

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Chemistry Paper 2F

Wednesday 10 June 2020

Morning

Time allowed: 1 hour 15 minutes

Materials

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.
- 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	
7	
TOTAL	



0 1 Crude oil is a mixture of hydrocarbons.

0 1 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

air	enzymes	mud	plankton	trees
-----	---------	-----	----------	-------

Crude oil is the remains of _____.

Millions of years ago biomass was buried under _____.

0 1 . 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 _____



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

[1 mark]

Tick (✓) **one** box.

Chromatography

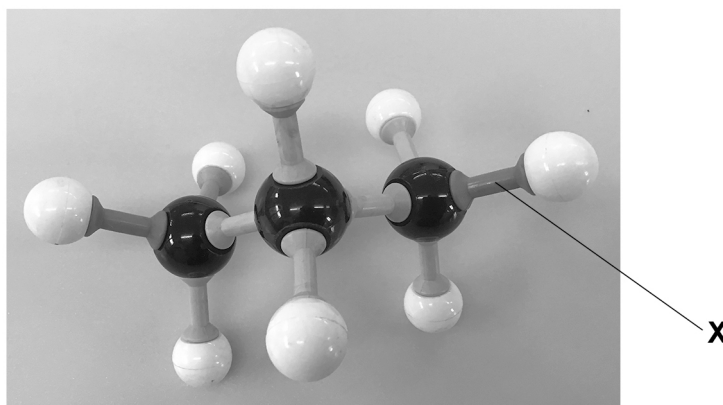
Filtration

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

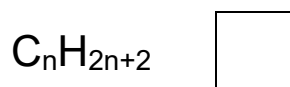
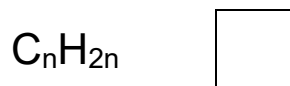
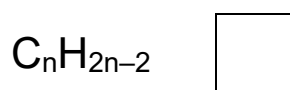
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0 1 . 6 What is the general formula for alkanes?

[1 mark]

Tick (✓) **one** box.



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

8

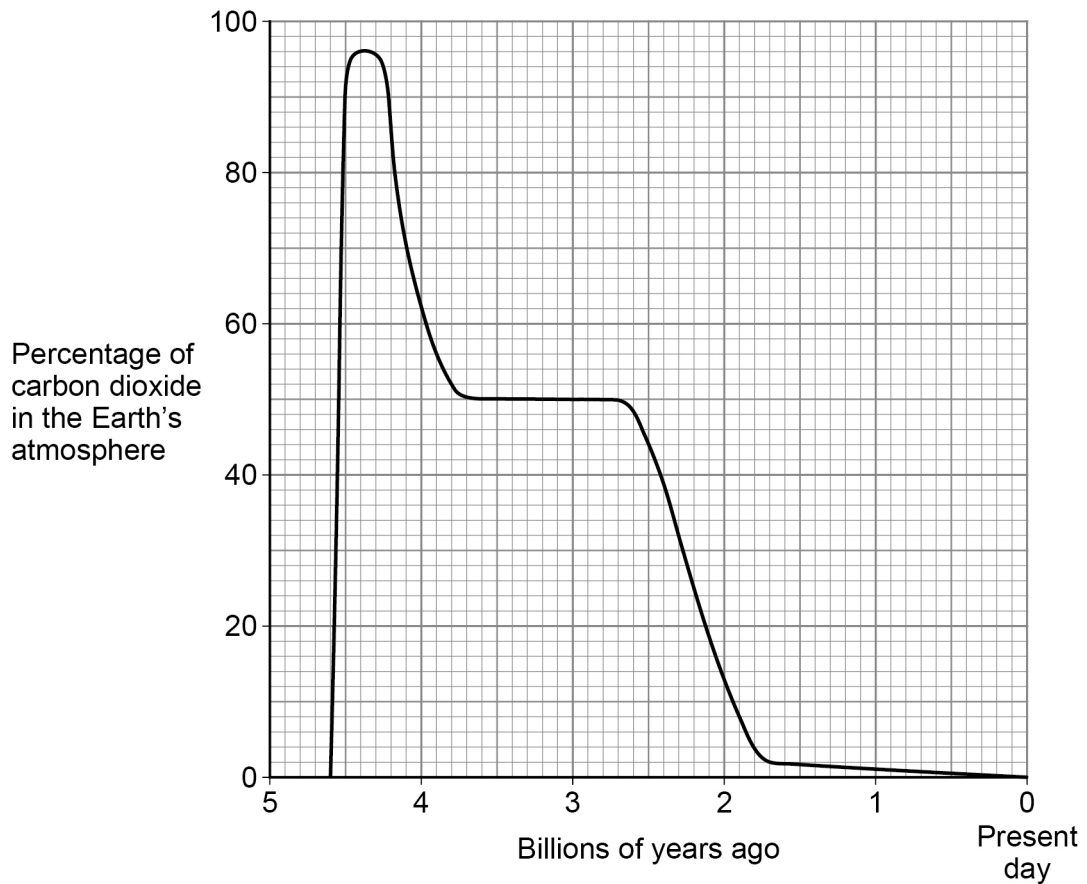


0 2

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

Figure 2 shows how the percentage of carbon dioxide in the Earth's atmosphere has changed over 4.6 billion years.

Figure 2



0 2 . 1

What was the highest percentage of carbon dioxide in the Earth's atmosphere?

Use **Figure 2**.

[1 mark]

Highest percentage = _____ %

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

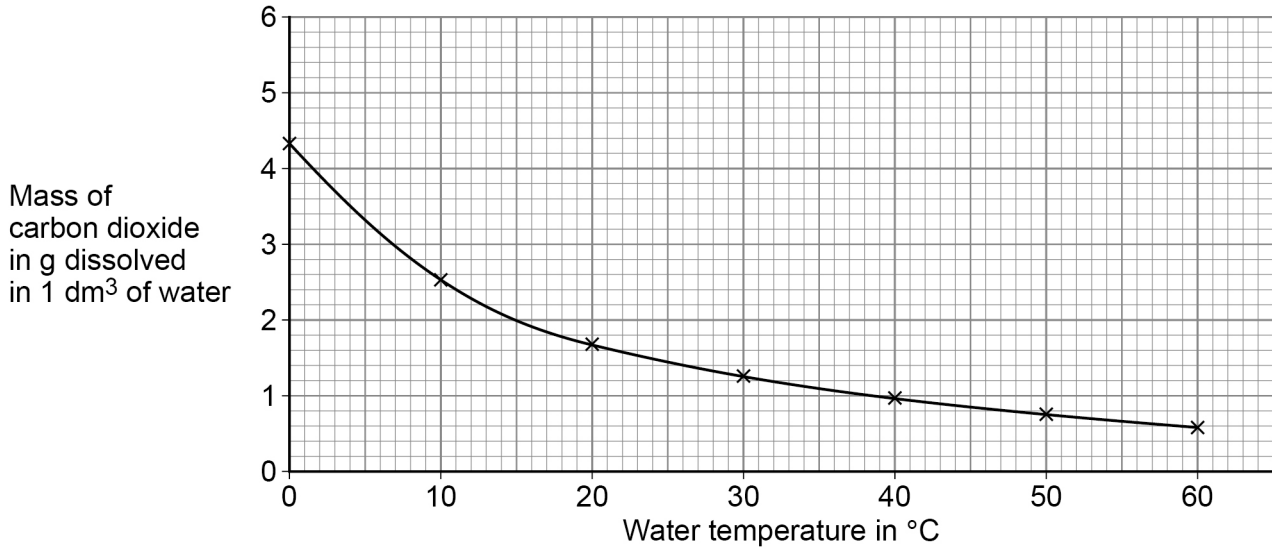
Greenhouse effect



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 dm³ of water at 5 °C and at 15 °C

Use **Table 1**.

[1 mark]

Mass = _____ g

Turn over ►



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 _____

10



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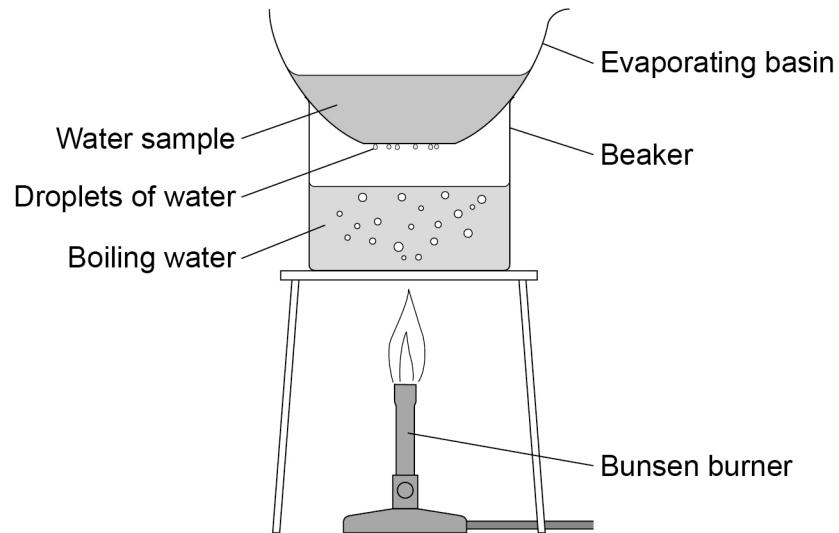
0 9

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 cm³ 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



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.

Question 3 continues on the next page

Turn over ►



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

What is the name of this process?

[1 mark]

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

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

0 3 . 9 A different water sample contains 3.6 g of dissolved solids in 150 cm³

Calculate the mass of dissolved solids in 25 cm³ of this sample.

[2 marks]

Mass = _____ g

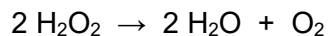
11

Turn over ►



0 4

This question is about hydrogen peroxide.

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

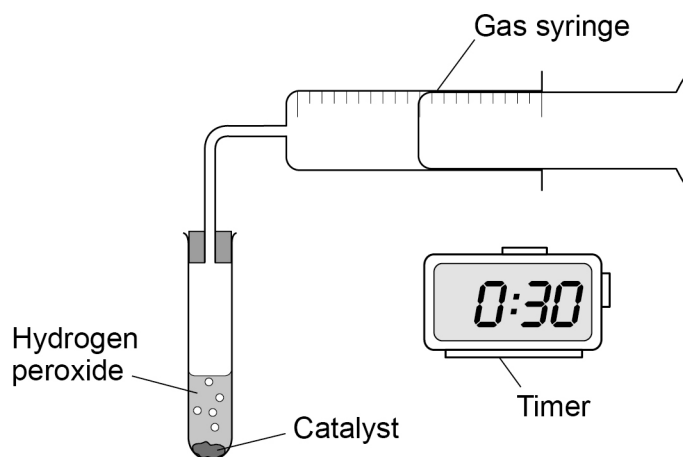
Complete the word equation for the decomposition of hydrogen peroxide.

[2 marks]hydrogen peroxide \rightarrow _____ + _____

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

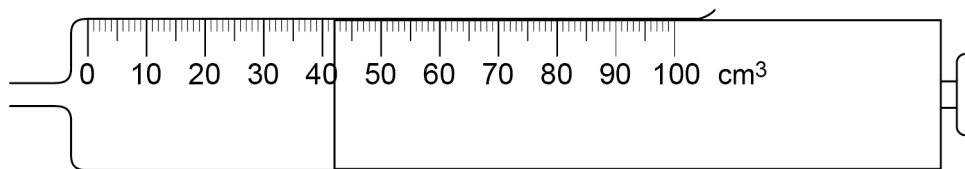
Size of gas syringe

Type of catalyst

Volume of gas collected

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

Figure 6



What is the volume of gas in the syringe?

[1 mark]

Volume = _____ cm³

Question 4 continues on the next page

Turn over ►



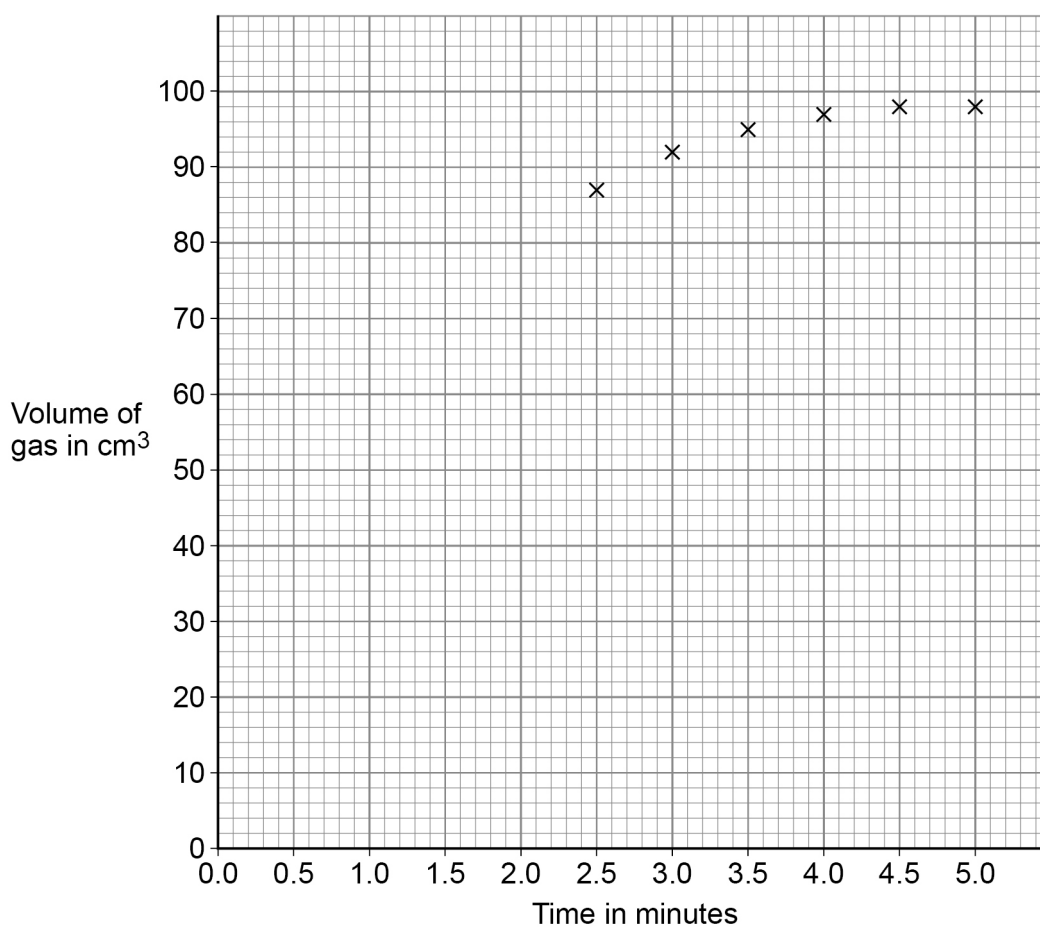
Table 3 shows the student's results for one catalyst.

Table 3

Time in minutes	0.0	0.5	1.0	1.5	2.0
Volume of gas in cm³	0	34	54	68	78

0 4 . 4 Six of the other results have been plotted on **Figure 7**.

Figure 7



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]



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.

12

Turn over ►



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]

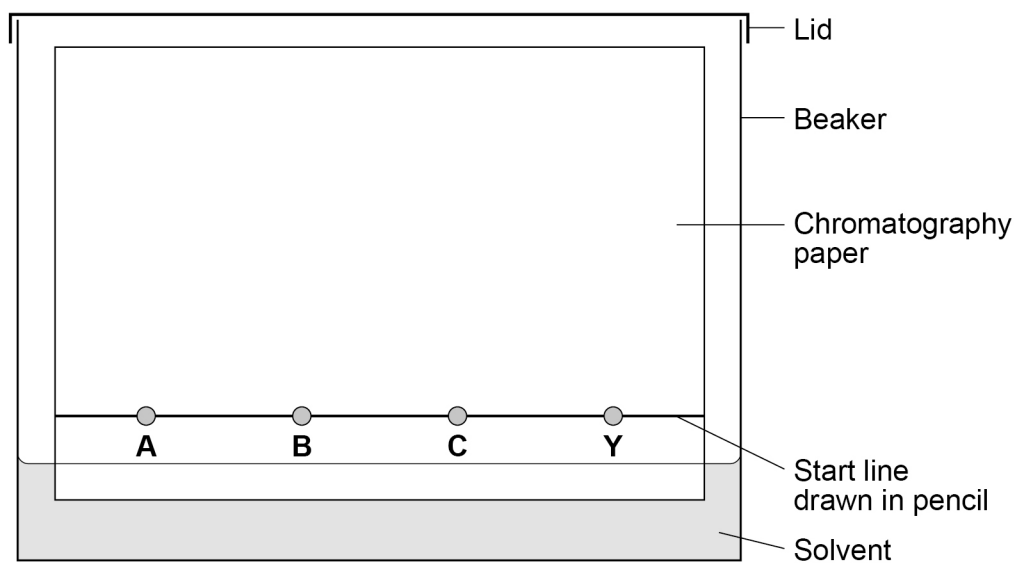
A student investigated a purple food colouring, **Y**, using chromatography.

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

Question 5 continues on the next page

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]

 $R_f =$ _____

9**Turn over for the next question****Turn over ►**

0 6

This question is about the Earth's resources.

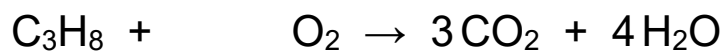
When most fuels burn carbon dioxide is produced.

Propane (C₃H₈) is a fuel.

0 6 . 1

Balance the equation for the combustion of propane.

[1 mark]



0 6 . 2

Describe the test for carbon dioxide.

Give the result of the test.

[2 marks]

Test _____

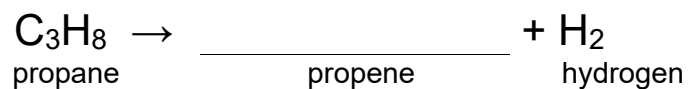
Result _____

0 6 . 3

Propane can be cracked to produce propene and hydrogen.

Complete the symbol equation for the reaction.

[1 mark]



0 6 . 4 Describe the test for hydrogen.

Give the result of the test.

[2 marks]

Test _____

Result _____

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

Turn over for the next question

Turn over ►



0 7

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

0 7 . 1

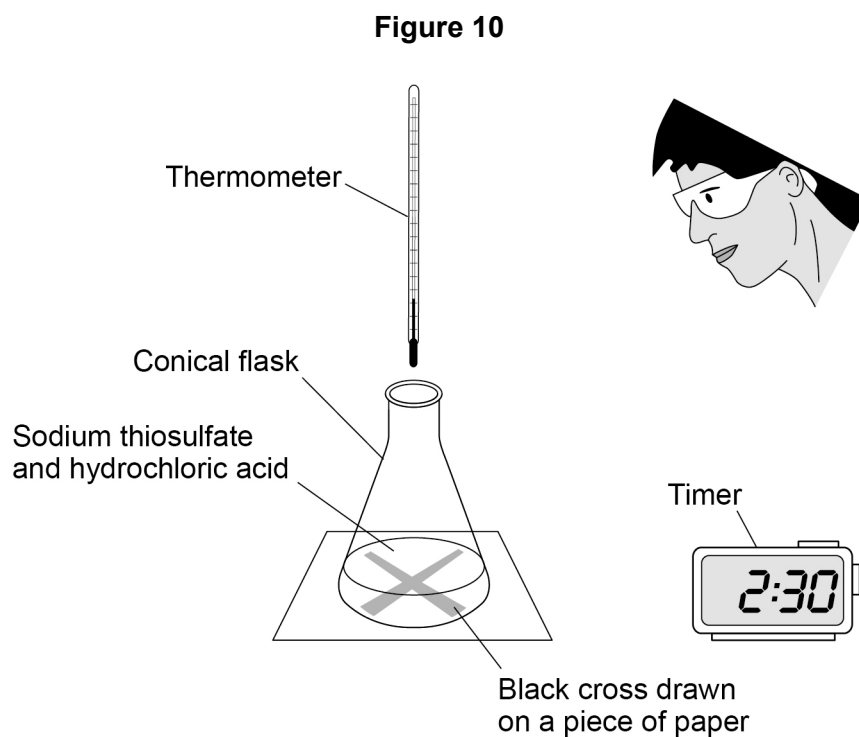
The students reacted sodium thiosulfate solution with hydrochloric acid.

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 shows the apparatus.



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]

Question 7 continues on the next page

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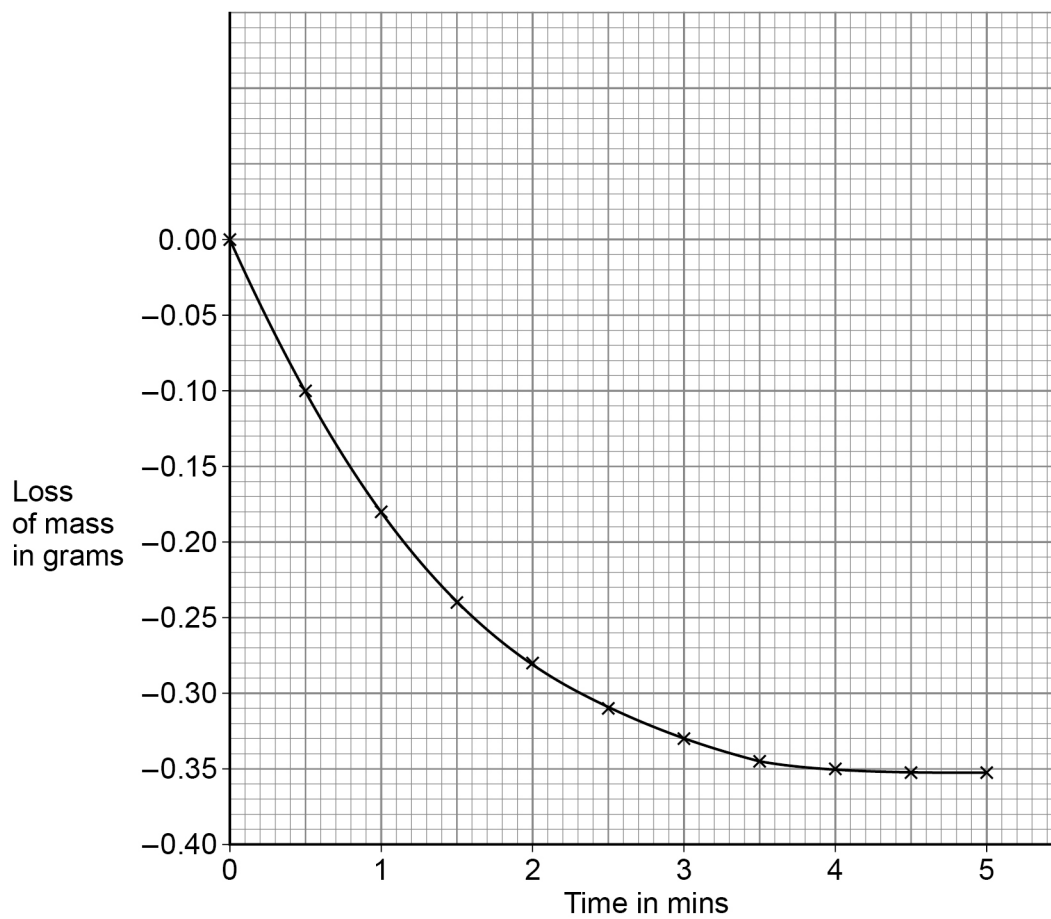


Some students investigated the effect of temperature on the rate of a different reaction.

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

Figure 11 shows the results.

Figure 11



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

Use **Figure 11** and the equation:

$$\text{Mean rate of reaction} = \frac{\text{change in mass of gas in g}}{\text{time in mins}}$$

[3 marks]

Mean rate of reaction = _____ g/min

0 7 . 3 Draw a curve on **Figure 11** for the results you would expect at a temperature of 50 °C instead of 40 °C

[2 marks]

11

END OF QUESTIONS



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