

**Thursday 24 May 2012 – Morning**

**GCSE GATEWAY SCIENCE  
CHEMISTRY B**

**B741/01** Chemistry modules C1, C2, C3 (Foundation Tier)

Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)

**Duration:** 1 hour 15 minutes



|                       |  |                      |  |
|-----------------------|--|----------------------|--|
| Candidate<br>forename |  | Candidate<br>surname |  |
|-----------------------|--|----------------------|--|

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

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

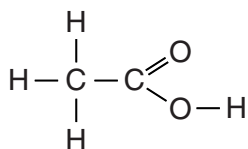
- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The Periodic Table can be found on the back page.
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document consists of **24** pages. Any blank pages are indicated.

Answer **all** the questions.

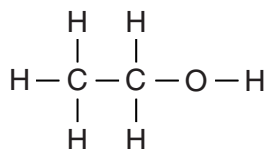
**Section A – Module C1**

- 1 This question is about carbon compounds.

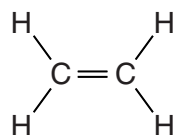
Look at the displayed formulas of some compounds.



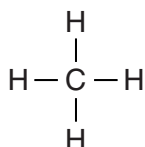
**ethanoic acid**



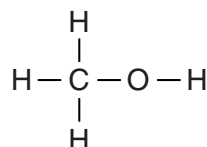
**ethanol**



**ethene**



**methane**



**methanol**

- (a) Write down the name of a compound that is a **hydrocarbon**.

Choose from the compounds shown.

..... [1]

- (b) Look at the displayed formula of **ethanol**.

How many atoms are shown in the displayed formula?

..... [1]

- (c) Many ethene molecules react together to make a **polymer**.

Write down the name of the polymer.

..... [1]

**[Total: 3]**

2 John and Sue are building a new house.



They want to choose the best fuel for their house.

They find out some information about four possible fuels.

| fuel        | is it easy to use? | annual cost to heat the house in £ | is it available to this house? |
|-------------|--------------------|------------------------------------|--------------------------------|
| coal        | no                 | 750                                | yes                            |
| LPG         | yes                | 972                                | yes                            |
| natural gas | yes                | 720                                | no                             |
| oil         | yes                | 750                                | yes                            |

(a) Which fuel should John and Sue choose?

Explain your choice.

.....

.....

..... [2]

(b) John and Sue need to consider other factors apart from ease of use, cost and availability.

Write down two **other** factors they need to consider when choosing a fuel for their house.

1.....

2..... [2]

(c) LPG contains propane gas.

Propane burns in oxygen. Carbon dioxide and water are made.

Write the **word equation** for this reaction.

..... [1]

[Total: 5]

3 This question is about paint.



Look at the information about two different paints.

| ingredient                                 | percentage of each ingredient |         |
|--|-------------------------------|---------|
|  | paint X                       | paint Y |
| binding medium                             | 53                            | 47      |
| pigment                                    | 27                            | 20      |
| solvent                                    | 14                            | 30      |
| additives (to speed up the drying process) | 6                             | 3       |

(a) What is the job of the **pigment** in the paint?

Put a tick in the box (✓) next to the correct statement.

To stick the paint to the wall.

To give the paint its colour.

To stop the paint reacting with oxygen.

To stop the paint separating.

[1]

(b) Which paint, **X** or **Y**, would you expect to spread most easily on a wall?

Explain your choice.

.....

..... [2]

(c) Paint Y is cheaper than paint X.

Suggest **two** reasons why the cheaper paint may not be the best paint to buy.

.....  
.....  
..... [2]

[Total: 5]

4 This question is about polymers which are used to make plastics.

(a) Polymers are made in a reaction called **polymerisation**.

What happens in a polymerisation reaction?

.....

.....

..... [2]

(b) Look at the information about four polymers, **A**, **B**, **C** and **D**.

| polymer  | melting point<br>in °C | easy to<br>mould? | easily<br>coloured? |
|----------|------------------------|-------------------|---------------------|
| <b>A</b> | 250                    | no                | yes                 |
| <b>B</b> | 60                     | yes               | no                  |
| <b>C</b> | 240                    | no                | no                  |
| <b>D</b> | 160                    | yes               | yes                 |

Which polymer would be best for making a washing-up bowl?

answer ..... [1]

(c) Polymers have been described as “*one of the greatest inventions of the 20<sup>th</sup> century*”.

However, polymers still cause problems.

- Write about some of the ways of disposing of polymers.
- Suggest why chemists are developing new types of polymers to help with disposal problems.

.....

.....

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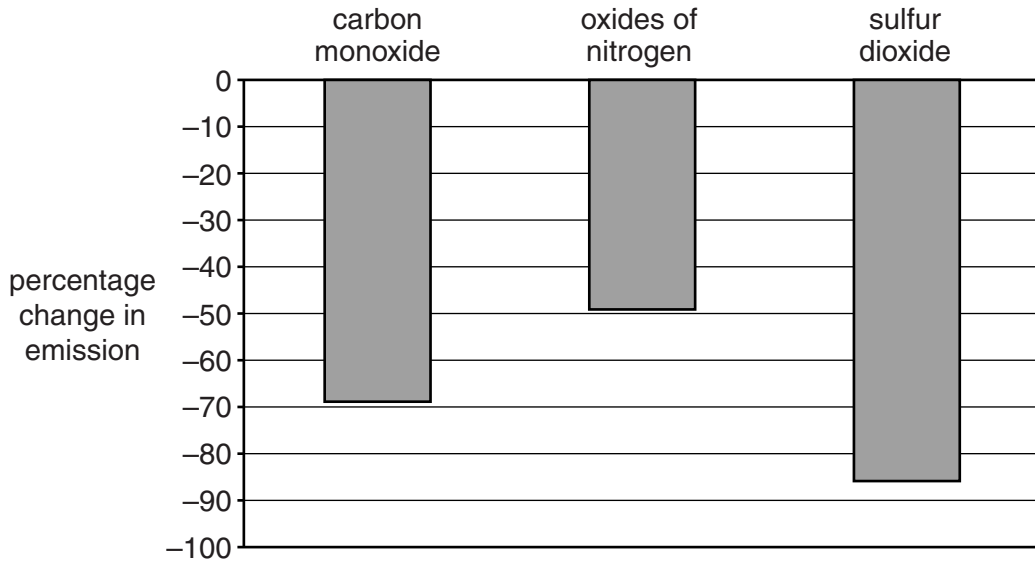
..... [3]

[Total: 6]

5 This question is about air pollutants.

Look at the graph.

It shows how the levels of some pollutants found in UK cities have changed from 1990 to 2008.



Describe how the levels of these pollutants have changed and suggest why.

Explain why it is important that air pollution is controlled.



*The quality of written communication will be assessed in your answer to this question.*

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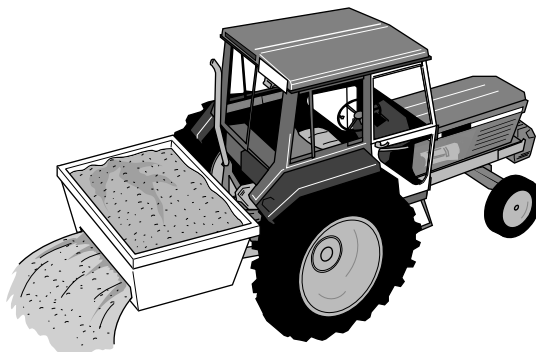
..... [6]

[Total: 6]

## Section B – Module C2

6 This question is about fertilisers.

Farmers use fertilisers to increase crop yield.



Look at the table. It lists three fertilisers.

| fertiliser         | formula                      |
|--------------------|------------------------------|
| ammonium nitrate   | $\text{NH}_4\text{NO}_3$     |
| ammonium phosphate | $(\text{NH}_4)_3\text{PO}_4$ |
| potassium nitrate  | $\text{KNO}_3$               |

(a) (i) Ammonium phosphate contains **two** of the **essential elements** needed for plant growth.

Which two?

..... and ..... [1]

(ii) Write down the total number of **atoms** in the formula  $(\text{NH}_4)_3\text{PO}_4$ .

answer ..... [1]

(b) Chloe finds the pH of a solution of a fertiliser using a pH meter.

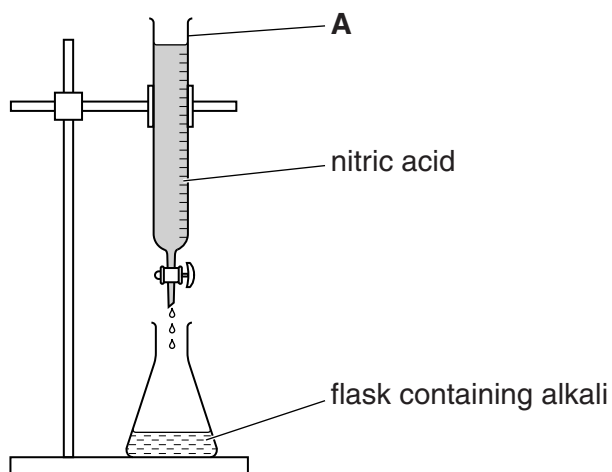
Write about **another** way she can find the pH of this solution.

.....  
 .....  
 ..... [2]



(c) Chloe makes some potassium nitrate by neutralising an alkali with nitric acid.

Look at the diagram. It shows the apparatus she uses.



(i) Write down the name of apparatus **A**.

..... [1]

(ii) Write down the **name** of the **alkali** Chloe uses to make potassium nitrate.

..... [1]

[Total: 6]

7 Copper wire is used in electrical circuits.

Solder is an alloy used to join electrical wires together.

A hot soldering iron is used to melt the solder.

Look at the table.

It gives some information about solder.

|        | <b>melting point in °C</b> | <b>density in g/cm<sup>3</sup></b> | <b>relative strength</b> | <b>electrical conductivity</b> | <b>hardness</b> |
|--------|----------------------------|------------------------------------|--------------------------|--------------------------------|-----------------|
| solder | 183                        | 10.3                               | strong                   | conducts well                  | soft            |

Write about the properties that make solder suitable for joining electrical wires.

Use the information in the table.

.....

.....

..... [2]

[Total: 2]

8 Look at the photograph of an erupting volcano.



(a) Lava erupts from the volcano.

Some of the lava is thrown up into the air and falls into the sea.

The lava cools to form solid rock made of crystals.

Suggest what size the crystals in the rock will be.

Explain your answer.

.....  
..... [1]

(b) It can be dangerous to live near an active volcano.

Some people choose to live near volcanoes.

Suggest why.

.....  
..... [1]

(c) Many theories have been put forward to explain the structure of the Earth's surface.

Put a tick (✓) in the box next to the name of a theory that explains the structure of the Earth's surface.

- reacting particle model
- electrolysis
- neutralisation
- plate tectonics

[1]

[Total: 3]

Turn over



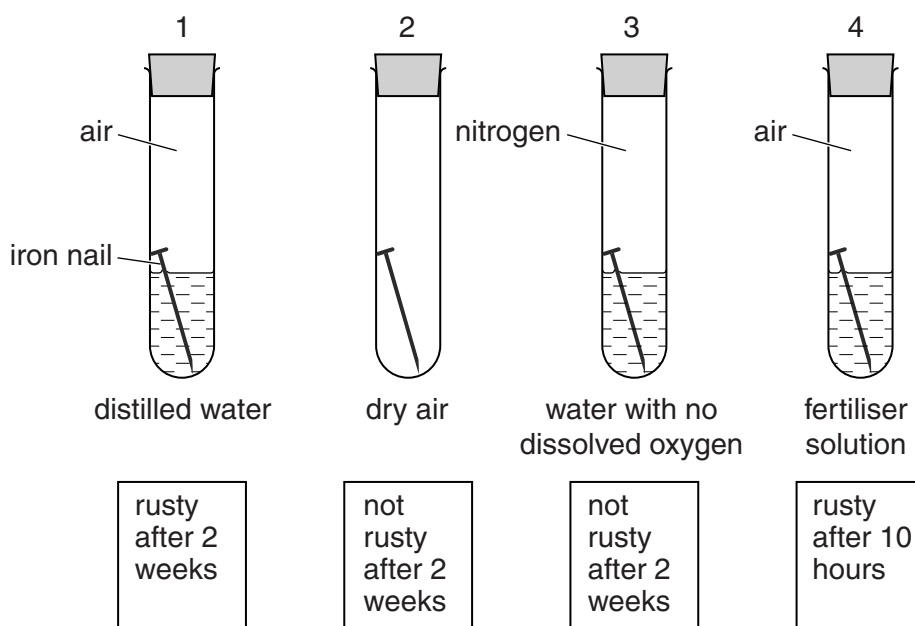
**Question 10 begins on page 14.**

**PLEASE DO NOT WRITE ON THIS PAGE**

10 Charlotte investigates the rusting of iron.

Look at the diagram.

It shows the apparatus she uses.



(a) (i) Which substance in Charlotte's investigation **speeds up** rusting the most?

..... [1]

(ii) Charlotte thinks that oxygen and water react with iron when it rusts.

How do you know she is right?

Use the diagram to help you.

.....  
 .....  
 ..... [2]

(b) Charlotte repeats her investigation using aluminium nails instead of iron.

The aluminium does not corrode.

Explain why.

.....  
 ..... [1]

(c) Drink cans are often made of aluminium.

People often put aluminium cans in recycling bins.

Write about the advantages of **recycling** aluminium.

.....

.....

..... [2]

[Total: 6]

## Section C – Module C3

11 Antacid tablets are used to stop indigestion.

Jennie and Gary investigate two different antacid tablets, **X** and **Y**.

Both tablets, **X** and **Y**, contain only calcium carbonate and magnesium hydroxide.

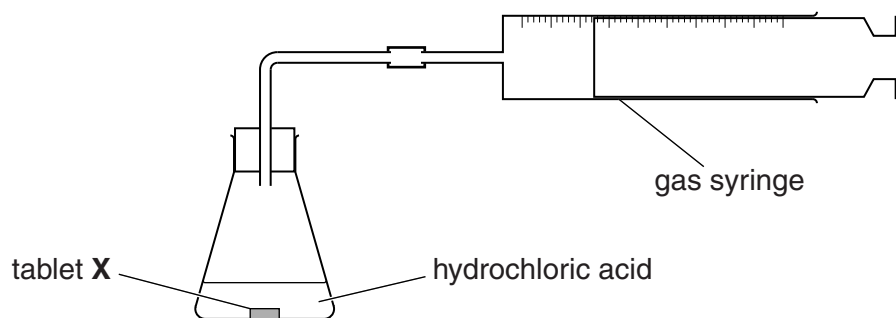
Calcium carbonate reacts with hydrochloric acid.

Calcium chloride, water and carbon dioxide are made.

(a) Write a **word equation** for this reaction.

.....  
 ..... [1]

(b) Look at the diagram. It shows the apparatus they use.



Jennie and Gary react tablet **X** with 100 cm<sup>3</sup> of hydrochloric acid.

They measure the volume of gas made during the first five minutes.

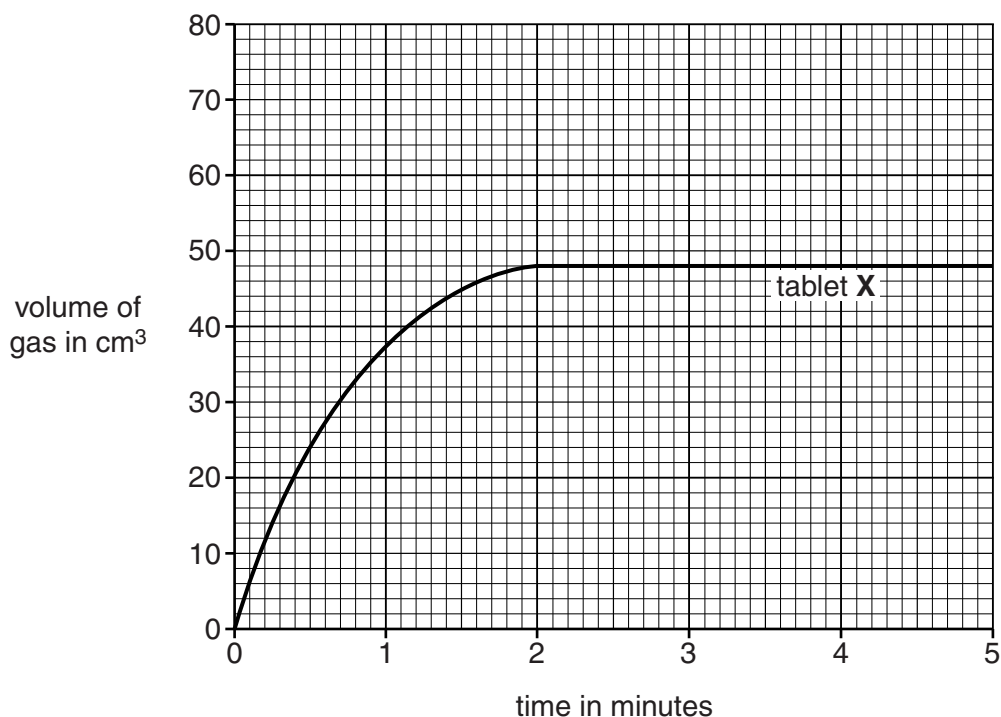
They do a second experiment using tablet **Y** and 100 cm<sup>3</sup> of hydrochloric acid.

Look at the table. It shows their results.

| time in minutes | total volume of gas in cm <sup>3</sup> |          |
|-----------------|--|----------|
|                 | tablet X                               | tablet Y |
| 0               | 0                                      | 0        |
| 1               | 38                                     | 32       |
| 2               | 48                                     | 54       |
| 3               | 48                                     | 67       |
| 4               | 48                                     | 72       |
| 5               | 48                                     | 72       |



Look at the graph. It shows the results for tablet X.



(i) What is the volume of gas made by the end of the experiment?

answer ..... cm<sup>3</sup> [1]

(ii) Why does the reaction stop?

..... [1]

(iii) Plot the results for tablet Y on the graph.

Draw the best curve through the points. [2]

(c) Tablet X contains less calcium carbonate than tablet Y.

How do the results show this?

.....  
 ..... [1]

(d) The rate of reaction between calcium carbonate and hydrochloric acid can be sped up.

One method is by using a more concentrated solution of hydrochloric acid.

Write down and explain, using the reacting particle model, two **other** ways that the reaction could be **sped up**.

.....

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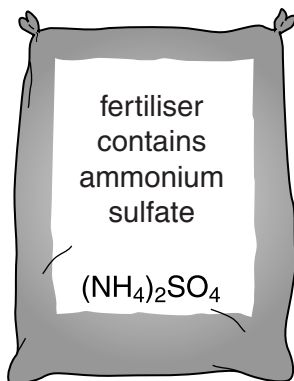
.....

..... [4]

[Total: 10]

12 Fertilisers and medicines are useful chemicals.

Ammonium sulfate is used as a fertiliser.



Ammonium sulfate is made by reacting ammonia with dilute sulfuric acid.

The ammonia needed for this reaction is made in a **continuous** process.

This is different to the **batch** process used to make most medicines.

- (a) (i) A continuous process is used to make ammonia but a batch process is used to make most medicines.

Explain why.

.....  
 .....  
 ..... [2]

- (ii) How do scientists check that medicines are pure?

Choose from this list.

**chromatography**

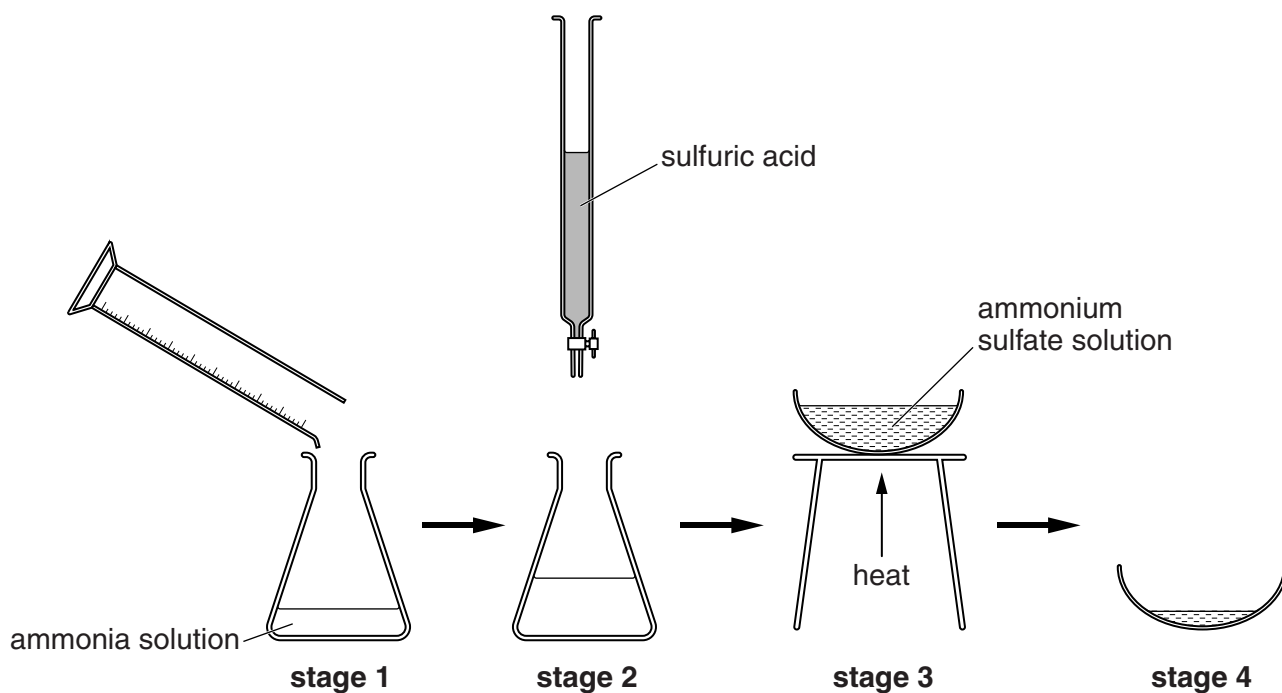
**electrolysis**

**neutralisation**

answer ..... [1]

(b) Alex makes some ammonium sulfate in a laboratory.

Look at the diagrams. They show the method he uses.



(i) Alex predicts he should make 8.0g of ammonium sulfate.

He actually makes 6.0g.

Show, by calculation, that his **percentage yield** of ammonium sulfate is 75%.

.....  
 .....  
 ..... [2]

(ii) Suggest why he did not get a 100% yield.

.....  
 ..... [1]

(c) Alex decides to make another fertiliser called sodium nitrate,  $\text{NaNO}_3$ .

He reacts sodium hydroxide,  $\text{NaOH}$ , with nitric acid,  $\text{HNO}_3$ .

Sodium nitrate and water are made.

(i) Write a **balanced symbol** equation for this reaction.

..... [1]

(ii) Alex reacts 4.0g of sodium hydroxide with 6.3g of nitric acid.

He makes sodium nitrate and 1.8g of water.

Use the principle of conservation of mass to calculate the mass of sodium nitrate that Alex made.

.....  
.....

mass of sodium nitrate ..... g [2]

[Total: 9]

13 Stephanie is investigating some liquid fuels.

Stephanie investigates the energy given out by four different fuels.

She burns 1.5g of fuel each time.

Look at her table of results.

| fuel     | starting temperature of water in °C | final temperature of water in °C |
|----------|-------------------------------------|----------------------------------|
| paraffin | 20                                  | 45                               |
| petrol   | 20                                  | 40                               |
| ethanol  | 18                                  | 45                               |
| propanol | 15                                  | 45                               |

Describe, using a diagram, the experiment Stephanie did to obtain these results.

Use her results to decide which fuel gives out the most energy. Explain your choice.



*The quality of written communication will be assessed in your answer to this question.*

.....

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.....

.....

.....

.....

..... [6]

[Total: 6]

END OF QUESTION PAPER

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