

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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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	
<b>TOTAL</b>	



J U N 2 0 8 4 6 4 C 2 F 0 1

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 evaporateStage **B**    Crude oil is heatedStage **C**    Vapours condenseGive 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

☐

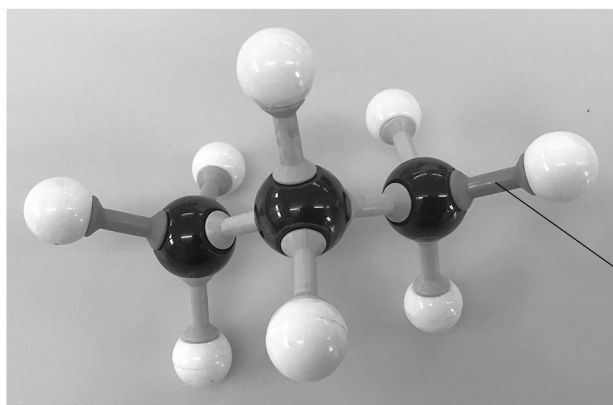
Fractional distillation

☐

**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

☐

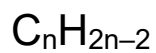
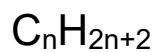
**Turn over ►**



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

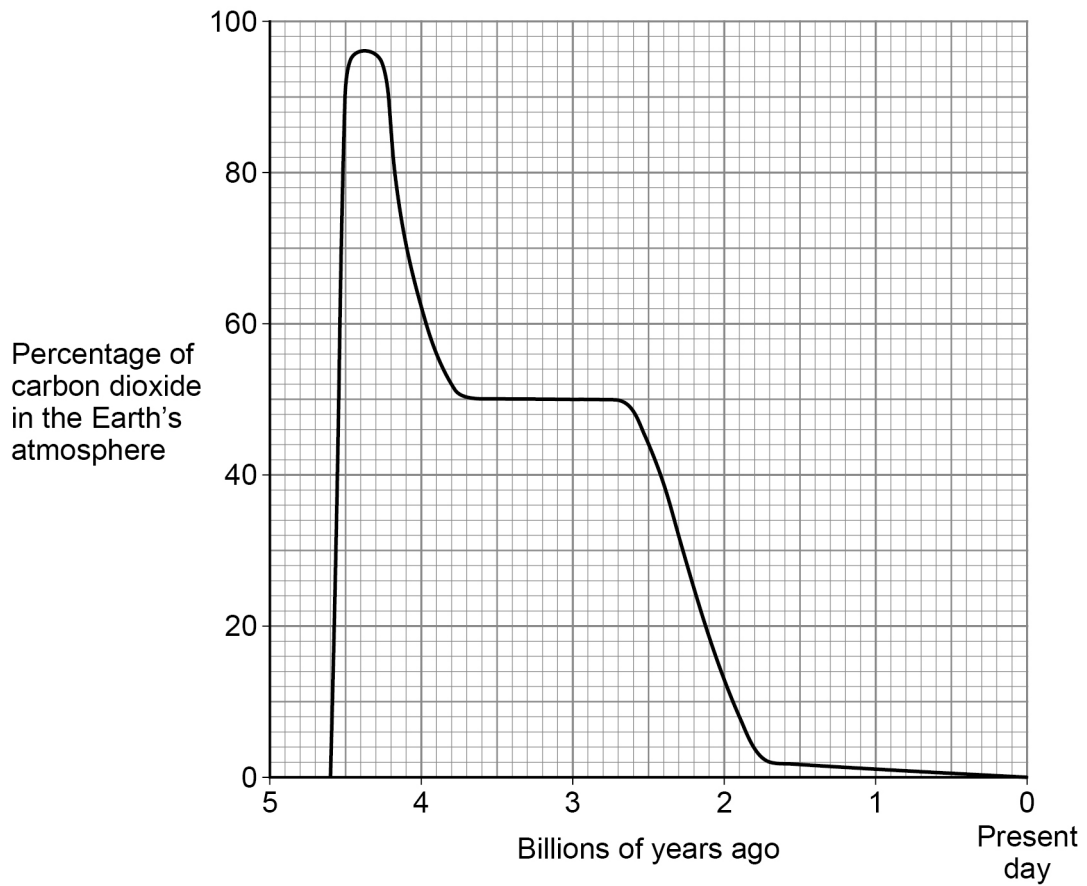


0 2

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

☐

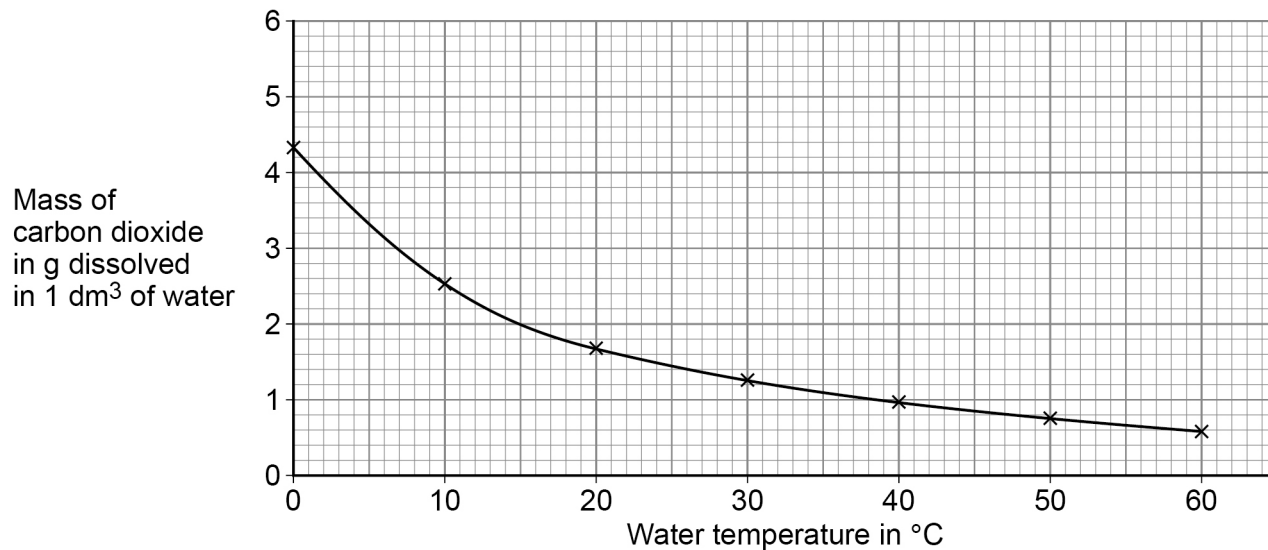
Greenhouse effect

☐

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 <sup>3</sup> of water
5	
15	

**0 2 . 5** Calculate the difference in the mass of carbon dioxide dissolved in 1 dm<sup>3</sup> 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 escapingStage **B** Radiation is absorbed by the EarthStage **C** Longer wavelength radiation is emittedStage **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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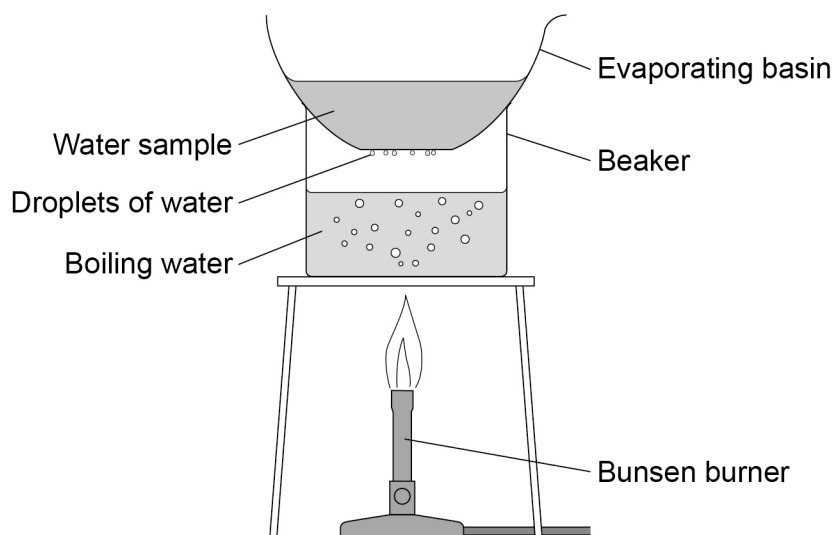


0 3

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<sup>3</sup> 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]

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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
<b>A</b>	0.23	0.23	0.20	<b>X</b>
<b>B</b>	0.03	0.07	0.02	0.04
<b>C</b>	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]**


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**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 cm<sup>3</sup>Calculate the mass of dissolved solids in 25 cm<sup>3</sup> of this sample.**[2 marks]**


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Mass = \_\_\_\_\_ g

11

Turn over ►

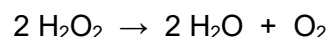


0	4
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This question is about hydrogen peroxide.

0	4	.	1
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The symbol equation for the decomposition of hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) is:



Complete the word equation for the decomposition of hydrogen peroxide.

[2 marks]

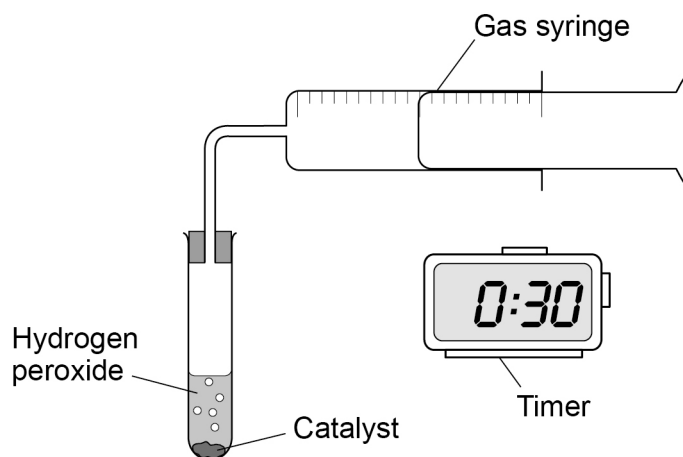
hydrogen peroxide  $\rightarrow$  \_\_\_\_\_ + \_\_\_\_\_

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

☐

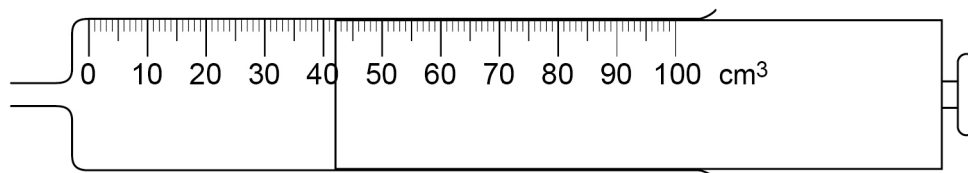
Volume of gas collected

☐

0 4 . 3

**Figure 6** shows a gas syringe.

**Figure 6**



What is the volume of gas in the syringe?

[1 mark]

Volume = \_\_\_\_\_ cm<sup>3</sup>

**Question 4 continues on the next page**

**Turn over ►**



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

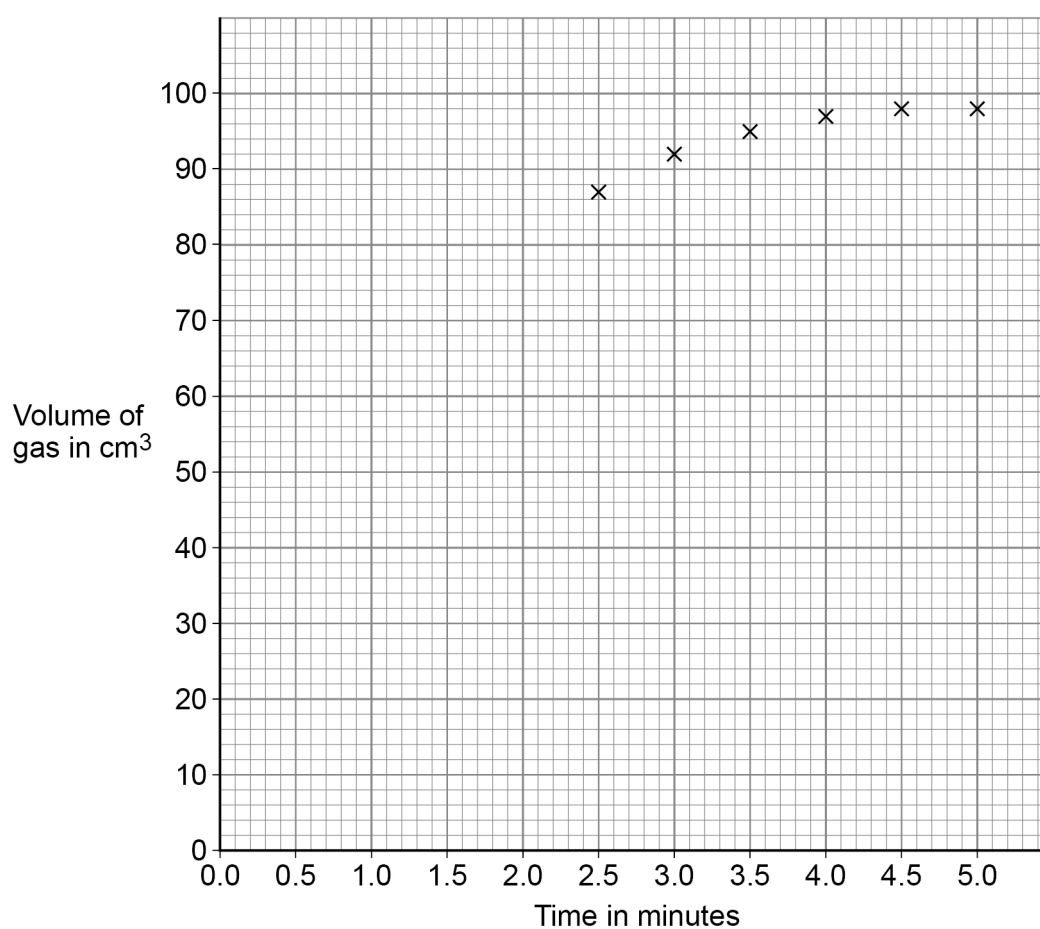
**Table 3**

Time in minutes	0.0	0.5	1.0	1.5	2.0
Volume of gas in cm <sup>3</sup>	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]

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0 4 . 6

All the graphs level off at the same volume of gas.

Suggest why.

[1 mark]

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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?

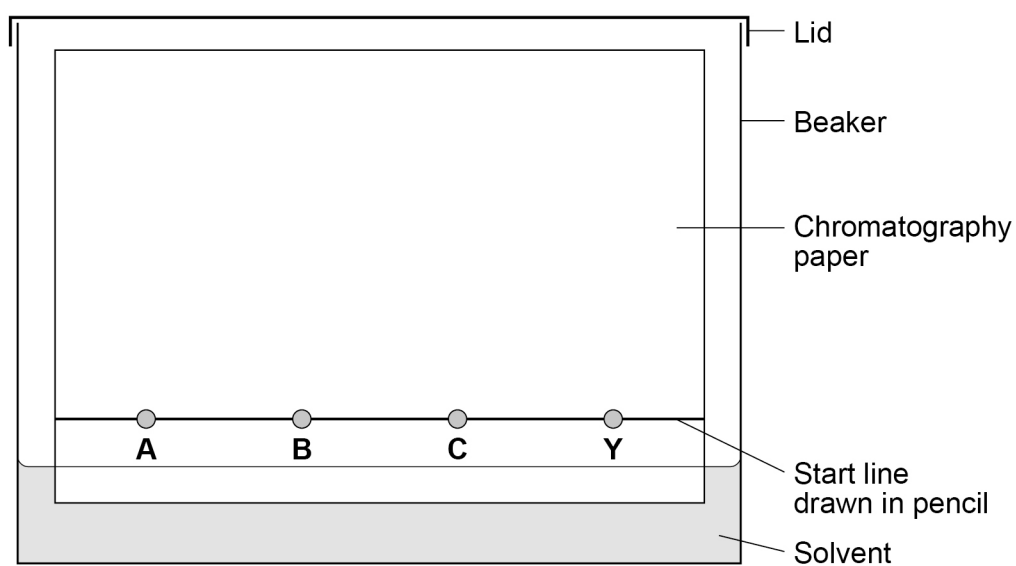
**[1 mark]**Tick (✓) **one** box.

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
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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]

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$R_f =$  \_\_\_\_\_

9
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Turn over for the next question

Turn over ►



0 6

This question is about the Earth's resources.

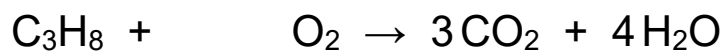
When most fuels burn carbon dioxide is produced.

Propane (C<sub>3</sub>H<sub>8</sub>) 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 \_\_\_\_\_

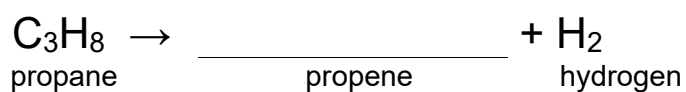
Result \_\_\_\_\_

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 \_\_\_\_\_

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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**

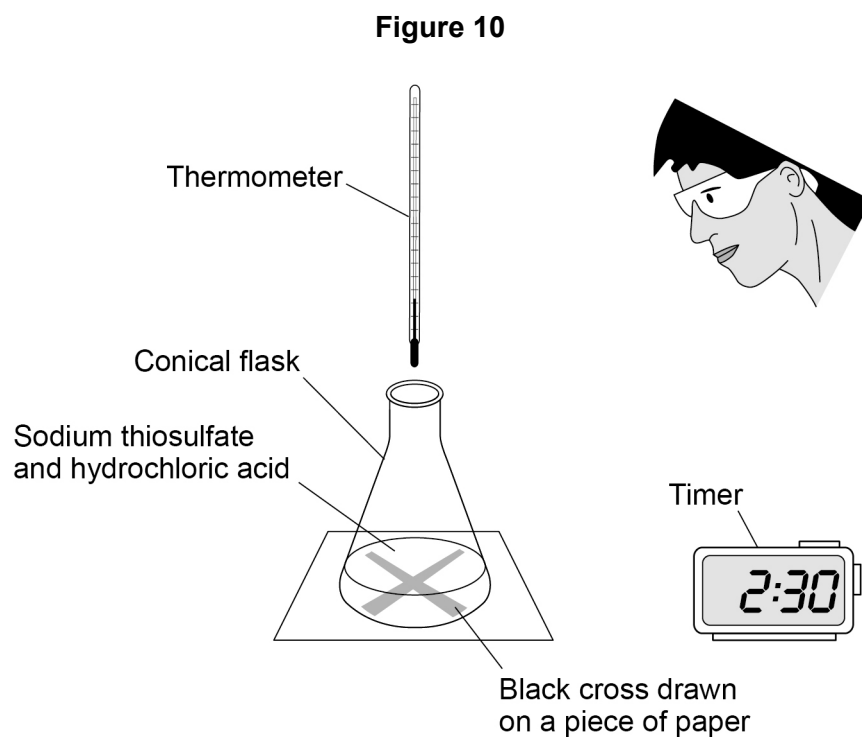
The students reacted sodium thiosulfate solution with hydrochloric acid.

This is the method used.

1. Use a beaker to measure  $50\text{ cm}^3$  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  $10\text{ cm}^3$  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.





You do **not** need to write about safety precautions.

[illegible]

**Turn over ►**

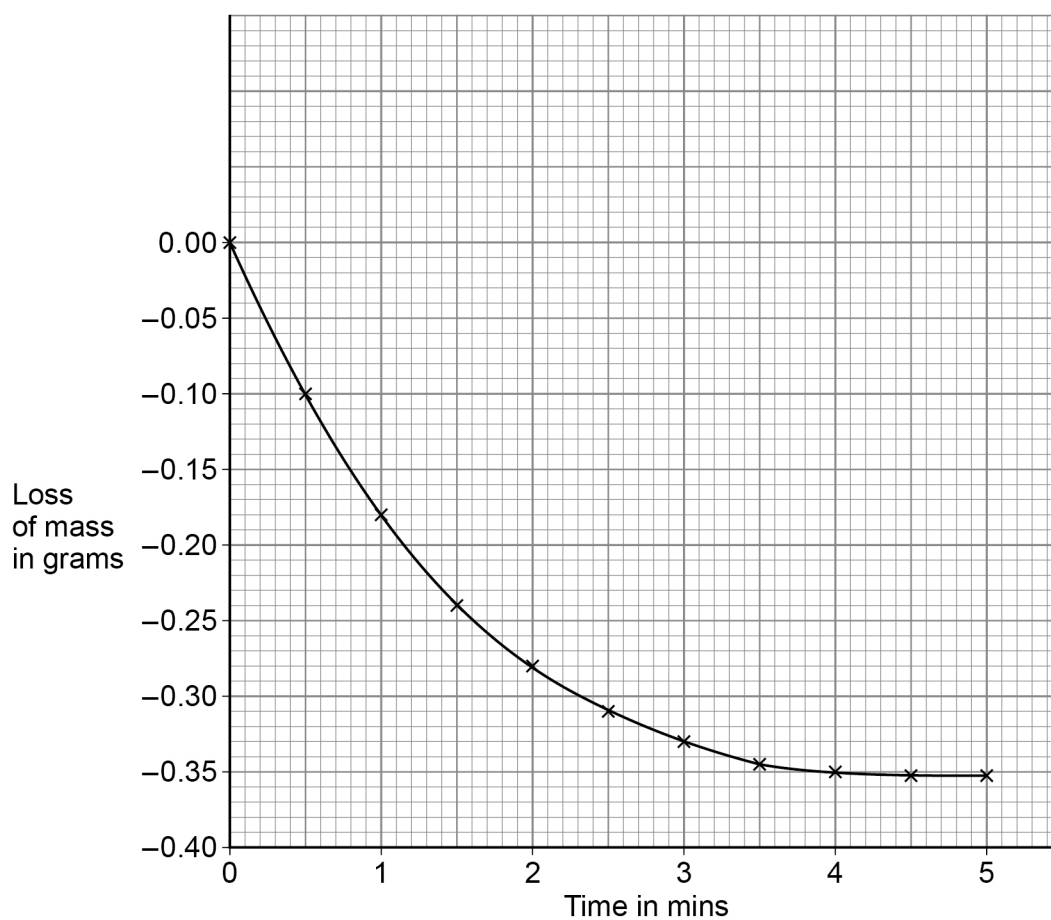


Some students investigated the effect of temperature on the rate of a different reaction.

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

**Figure 11** 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]**


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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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3 2



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