ruler**
- **a scientific calculator**
- **the periodic table (enclosed).**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Pencil should only be used for drawing.**
- **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.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

0 1 Crude oil is a mixture of hydrocarbons.

0 1 . 1 Complete the sentences.

Choose answers from the list. [2 marks]

- air
- enzymes
- mud
- plankton
- trees

Crude oil is the remains of

________________________ .

Millions of years ago biomass was buried under

________________________ .

01.2 There are three stages, A, B and C, in separating hydrocarbons from crude oil.

Stage A	Hydrocarbons evaporate
Stage B	Crude oil is heated
Stage C	Vapours condense

Give the correct order for stages A, B and C.
[1 mark]

First stage ____________

Second stage ____________

Third stage ____________

[Turn over]

0 1 . 3 What is the name of the process used in separating hydrocarbons from crude oil?
[1 mark]

Tick (✓) ONE box.

☐ Chromatography

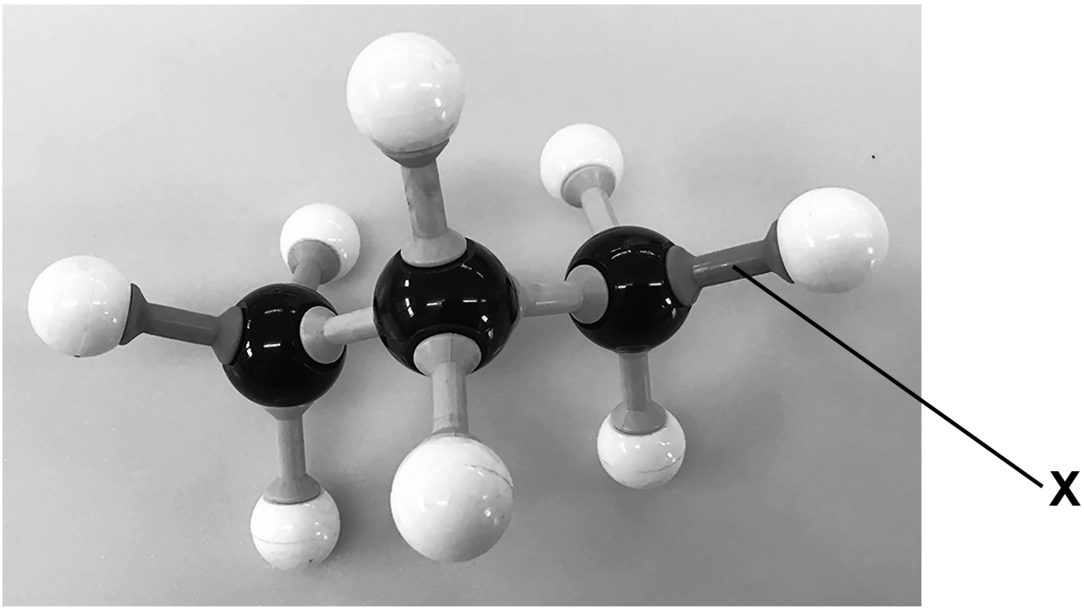
☐ Filtration

☐ Fractional distillation

0 1 . 4 Alkanes are hydrocarbons.

FIGURE 1 represents an alkane.

FIGURE 1



What is the formula of the alkane in FIGURE 1? [1 mark]

C ________ H________

0 1 . 5 What does X represent in FIGURE 1? [1 mark]

Tick (✓) ONE box.

- [ ] Covalent bond
- [ ] Ionic bond
- [ ] Metallic bond

[Turn over]

0 1 . 6 **What is the general formula for alkanes?**
[1 mark]

Tick (✓) ONE box.

- [ ] C_nH_{2n-2}
- [ ] C_nH_{2n}
- [ ] C_nH_{2n+2}

0 1 . 7 **Hydrocarbons are used to make polymers. Polymers are used to make plastic bags.**

In one year 8.0 billion plastic bags were used.

The next year there was a charge for plastic bags and only 1.3 billion plastic bags were used.

Calculate the decrease in the number of plastic bags used. [1 mark]

____

____

Decrease = ____________________ billion

[Turn over]

8

0 2 This question is about carbon dioxide in the Earth's atmosphere.

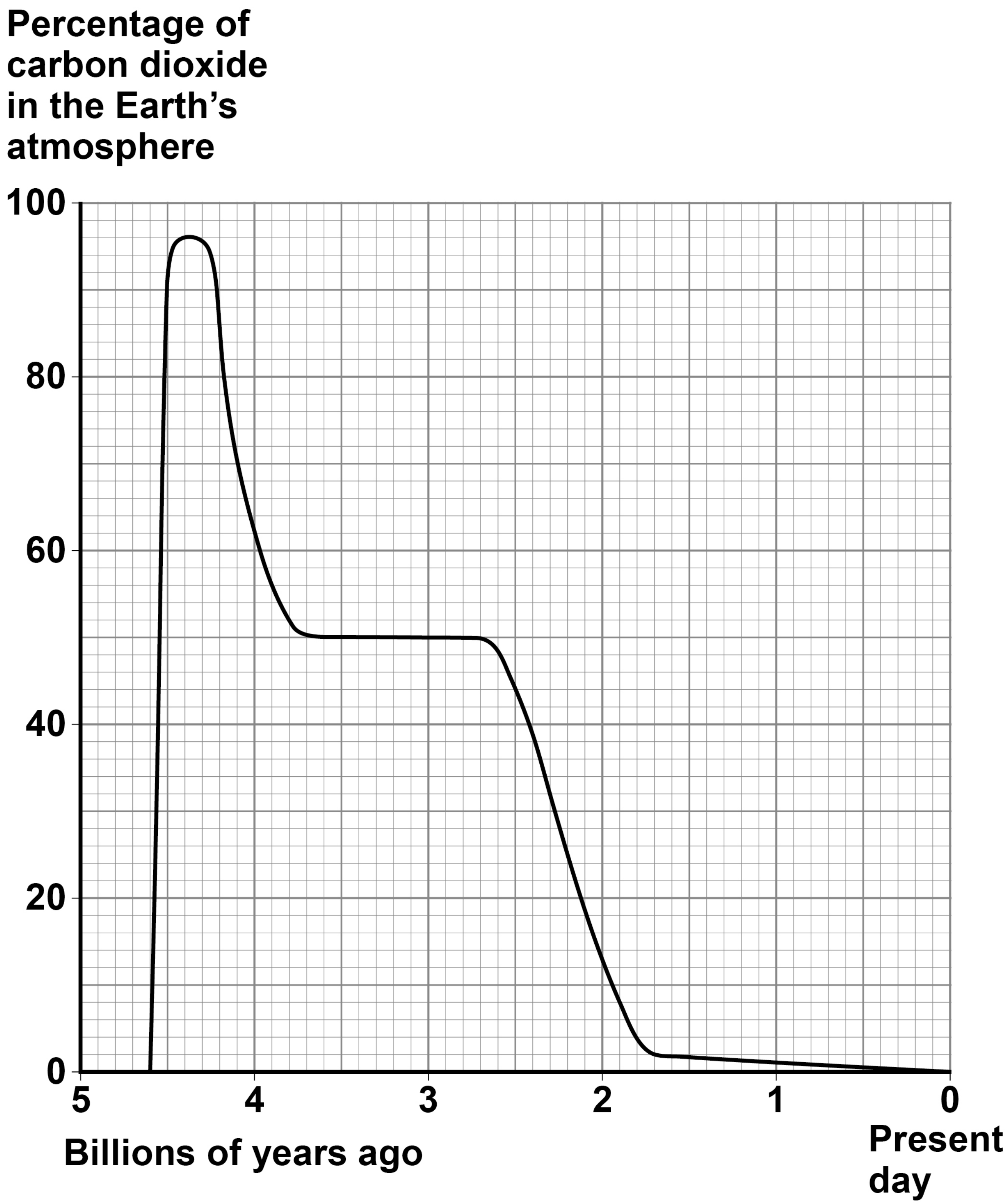
FIGURE 2, on the opposite page, shows how the percentage of carbon dioxide in the Earth's atmosphere has changed over 4.6 billion years.

0 2 . 1 What was the highest percentage of carbon dioxide in the Earth's atmosphere?

Use FIGURE 2. [1 mark]

Highest percentage = ____________________%

FIGURE 2



[Turn over]

0 2 . 2 **The percentage of carbon dioxide in the atmosphere has decreased since Earth's early atmosphere.**

Which TWO processes have decreased the percentage of carbon dioxide in the Earth's atmosphere? [2 marks]

Tick (✓) TWO boxes.

- ☐ **Combustion of fuels**
- ☐ **Formation of sedimentary rocks**
- ☐ **Photosynthesis**
- ☐ **Volcanic activity**

0 2 . 3 The total amount of carbon dioxide emitted over the life cycle of a product can be measured.

What name is given to the total amount of carbon dioxide emitted during the life cycle of a product? [1 mark]

Tick (✓) ONE box.

☐ Carbon footprint

☐ Global dimming

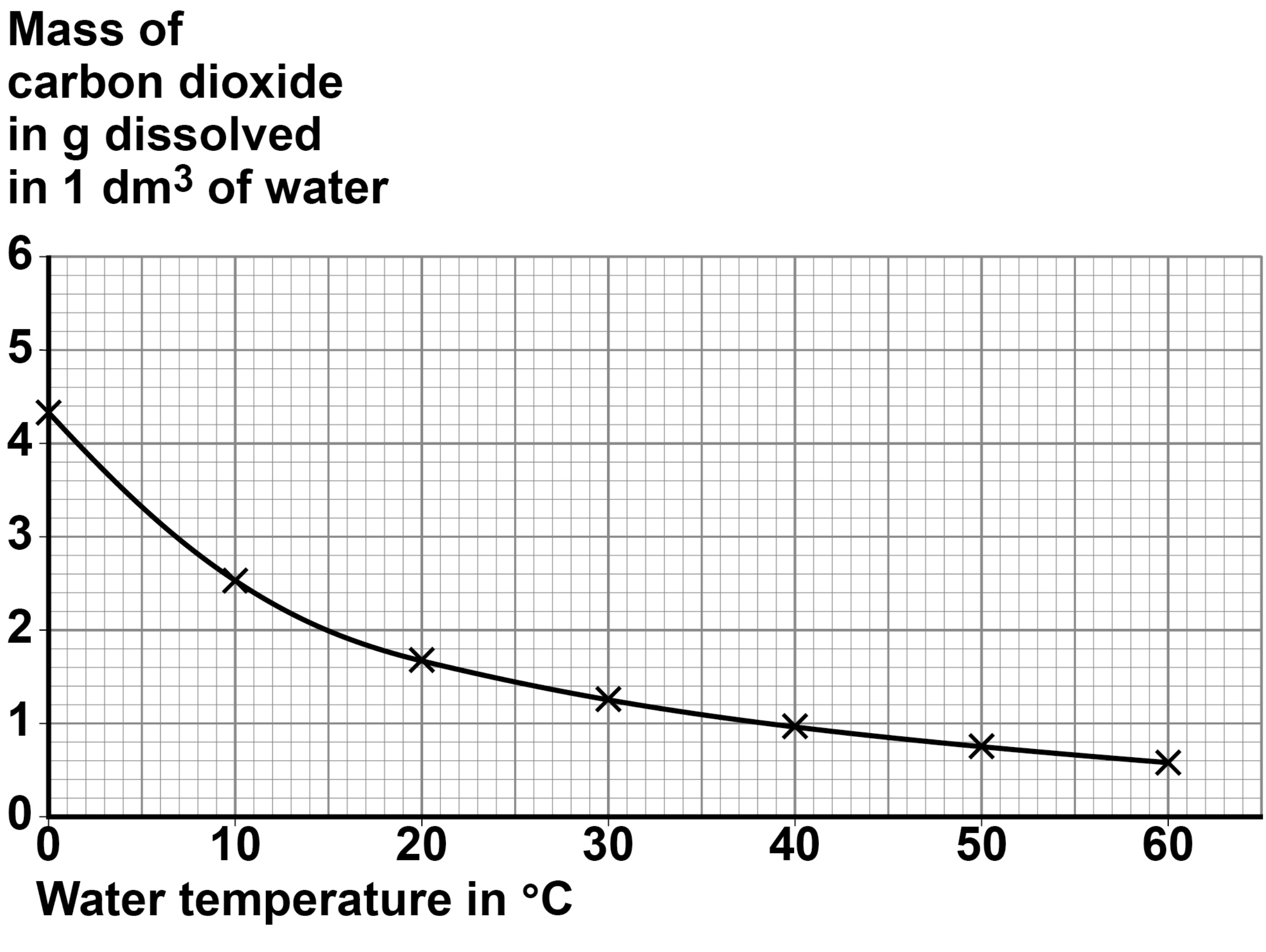
☐ Greenhouse effect

[Turn over]

Carbon dioxide dissolves in water.

FIGURE 3 shows the mass of carbon dioxide dissolved in water at different temperatures.

FIGURE 3



0 2 . 4 **Complete TABLE 1.**

Use FIGURE 3. [2 marks]

TABLE 1

Water temperature in °C	Mass of carbon dioxide in g dissolved in 1 dm^3 of water
5	
15	

0 2 . 5 **Calculate the difference in the mass of carbon dioxide dissolved in 1 dm^3 of water at 5 °C and at 15 °C**

Use TABLE 1. [1 mark]

____

____

Mass = ____________________ g

0 2 . 6 **Carbon dioxide is a greenhouse gas.**

The greenhouse effect happens in four stages.

The four stages are:

Stage A	**Carbon dioxide stops longer wavelength radiation escaping**
Stage B	**Radiation is absorbed by the Earth**
Stage C	**Longer wavelength radiation is emitted**
Stage D	**Shorter wavelength radiation enters the atmosphere.**

What is the correct order of stages A, B, C and D? [1 mark]

Tick (✓) ONE box.

☐ **C, A, B, D**

☐ **C, D, B, A**

☐ **D, B, C, A**

☐ **D, C, B, A**

0 2 . 7 **Changes in the percentage of carbon dioxide in the Earth's atmosphere cause climate change.**

Give TWO effects of climate change. [2 marks]

1 ______________________________

____

____

2 ______________________________

____

____

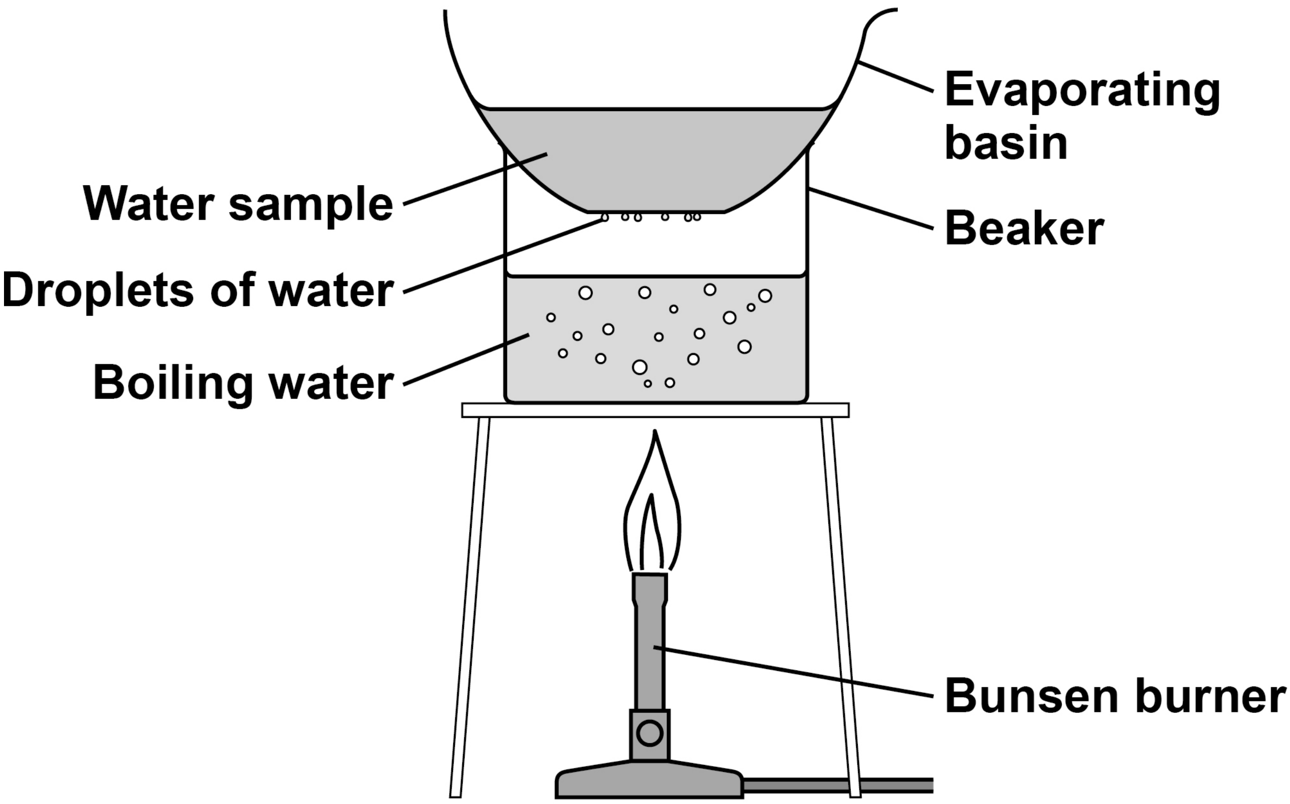
[Turn over]

10

0 3 A student investigated the mass of dissolved solids in water samples.

FIGURE 4 shows the apparatus used.

FIGURE 4



This is the method used.

1. Record the mass of a dry evaporating basin.
2. Pour 25 cm^3 of the water sample into the evaporating basin.
3. Place the evaporating basin on the beaker for 10 minutes.
4. Record the mass of the evaporating basin and contents.

0 3 . 1 **What is used to find the mass of the evaporating basin? [1 mark]**

Tick (✓) ONE box.

- [ ] **Balance**
- [ ] **Beaker**
- [ ] **Measuring cylinder**
- [ ] **Thermometer**

[Turn over]

One error is that droplets of water collect on the bottom of the evaporating basin.

0 3 . 2 **Suggest how this error affects the mass of the evaporating basin and contents. [1 mark]**

0 3 . 3 **How can this error be corrected? [1 mark]**

0 3 . 4 **Another error in the method is that not all the water was removed from the water sample.**

How can this error be corrected? [1 mark]

Tick (✓) ONE box.

☐ **Add more boiling water to the beaker.**

☐ **Heat until the mass of the evaporating basin and contents is constant.**

☐ **Stir the water sample in the evaporating basin with a glass rod.**

0 3 . 5 **The water in the water sample turns into steam.**

What is the name of this process? [1 mark]

____

____

[Turn over]

Another student did the experiment correctly with three water samples A, B and C.

TABLE 2 shows the results.

TABLE 2

Water sample	Mass of dissolved solids in g			
	Test 1	Test 2	Test 3	Mean
A	0.23	0.23	0.20	X
B	0.03	0.07	0.02	0.04
C	1.45	1.60	1.45	1.50

0 3 . 6 The range is the difference between the largest value and the smallest value.

Which water sample has the greatest range of results? [1 mark]

Tick (✓) ONE box.

☐ A

☐ B

☐ C

0 3 . 7 **Calculate the mean mass X for water sample A.**

Use TABLE 2. [2 marks]

____

____

____

____

____

____

X = ______________________ g

[Turn over]

0 3 . 8 **What is the dependent variable in this experiment? [1 mark]**

Tick (✓) ONE box.

☐ **Mass of dissolved solids**

☐ **Time taken for water to heat**

☐ **Type of water sample**

☐ **Volume of boiling water**

03.9 **A different water sample contains 3.6 g of dissolved solids in 150 cm^3**

Calculate the mass of dissolved solids in 25 cm^3 of this sample. [2 marks]

____

____

____

____

____

____

Mass = ______________________ g

[Turn over]

11

0 4 **This question is about hydrogen peroxide.**

0 4 . 1 **The symbol equation for the decomposition of hydrogen peroxide (H_2O_2) is:**

$$2\,H_2O_2 \longrightarrow 2\,H_2O + O_2$$

Complete the word equation for the decomposition of hydrogen peroxide.
[2 marks]

hydrogen peroxide $\longrightarrow$

________________________ **+** ________________________

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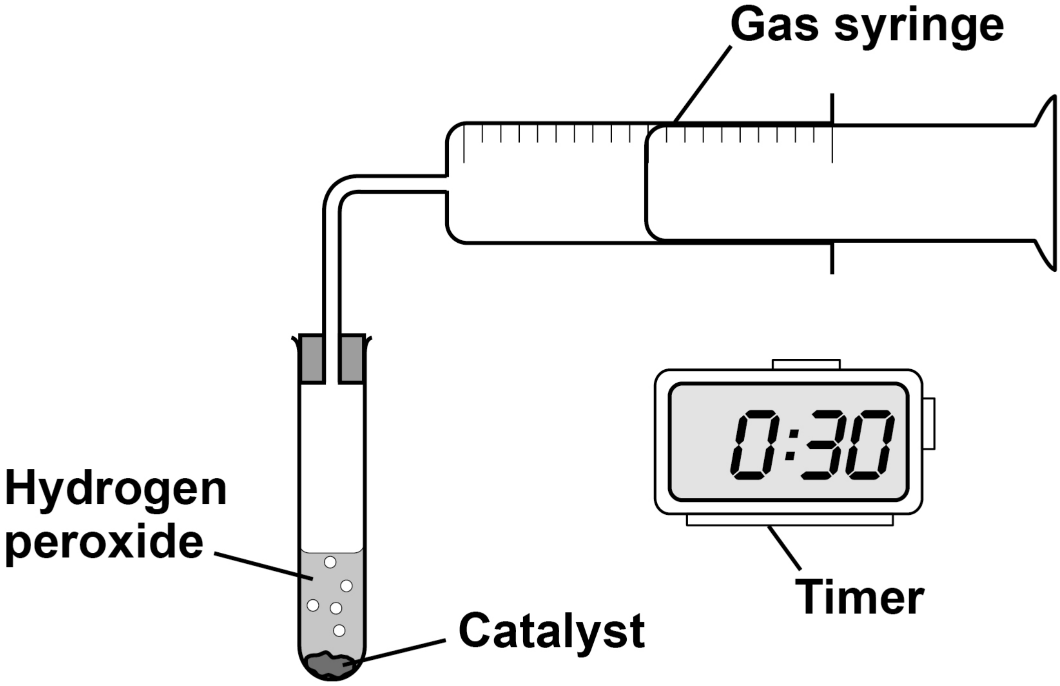
[Turn over]

A student investigated the effect of different catalysts on the decomposition of hydrogen peroxide.

The student measured the volume of gas collected every 30 seconds for 5 minutes.

FIGURE 5 shows the apparatus used.

FIGURE 5



0 4 . 2 **Which TWO variables should the student keep the same to make the investigation a fair test? [2 marks]**

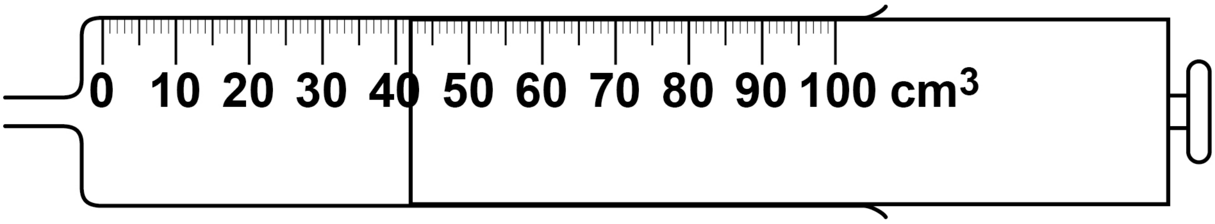
Tick (✓) TWO boxes.

- [ ] **Concentration of hydrogen peroxide**
- [ ] **Mass of catalyst**
- [ ] **Size of gas syringe**
- [ ] **Type of catalyst**
- [ ] **Volume of gas collected**

[Turn over]

0 4 . 3 **FIGURE 6 shows a gas syringe.**

FIGURE 6



What is the volume of gas in the syringe?
[1 mark]

Volume = ____________________ cm^3

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[Turn over]

TABLE 3 shows the student's results for one catalyst.

TABLE 3

Time in minutes	0.0	0.5	1.0	1.5	2.0
Volume of gas in cm^3	0	34	54	68	78

0 4 . 4 **Six of the other results have been plotted on FIGURE 7, on the opposite page.**

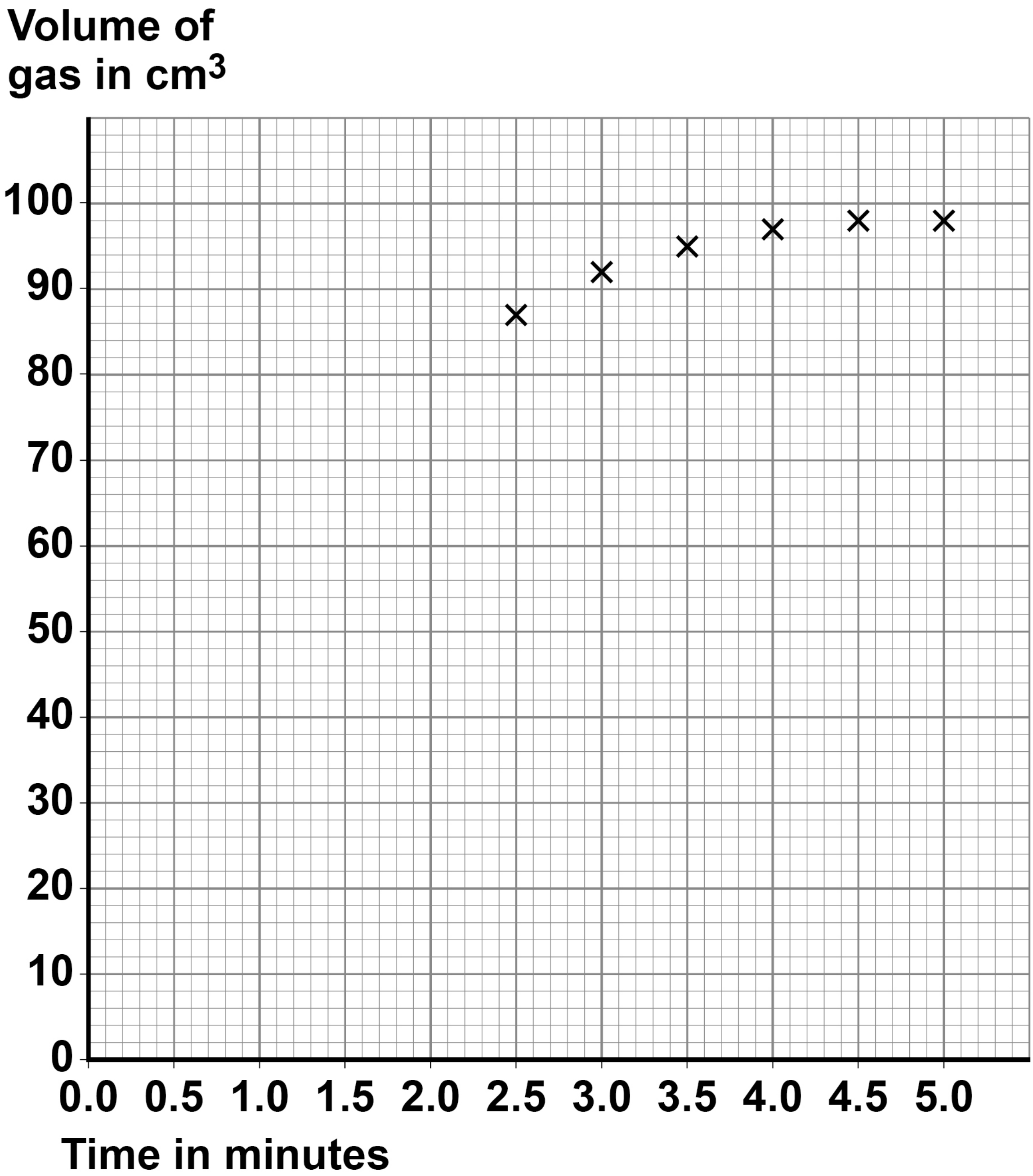
Complete the graph in FIGURE 7.

You should:

- **plot the results from TABLE 3**
- **draw a line of best fit for all of the results.**

[3 marks]

FIGURE 7



[Turn over]

The student repeated the experiment with other catalysts and plotted a graph for each of the catalysts used.

0 4 . 5 **Suggest how the student could use these graphs to identify the best catalyst. [1 mark]**

0 4 . 6 **All the graphs level off at the same volume of gas.**

Suggest why. [1 mark]

0 4 . 7 In another investigation, a student increased the temperature of the hydrogen peroxide.

Why is the rate of reaction faster when the temperature of the hydrogen peroxide is increased? [2 marks]

Tick (✓) TWO boxes.

- [ ] The concentration of hydrogen peroxide decreases.
- [ ] The particles are moving more slowly.
- [ ] The particles have more energy.
- [ ] There are more particle collisions per second.
- [ ] There are more particles per unit volume.

[Turn over]

12

0 5 **This question is about mixtures.**

0 5 . 1 **Which substance is a mixture?** **[1 mark]**

Tick (✓) ONE box.

☐ **Air**

☐ **Gold**

☐ **Methane**

☐ **Nitrogen**

0 5 . 2 **Food colourings are often mixtures of dyes.**

What name is given to mixtures that are designed as useful products? [1 mark]

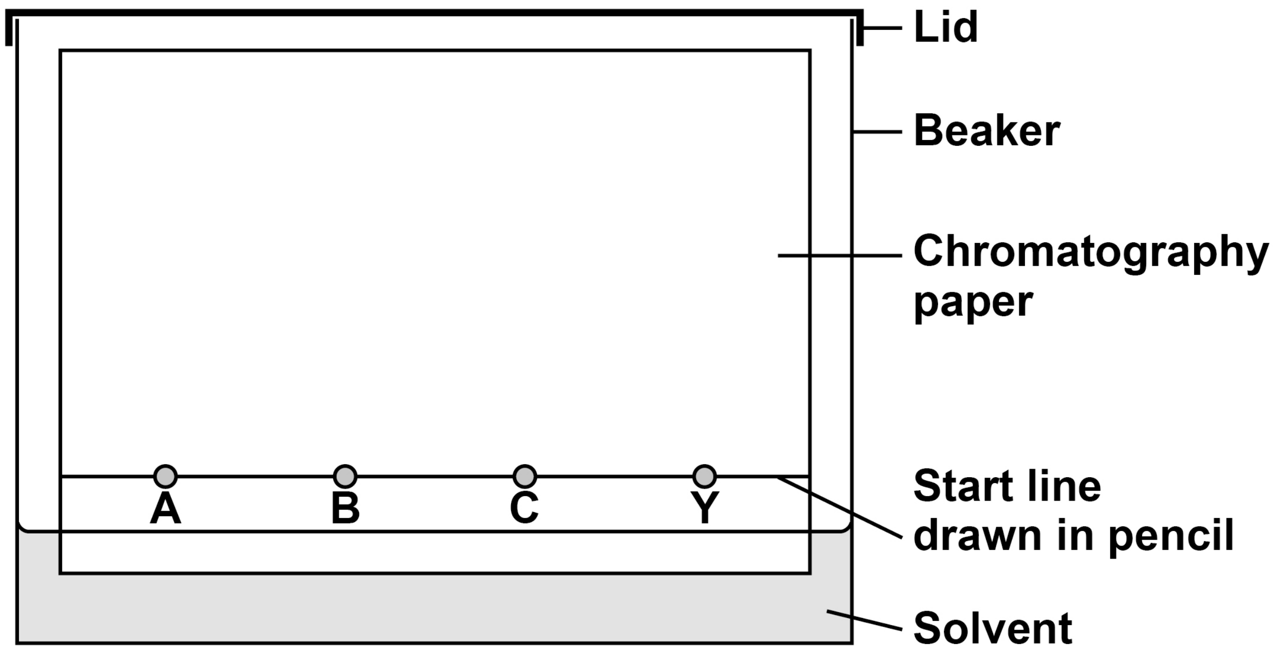
[Turn over]

A student investigated a purple food colouring, Y, using chromatography.

The student compares Y with dyes A, B and C.

0 5 . 3 FIGURE 8 shows the apparatus used.

FIGURE 8



Chromatography involves a stationary phase and a mobile phase.

Draw ONE line from each phase to what is used for that phase.

Use FIGURE 8. [2 marks]

PHASE	WHAT IS USED
	Beaker
Mobile phase	Chromatography paper
	Food colouring
Stationary phase	Pencil line
	Solvent

[Turn over]

FIGURE 9 shows the student's results.

FIGURE 9

0 5 . 4 **What THREE conclusions can you make about the dyes in food colouring Y? [3 marks]**

1 ____

____

____

2 ____

____

____

3 ______

______

______

0 5 . 5 In a different experiment a student recorded these results:

Distance moved by dye G = 60 mm

Distance moved by solvent = 80 mm

Calculate the R_f value of dye G.

$$R_f = \frac{\text{distance moved by dye G}}{\text{distance moved by solvent}}$$

[2 marks]

______

______

______

______

______

R_f ______

[Turn over]

9

0 6 This question is about the Earth's resources.

When most fuels burn, carbon dioxide is produced.

Propane (C_3H_8) is a fuel.

0 6 . 1 Balance the equation for the combustion of propane. [1 mark]

$$C_3H_8 + \_\_\_\_\_\_\_\_ O_2 \longrightarrow 3\,CO_2 + 4\,H_2O$$

0 6 . 2 Describe the test for carbon dioxide.

Give the result of the test. [2 marks]

Test ______________________________

Result ______________________________

____

____

0 6 . 3 Propane can be cracked to produce propene and hydrogen.

Complete the symbol equation for the reaction. [1 mark]

$C_3H_8 \rightarrow$ ____________________ $+ H_2$

propane propene hydrogen

0 6 . 4 Describe the test for hydrogen.

Give the result of the test. [2 marks]

Test ____

Result ____

____

____

[Turn over]

0 6 . 5 Propene is an alkene.

Describe the test for alkenes.

Give the colour change in the test. [3 marks]

Test ____________________________________

Colour change __________ to ______________

___
9

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[Turn over]

0 7 Some students investigated the effect of temperature on the rate of reaction.

0 7 . 1 The students reacted sodium thiosulfate solution with hydrochloric acid.

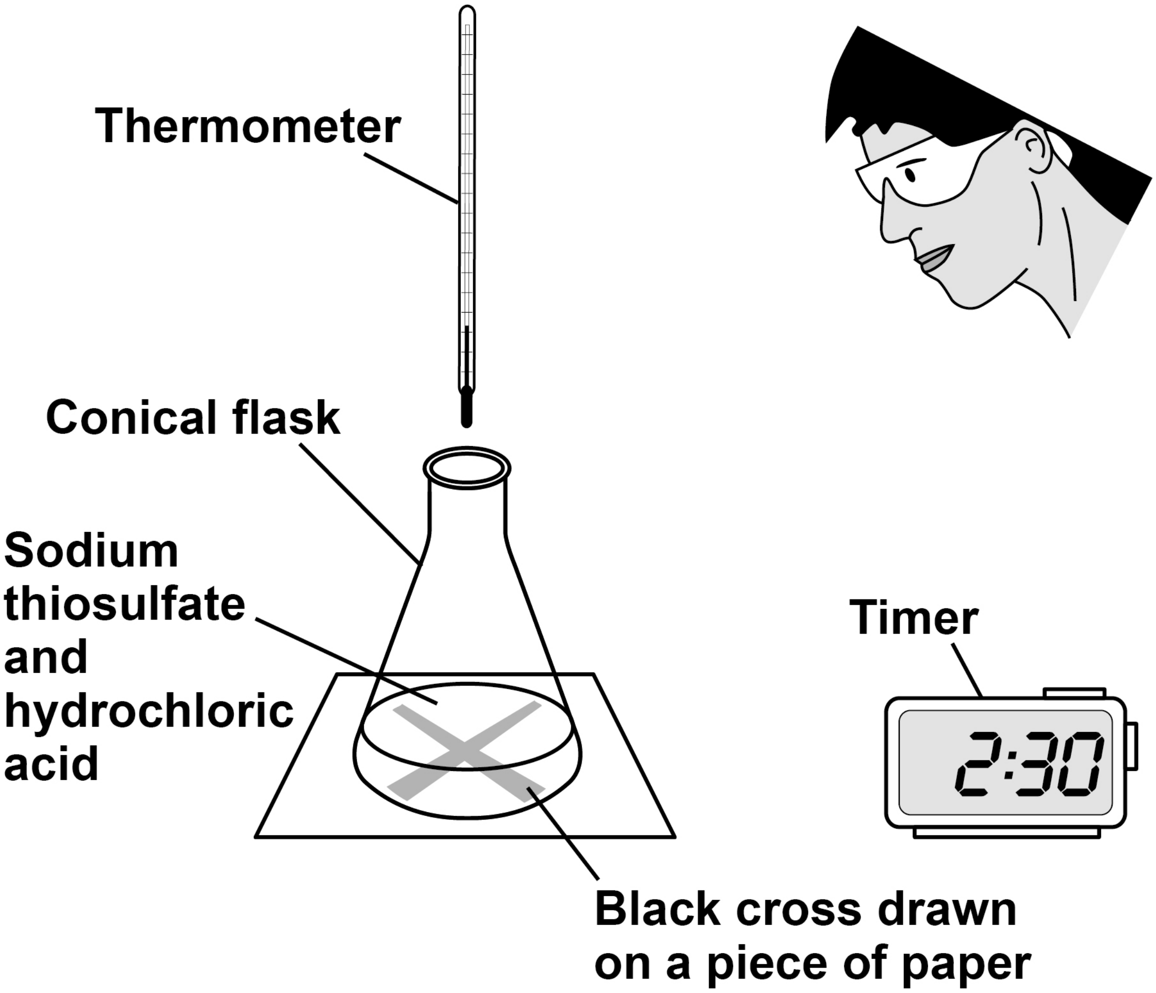
This is the method used.

1. Use a beaker to measure 50 cm^3 of heated sodium thiosulfate solution into a conical flask.
2. Measure the temperature of the room.
3. Put the conical flask on a black cross drawn on a piece of paper.
4. Start a timer.
5. Use the same beaker to measure 10 cm^3 of hydrochloric acid into the conical flask.
6. Stop the timer when the cross is no longer visible.

The students repeated the experiment at a different room temperature.

FIGURE 10, on the opposite page, shows the apparatus.

FIGURE 10



[Turn over]

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The method contains errors and does NOT produce accurate results.

Describe a method the students should use to produce accurate results.

You do NOT need to write about safety precautions. [6 marks]

[Turn over]

[Turn over]

Some students investigated the effect of temperature on the rate of a different reaction.

They recorded the loss of mass from their apparatus at 40 °C

FIGURE 11, on the opposite page, shows the results.

0 7 . 2 **Calculate the mean rate of reaction between 1 minute and 3 minutes at 40 °C**

Use FIGURE 11 and the equation:

Mean rate of reaction =

$$\frac{\text{change in mass of gas in g}}{\text{time in mins}}$$

[3 marks]

____

____

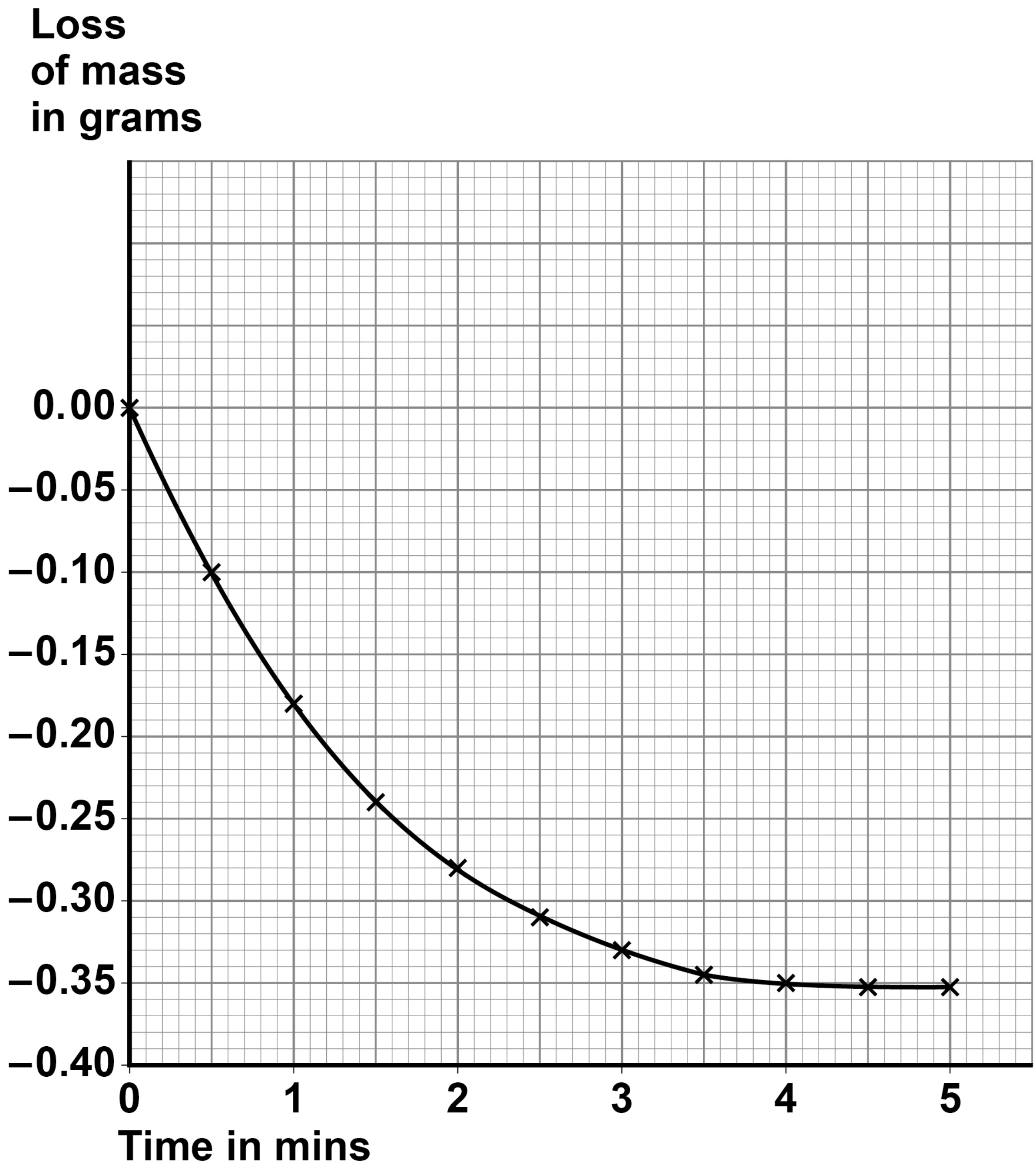
____

____

____

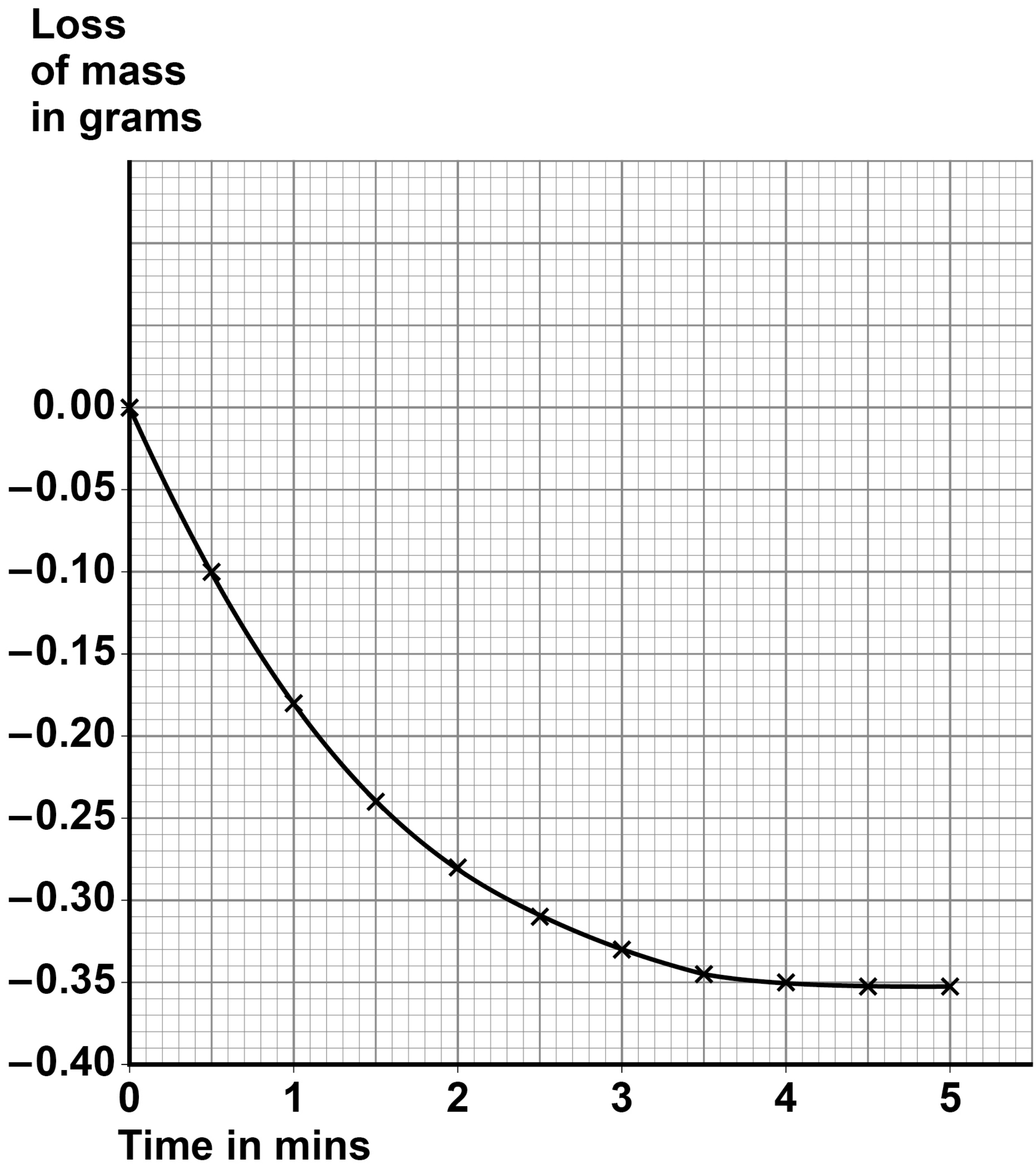
Mean rate of reaction = ________________ g/min

FIGURE 11



[Turn over]

REPEAT OF FIGURE 11



0 7 . 3 **Draw a curve on FIGURE 11, on the opposite page, for the results you would expect at a temperature of 50 °C instead of 40 °C**
[2 marks]

11

END OF QUESTIONS

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
2	
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7	
TOTAL	

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