OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

B741/01

GATEWAY SCIENCE
CHEMISTRY B

Chemistry modules C1, C2, C3 (Foundation Tier)

FRIDAY 6 JUNE 2014: Afternoon

DURATION: 1 hour 15 minutes plus your additional time allowance

MODIFIED ENLARGED

Candidate forename		Candidate surname	

Centre number						Candidate number				

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

OCR SUPPLIED MATERIALS:

Periodic table

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (NF/JG) 3959037124 95403/1

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the boxes on the first page. 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).

INFORMATION FOR CANDIDATES

The quality of written communication is assessed in questions marked with a pencil ().

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.

Any blank pages are indicated.

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Answer ALL the questions.

SECTION A – Module C1

1 Stowmarket Synthetics make perfumes.

They make and test four new perfumes.

(a) Perfumes must be tested before they are PERMITTED to be used.

Write about TWO reasons why.

_____

_____

_____

_____ **[2]**

(b) Look at some of the properties of the four new perfumes.

Perfume	Boiling point in °C	Solubility in water (0 = insoluble and 10 = very soluble)
G	130	10
I	340	0
J	40	0
K	50	5

(i) Which perfume has the best set of properties?

_____

Write down TWO reasons for your choice of perfume.

_____

_____

_____

_____ **[2]**

(ii) Richard works for Stowmarket Synthetics.

He thinks there is not enough information in the table to decide which perfume should be manufactured.

He thinks the COST of making the perfume is important.

Write down one OTHER piece of information that is important.

_____ **[1]**

[TOTAL: 5]

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QUESTION 2 BEGINS ON PAGE 8

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2 Coal is a fossil fuel. It is a non-renewable fuel.

(a) What is meant by a NON-RENEWABLE fuel?

_____

_____ **[1]**

(b) Some power stations burn coal.

Coal often contains SULFUR as an impurity.

The sulfur reacts with oxygen to make sulfur dioxide.

Write down the WORD EQUATION for this reaction.

_____ **[1]**

(c) Sulfur dioxide causes acid rain.

Write about TWO environmental problems caused by acid rain.

_____

_____

_____

_____ **[2]**

(d) Nitrogen dioxide is also made in a power station.

To stop the nitrogen dioxide going into the atmosphere it is reacted with water.

Nitrogen dioxide reacts with water to make two acids.

Copy out and BALANCE the SYMBOL EQUATION for this reaction.

$$NO_2 + H_2O \rightarrow HNO_2 + HNO_3$$

_____ **[1]**

(e) Karen burns some coal.

She wants to find out if any carbon dioxide is made.

Describe the chemical test she uses.

Name of chemical _____

Effect of carbon dioxide on the chemical _____

_____

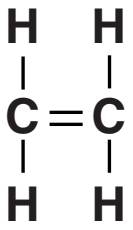
[2]

[TOTAL: 7]

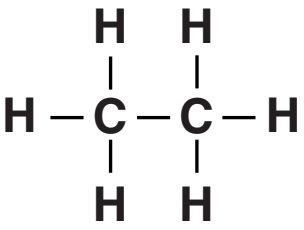
3 This question is about compounds containing carbon.

Look at the displayed formulas of some compounds.

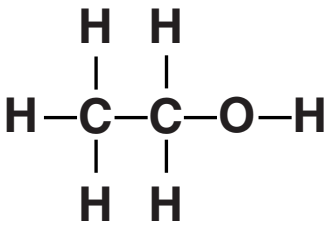
compound A



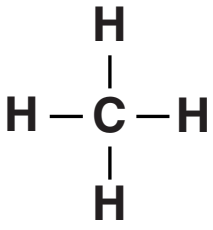
compound B



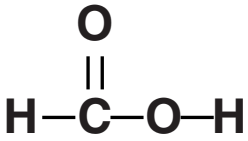
compound C



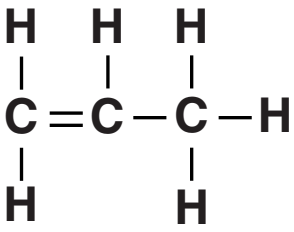
compound D



compound E



compound F



(a) Two compounds have molecules that contain only FIVE atoms.

Which two?

_____ and _____ [1]

(b) Two compounds decolourise bromine water.

Which two?

_____ and _____ [1]

(c) Explain why compound B is a hydrocarbon but compound C is not a hydrocarbon.

_____

_____

_____

_____ **[3]**

[TOTAL: 5]

4 Anna buys sandwiches from a shop.

The sandwiches are in plastic packaging.

The plastic is made from a polymer called poly(propene).

Two properties of poly(propene) are:

it is non-biodegradable

it is insoluble in water.

(a) Explain why these two properties make poly(propene) suitable for making the packaging and suggest, with a reason, one OTHER suitable property needed by poly(propene). [6]

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

_____

_____

(b) Anna finishes her sandwiches.

She throws the packaging into a dustbin.

Write about TWO ways the waste plastic from the dustbin is disposed of.

_____

_____

_____

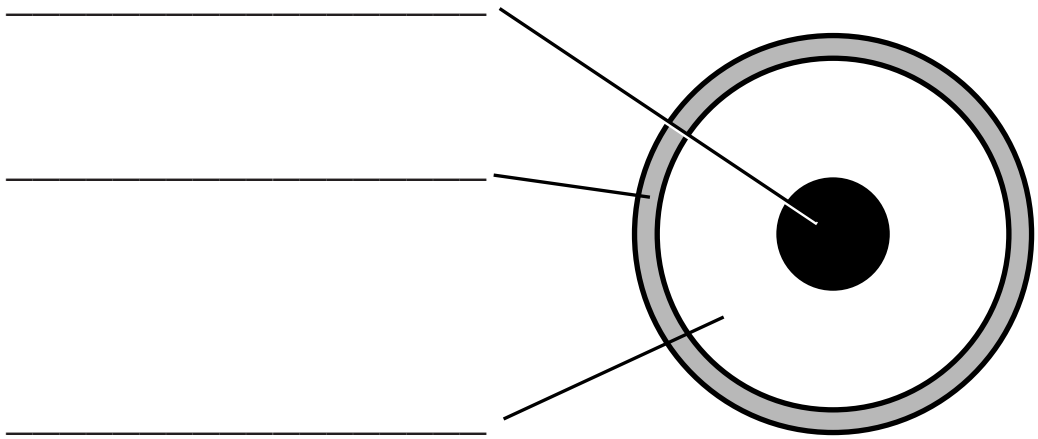
_____ **[2]**

[TOTAL: 8]

SECTION B – Module C2

5 This question is about the structure of the Earth.

(a) Label the diagram of the Earth.



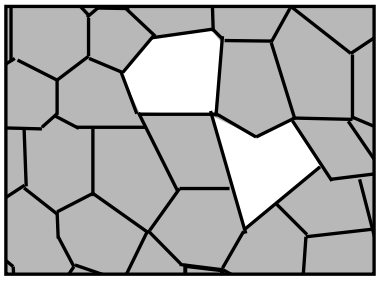
(not to scale)

[2]

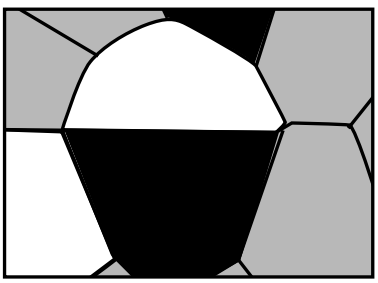
(b) Igneous rocks are made when molten rock cools.

Look at the diagrams of two different types of igneous rock, A and B.

rock A



rock B



One rock was made when molten rock cooled SLOWLY.

Which rock? _____

Explain your answer.

_____

_____ **[1]**

(c) Bornite is a mineral extracted from the Earth.

Bornite has the chemical formula Cu_5FeS_4.

How many different ELEMENTS are in Cu_5FeS_4?

_____ **[1]**

[TOTAL: 4]

6 This question is about fertilisers.

(a) Fertilisers are chemicals that provide plants with ESSENTIAL ELEMENTS.

Sodium nitrate, $NaNO_3$, is a fertiliser.

Write down the NAME of the essential element for plant growth found in sodium nitrate.

_____ **[1]**

(b) Ammonium sulfate is another fertiliser.

Ammonium sulfate is made by reacting an acid with an alkali.

Write down the name of the ACID used to make ammonium sulfate.

_____ **[1]**

(c) Fertilisers can be BENEFICIAL but may also cause PROBLEMS.

Write about the benefits and problems of using fertilisers.

_____

_____

_____

_____ **[2]**

(d) Nitric acid is used to make fertilisers.

Ammonia and oxygen are used to manufacture nitric acid.

Water is the other product.

Write the WORD EQUATION for this process and describe COSTS of making nitric acid.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

[TOTAL: 10]

7 Many different materials are needed to build a car.

(a) (i) Suggest a property of glass that makes it useful for making a car windscreen.

_____ **[1]**

(ii) Some car bodies are now built from aluminium instead of steel.

One advantage of using aluminium is that it is less dense than steel.

Write down ONE OTHER ADVANTAGE of building car bodies from aluminium instead of steel.

_____ **[1]**

(b) Look at the table.

It shows information about some of the materials used to build a car.

Material	Density in g/cm^3	Electrical conductivity	Flexibility
aluminium	2.7	very high	low
glass	2.5	very low	low
PVC	1.4	very low	high
steel	7.8	high	low

Explain why PVC is used for covering the electrical wires in a car.

Use the information from the table.

_____

_____

_____ **[2]**

[TOTAL: 4]

8 Sodium chloride (salt) is an important raw material in the chemical industry.

(a) Sodium, Na, reacts with chlorine, Cl_2.

Sodium chloride, NaCl, is made.

Write a BALANCED SYMBOL equation for this reaction.

_____ **[2]**

(b) The electrolysis of concentrated sodium chloride solution (brine) makes:

hydrogen

chlorine

sodium hydroxide.

(i) Write down one USE of CHLORINE.

_____ **[1]**

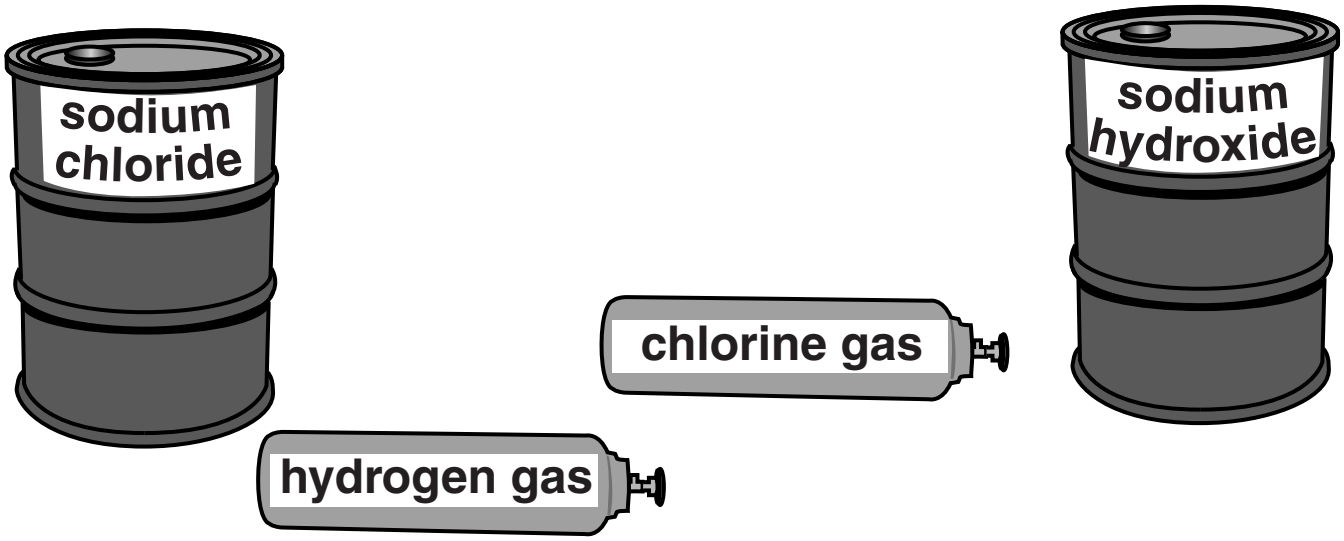
(ii) Describe the chemical test for chlorine and write down what you would see.

_____

_____

_____ **[2]**

(c) Trevor needs to store these four chemicals.



Trevor investigates different metals, A, B, C and D.

Look at the results of his investigation.

	Rate of corrosion of metal by chemical (1 = very slow, 3 = fast)			
	Metal A	Metal B	Metal C	Metal D
chlorine gas	1	2	3	3
hydrogen gas	1	1	1	1
sodium chloride	3	1	1	2
sodium hydroxide	1	3	1	2

Trevor concludes that he CANNOT use the same metal to make the container for each chemical.

Do you think that Trevor has made the correct conclusion? _____

Explain your answer using the evidence in the table.

_____

_____

_____ **[2]**

[TOTAL: 7]

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SECTION C BEGINS ON PAGE 24

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SECTION C – Module C3

9 This question is about carbon.

Look at the structures of the three allotropes of carbon on the opposite page.

(a) What is the name of allotrope Z?

_____ **[1]**

(b) One property of graphite is that it is slippery.

Write about two OTHER properties of graphite.

_____

_____

_____ **[2]**

(c) Fullerenes can be used in new drug delivery systems for patients who are ill in hospitals.

Explain why fullerenes can be used.

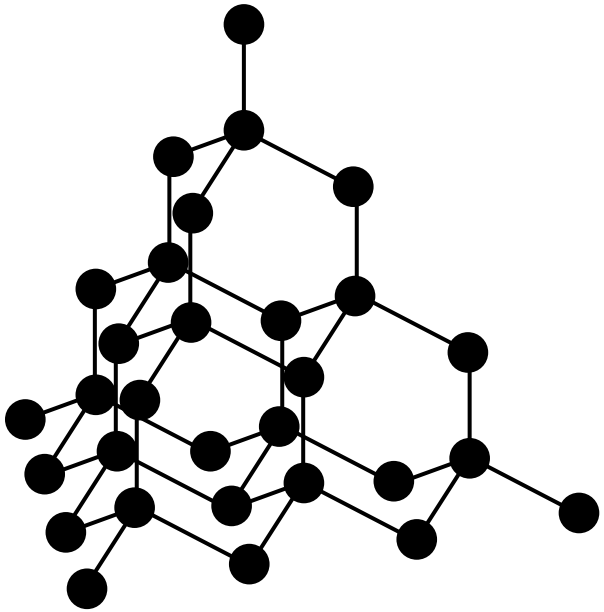
_____

_____ **[1]**

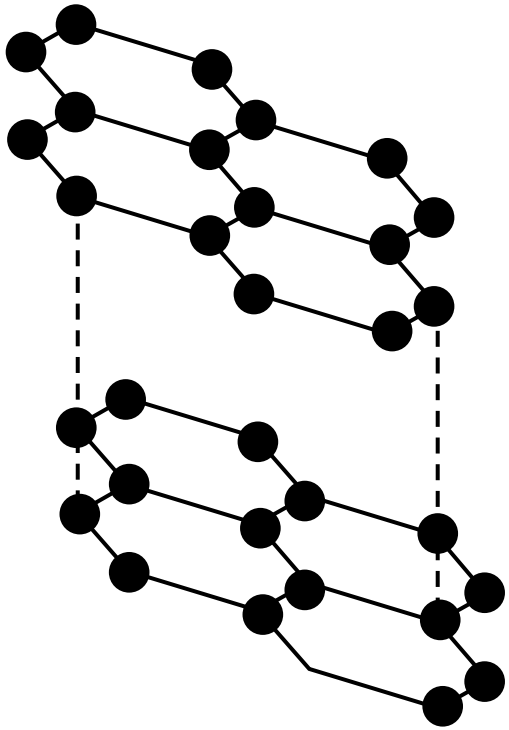
[TOTAL: 4]

● = carbon atom

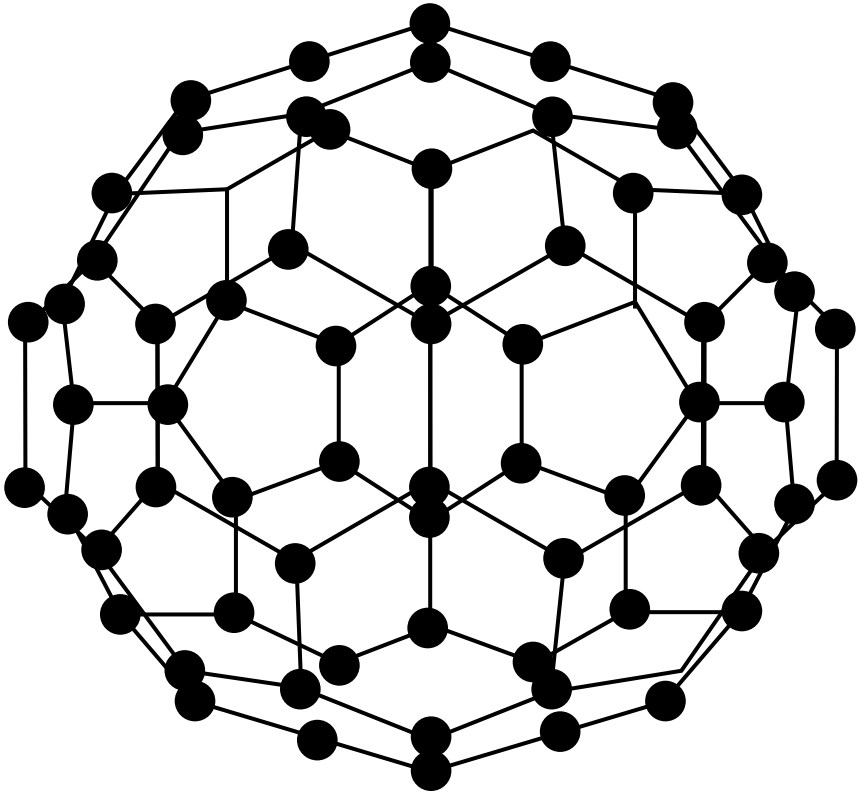
allotrope Z



graphite



Buckminster fullerene



10 Rachel investigates the reaction between magnesium and hydrochloric acid.

She adds a piece of magnesium ribbon to hydrochloric acid in a beaker.

Rachel measures the time it takes for all the magnesium ribbon to react.

This is the reaction time.

She does four different experiments.

Rachel's prediction is, 'The larger the volume of acid, the faster the reaction.'

Look at Rachel's results.

Experiment number	Mass of magnesium used in g	Volume of acid used in cm^3	Concentration of acid in mol/dm^3	Reaction time in seconds
1	0.05	25	1.0	30
2	0.10	25	1.0	30
3	0.05	50	1.0	30
4	0.05	50	2.0	15

(a) Explain if Rachel's results support her prediction. Use the reacting particle model to explain the difference between the reaction time in experiments 3 and 4.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

(b) Rachel repeats experiment 1. This time she uses acid at a HIGHER temperature.

Predict, with a reason, the reaction time for this new experiment.

Predicted reaction time: _____ seconds

Reason _____

_____

_____ **[2]**

[TOTAL: 8]

11 Ethanoic acid, $C_2H_4O_2$, can be made by several different processes.

Three of these are process R, process S and process T.

(a) In process R, methanol reacts with carbon monoxide.

$$CH_4O + CO \rightarrow C_2H_4O_2$$

(i) Process R has 100% atom economy.

What does 100% atom economy mean?

_____

_____

_____ **[1]**

(ii) A factory uses 16 tonnes of methanol to make 30 tonnes of ethanoic acid.

What mass of carbon monoxide is needed?

_____

mass of carbon monoxide =

_____ **tonnes** **[1]**

(b) In process S, ethanol is oxidised using oxygen.

$C_2H_6O + O_2 \rightarrow C_2H_4O_2 + H_2O$

Mike knows that 46 tonnes of ethanol should make 60 tonnes of ethanoic acid.

A factory uses 4.6 tonnes of ethanol.

Predict the mass of ethanoic acid that should be made.

_____

_____

predicted mass of ethanoic acid =

_____ **tonnes** **[1]**

(c) Process R is a continuous process and process S is a batch process.

Explain the difference between a continuous process and a batch process.

_____

_____

_____

_____ **[2]**

(d) In process T, hydrocarbons are oxidised to make ethanoic acid.

Mike predicts that 5.2 tonnes of ethanoic acid should be made.

The factory actually makes 2.4 tonnes of ethanoic acid.

Calculate the percentage yield of ethanoic acid.

Write your answer to TWO significant figures.

_____

_____

_____

percentage yield = _____ % [2]

[TOTAL: 7]

12 Paraffin is a liquid fuel obtained from crude oil.

Heat energy is released when paraffin burns.

(a) What is the name of a reaction that releases heat energy?

Put a (ring) around the correct answer from the list below.

catalysis

endothermic

evaporation

exothermic

filtration

[1]

(b) Jenna investigates the amount of energy released when paraffin is burnt.

She does five experiments.

She uses the same mass of water in each experiment.

She uses a different mass of paraffin for each experiment.

Look at her results.

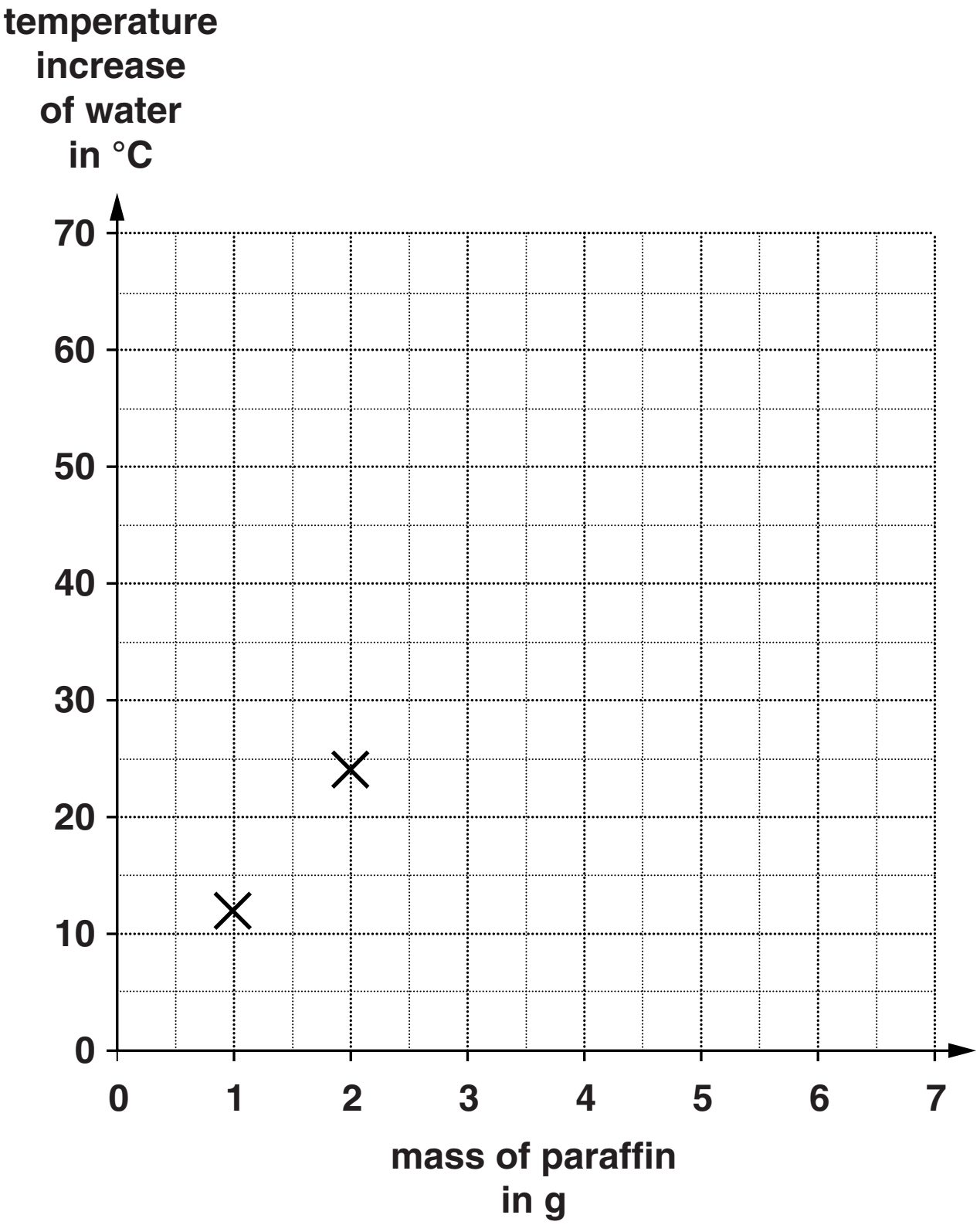
Mass of paraffin burnt in grams	Temperature increase of water in °C
1.0	12
2.0	24
3.0	36
4.0	48
5.0	60

(i) Jenna uses a spirit burner with paraffin in the investigation.

Draw a fully LABELLED diagram of the apparatus she must use to collect these results. [3]

(ii) Plot Jenna's results on the graph opposite. Two points have been done for you.

Use the graph to predict what mass of paraffin would give a temperature rise of 30 °C.



mass of paraffin = _____ g
[2]

[TOTAL: 6]

END OF QUESTION PAPER