OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B642/01

CHEMISTRY B

Unit 2 Modules C4 C5 C6
(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)

Wednesday 17 June 2009
Morning

Duration: 1 hour

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

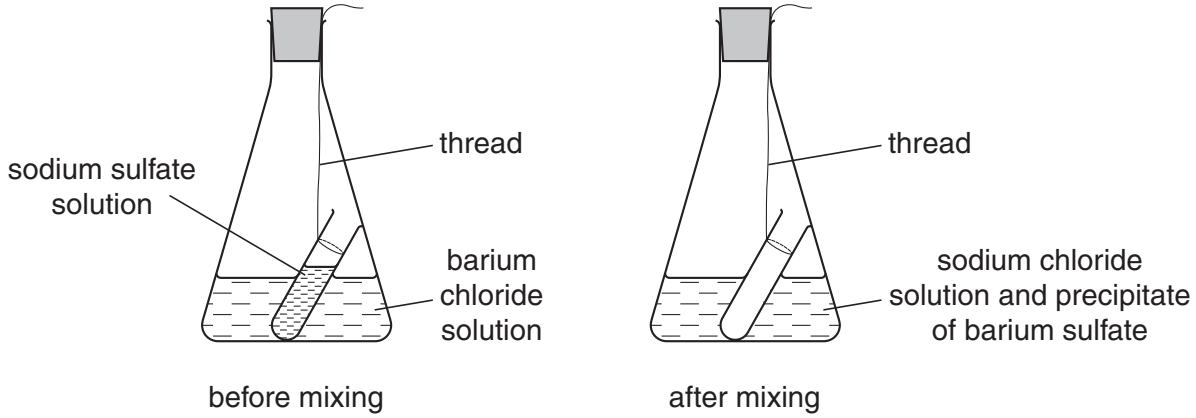
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **60**.
- The Periodic Table is printed on the back page.
- This document consists of **24** pages. Any blank pages are indicated.

Answer **all** the questions.

Section A – Module C4

1 Nick and Sloane investigate precipitation reactions.

Look at the apparatus they use.



They record the total mass of the flask, test-tube and contents.

They then take the flask off the balance and tip the flask upside down.

Nick and Sloane are careful not to let any liquid leak out of the flask.

The solutions mix and react. A precipitate is made.

They put the flask back on the balance and record the mass again.

(a) What happens to the mass during the reaction?

Choose from:

decreases

increases

stays the same

answer ..... **[1]**

(b) Barium chloride solution reacts with sodium sulfate solution.

Look at the word equation for this reaction.

barium chloride + sodium sulfate $\longrightarrow$ barium sulfate + sodium chloride

(i) Write down the name of one of the **products** of the reaction.

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

(ii) A precipitate is made.

What is the **colour** of the precipitate?

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

(c) Look at the table.

It shows the formula of each compound in the word equation.

compound	formula
barium chloride	$BaCl_2$
barium sulfate	$BaSO_4$
sodium chloride	$NaCl$
sodium sulfate	Na_2SO_4

(i) **Two** compounds in the table contain three elements.

Which two?

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

(ii) The relative formula mass (M_r) of sodium chloride, $NaCl$, is 58.5.

What is the relative formula mass of sodium sulfate, Na_2SO_4?

The relative atomic mass (A_r) of O is 16, of Na is 23, of S is 32 and of Cl is 35.5.

.....

.....

.....

.....

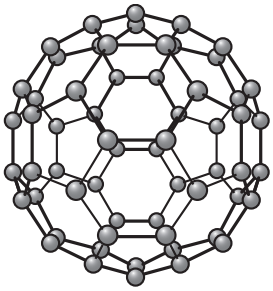
relative formula mass ..... **[1]**

[Total: 5]

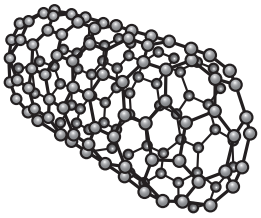
2 Buckminster fullerene and nanotubes are recently discovered substances.

Look at the diagrams.

They show the structures of Buckminster fullerene and of a nanotube.



Buckminster fullerene



a nanotube

(a) Buckminster fullerene has the molecular formula C_{60}.

It is a chemical element.

Write down the **name** of this element.

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

(b) Put a tick (✓) in the box next to the correct description of Buckminster fullerene.

black solid	☐
blue liquid	☐
colourless gas	☐
colourless and clear solid	☐

[1]

(c) Nanotubes can be made from Buckminster fullerene.

What do scientists do to Buckminster fullerene molecules to make nanotubes?

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

(d) Nanotubes are very strong and conduct electricity.

One use for nanotubes is as industrial catalysts.

Describe **one other** use of nanotubes.

.....

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

[Total: 4]

3 Dirty clothes can be cleaned using a solvent.

Look at the table.

It shows the types of stain that different solvents will dissolve.

	type of stain			
solvent	**food**	**grease**	**paint**	**wax**
A	✗	✓	✗	✓
B	✗	✗	✗	✗
C	✓	✗	✗	✗
D	✓	✓	✓	✓
E	✓	✓	✗	✓

A tick (✓) means the solvent will dissolve the stain.

A cross (✗) means the solvent will not dissolve the stain.

(a) Which solvent did not dissolve any of the stains?

Choose from **A**, **B**, **C**, **D** or **E**.

answer ..... **[1]**

(b) Which solvent will dissolve paint?

Choose from **A**, **B**, **C**, **D** or **E**.

answer ..... **[1]**

(c) Which solvent would be the most suitable for removing stains from clothes?

Choose from **A**, **B**, **C**, **D** or **E**.

answer ..... **[1]**

(d) One way of using a solvent to clean clothes is called dry cleaning.

Suggest why it is called **dry** cleaning.

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

[Total: 4]

4 A continuous process is used to make ammonia.

A batch process is used to make speciality chemicals such as medicines.

(a) (i) What is a **continuous** process?

.....

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

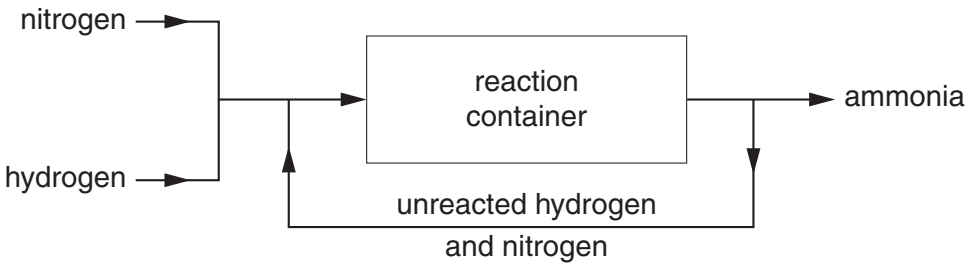
(ii) What is a **batch** process?

.....

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

(b) Ammonia is made in the Haber process.

Look at the diagram. It shows a flowchart of the Haber process.



Write about how ammonia is made in the Haber process.

Include in your answer

- the word equation for the reaction taking place in the Haber process
- the conditions used in the Haber process.

.....

.....

.....

.....

..... **[3]**

(c) Ammonia is used to make fertilisers such as ammonium phosphate.

(i) Write down the name of one **other** fertiliser made from ammonia.

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

(ii) Ammonium phosphate is made by reacting ammonia with an acid.

Which acid?

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

[Total: 7]

Section B – Module C5

5 Josh looks at this label on his packet of cornflakes.

It shows some information about **100 g** of cornflakes.

nutrient	mass of ingredient in milligrams	percentage of recommended daily allowance (RDA)
folic acid	0.2	85
iron	7.9	55
niacin	13.2	75
vitamin B1	0.7	50

(a) Which nutrient was in the **greatest** amount in 100 g of cornflakes?

Choose from the table.

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

(b) What is the mass of iron in **300 g** of cornflakes?

.....

.....

mass of iron = ... mg **[1]**

(c) What mass of cornflakes will contain the RDA for vitamin B1?

.....

.....

mass of cornflakes = ... g **[1]**

[Total: 3]

6 Insoluble compounds can be prepared by using a precipitation reaction.

(a) Emma mixes potassium iodide solution and silver nitrate solution.

A precipitate of insoluble silver iodide is made.

What is the colour of the precipitate?

Choose from:

cream

yellow

white

answer ..... **[1]**

(b) Emma wants to prepare a pure, dry sample of lead iodide.

She mixes potassium iodide solution and lead nitrate solution in a beaker.

An insoluble precipitate of lead iodide is made.

Describe the next steps Emma must do to get a **pure, dry** sample of lead iodide.

A labelled diagram may help you answer this question.

.....

.....

.....

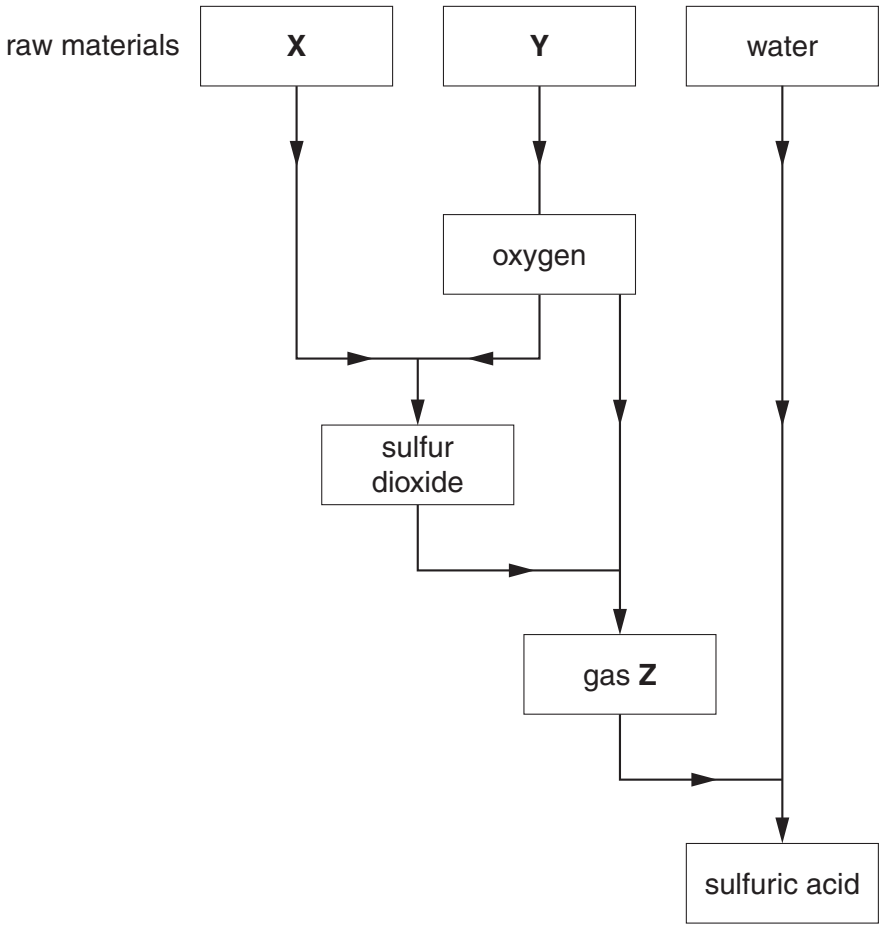
..... **[3]**

[Total: 4]

7 Sulfuric acid is made in the Contact Process.

Look at the flow chart.

It shows all the stages in the Contact Process.



(a) Three raw materials are needed to make sulfuric acid. Water is one of them.

What are the names of the **other** two?

Raw material **X** is …… and raw material **Y** is …… . **[2]**

(b) Look at the flow chart.

Sulfur dioxide and oxygen react to give gas **Z**.

$$\text{sulfur dioxide} + \text{oxygen} \rightleftharpoons \text{gas } \mathbf{Z}$$

(i) What does the symbol $\rightleftharpoons$ mean?

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

(ii) What is the name of gas **Z**?

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

[Total: 4]

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Question 8 starts on page 12.

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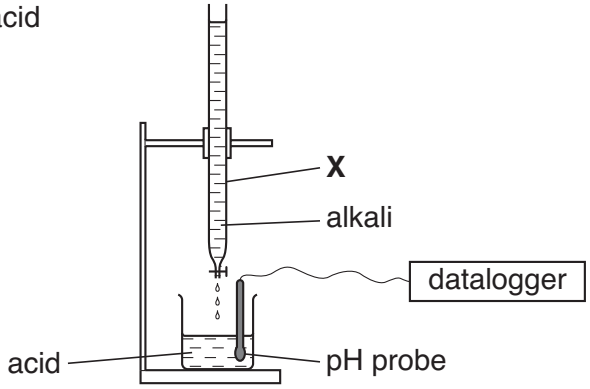
8 Tina investigates how the pH value changes as an acid is neutralised by an alkali.
Look at the apparatus she uses.

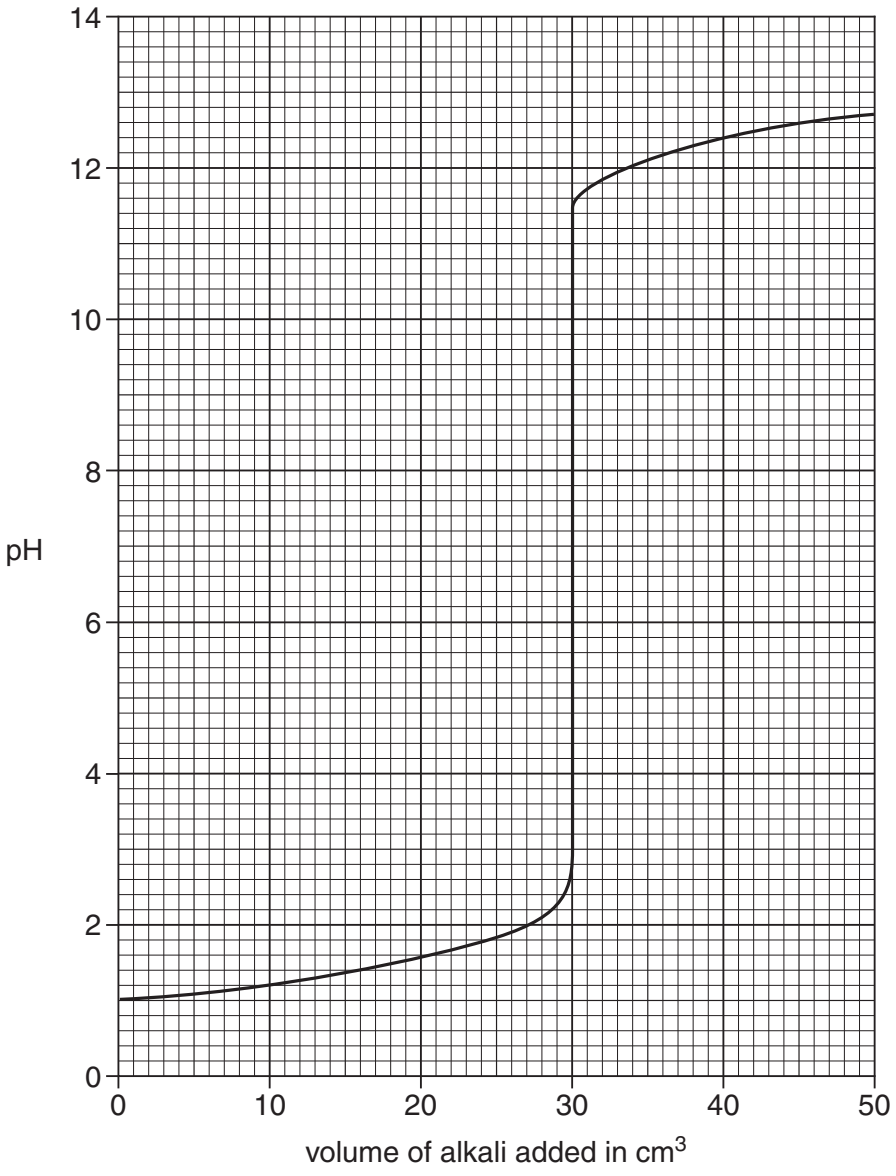


(a) What is the name of the apparatus labelled **X**?

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

(b) Sodium hydroxide solution is added slowly into the beaker of dilute sulfuric acid.
The pH probe is connected to a datalogger.

Look at the display from the datalogger.



(i) Describe how the pH value changes as more and more alkali is added.

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

(ii) What is the pH value when 15.0 cm^3 of sodium hydroxide has been added?

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

(iii) What volume of alkali is needed to exactly neutralise the sulfuric acid?

..... cm^3 **[1]**

(c) An indicator can be used to find the pH value of a solution.

Which indicator?

Choose from the list.

litmus

phenolphthalein

screened methyl orange

universal indicator

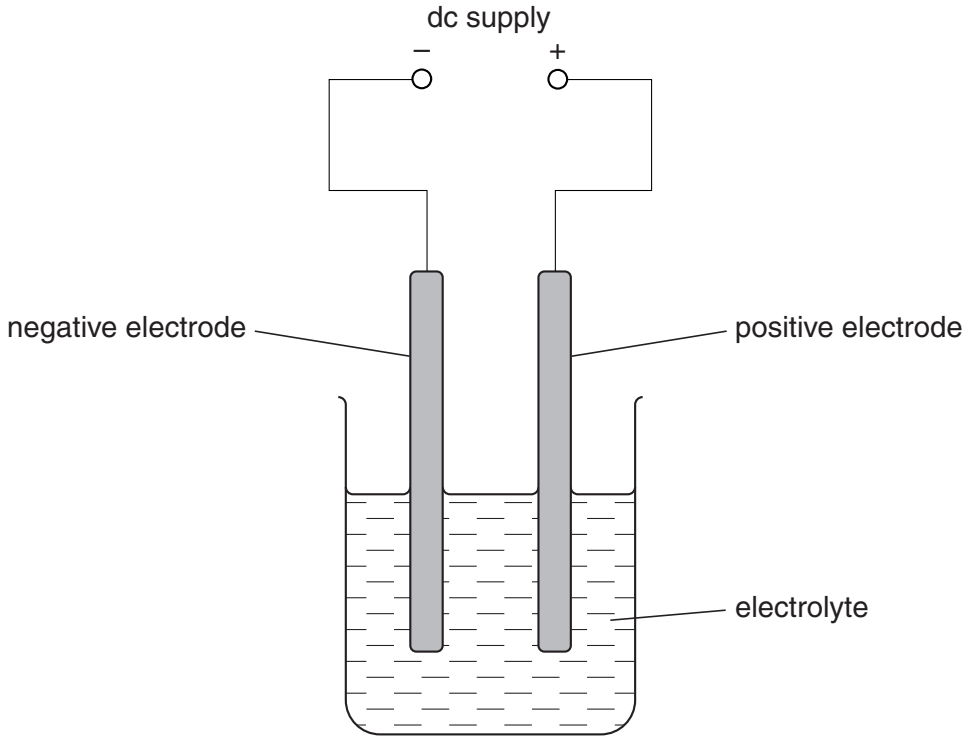
answer ..... **[1]**

[Total: 5]

9 This question is about electrolysis.

Look at the diagram.

It shows the apparatus that can be used to electrolyse solutions.



(a) Electrolysis is a type of chemical reaction.

What is meant by **electrolysis**?

.....

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

(b) Luke uses dilute hydrochloric acid as the electrolyte.

A gas is made at the negative electrode.

What is the name of this gas?

Choose from the list.

chlorine

hydrogen

hydrogen chloride

oxygen

answer ..... **[1]**

(c) Dilute ethanoic acid contains particles.

Look at the list of particles found in dilute ethanoic acid.

CH_3COOH

CH_3COO^-

H_2O

H^+

OH^-

(i) Write down the formula of one **ion** that is attracted to the positive electrode.

Choose from the list.

answer ..... **[1]**

(ii) Write down the formula of a **molecule**.

Choose from the list.

answer ..... **[1]**

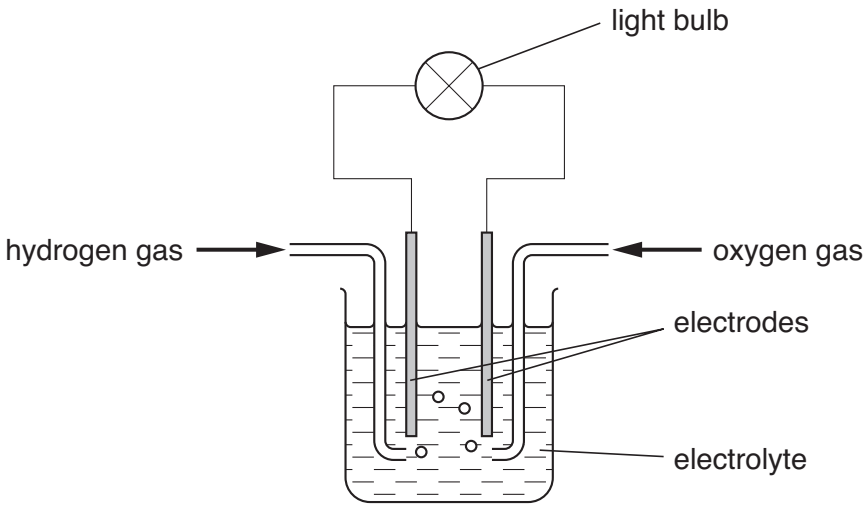
[Total: 4]

Section C – Module C6

10 This question is about fuel cells.

Look at the diagram.

It shows a fuel cell.



(a) Hydrogen and oxygen react in a fuel cell to release energy.

What is the name of this type of energy?

Choose from the list.

electrical

kinetic

nuclear

sound

answer ..... **[1]**

(b) Hydrogen reacts with oxygen to make water.

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

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

(c) John collects some hydrogen gas in a tube.

John tests the gas to show that it is hydrogen. How does he do this?

test .....

result ..... **[2]**

(d) Car makers may replace diesel or petrol engines with fuel cells.

Write down **two** reasons for doing this other than cost.

1 .....

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

[Total: 6]

11 This question is about calcium carbonate and hard water.

Look at the picture. The picture shows limescale in a kettle.

(a) Hard water causes limescale.

(i) What is hard water?

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

(ii) Limescale contains calcium carbonate, $CaCO_3$.

What is the total number of **atoms** in the formula $CaCO_3$?

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

(b) Limescale is removed by limescale removers.

Look at the list.

acids

alcohols

alkalis

bases

Use a word from the list to complete this sentence.

Most limescale removers are ..... . **[1]**

(c) Hard water is a problem in many areas of the U.K.

Describe **one** way in which hardness can be removed.

.....

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

[Total: 4]

12 This question is about reactions of metals.

This large statue is made from iron.

(a) The statue is going rusty.

Two substances are needed for iron to go rusty.

Write down the names of these two substances.

1 .....

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

(b) Covering iron in oil or grease stops iron rusting.

(i) Explain why.

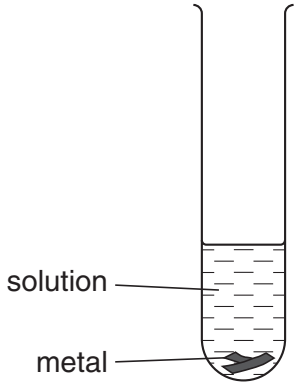
..... **[1]**

(ii) Write down **one** other method of stopping iron from rusting.

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

(c) John investigates the reactions of four metals, iron, magnesium, tin and zinc.

He puts pieces of each metal into different solutions.



The solutions are iron(II) sulfate, magnesium sulfate, tin(II) sulfate and zinc sulfate.

The table shows his results.

A tick (✓) means there is a reaction.

A cross (✗) means there is no reaction.

solution used	**metal added**			
	iron	**magnesium**	**tin**	**zinc**
iron(II) sulfate		✓	✗	✓
magnesium sulfate	✗		✗	✗
tin(II) sulfate	✓	✓		✓
zinc sulfate	✗	✓	✗	

Write down the order of reactivity of these four metals.

Use the table of results to help you.

most reactive .....

.....

.....

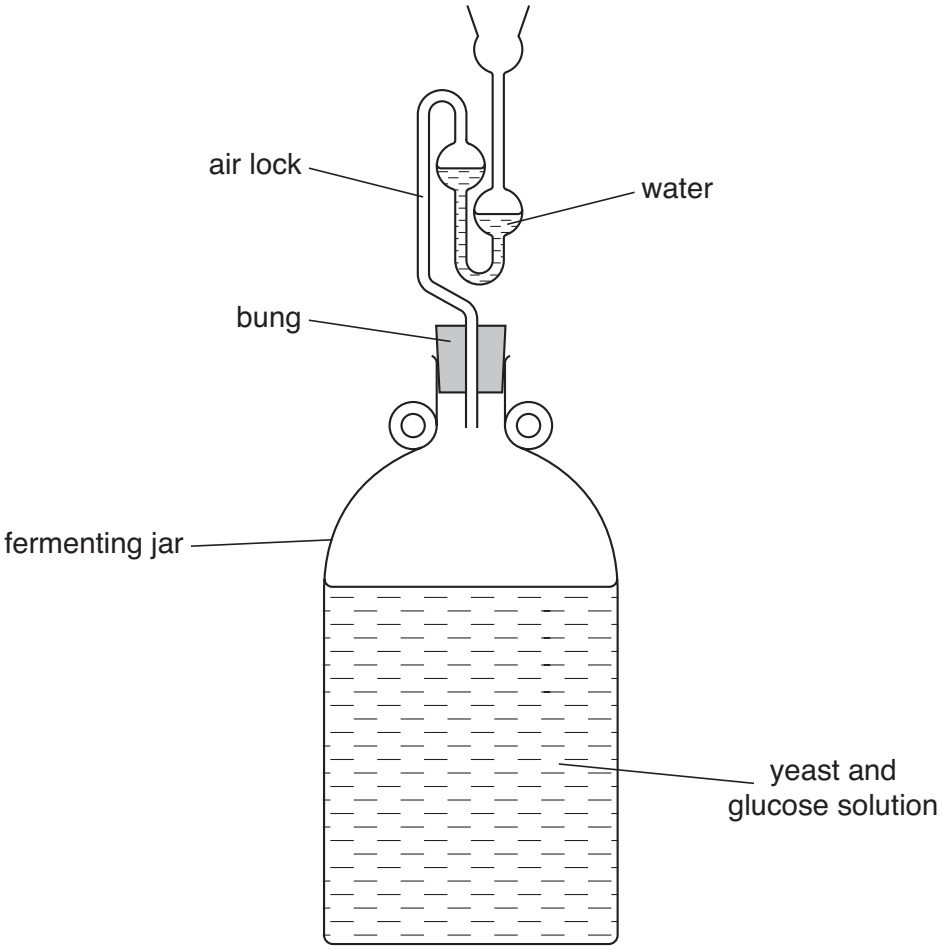
least reactive ..... **[1]**

[Total: 5]

13 This question is about ethanol.

(a) Look at the diagram.

It shows how ethanol can be made by fermentation in a school laboratory.



The fermenting jar contains a mixture of ethanol and water at the end of the process.

How can the ethanol be separated from the water?

Choose from the list.

distillation

electrolysis

filtration

saponification

answer ..... **[1]**

Turn over for the remainder of question 13

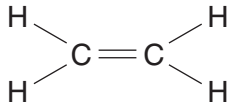
(b) Write about **two** different uses of ethanol.

.....

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

(c) The molecular formula of ethene is C_2H_4.

Look at the **displayed** formula of ethene.



The molecular formula of ethanol is C_2H_5OH.

Draw the **displayed** formula of ethanol.

[1]

(d) Ethanol, C_2H_5OH, can be made into ethene, C_2H_4.

$$\text{ethanol} \longrightarrow \text{ethene} + \text{water}$$

Write down the name given to this type of reaction.

Choose from the list.

dehydration

displacement

hydration

saturation

answer ..... **[1]**

[Total: 5]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.