

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

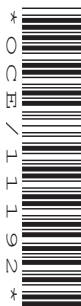
OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)

Wednesday 17 June 2009
Morning

Duration: 1 hour



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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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

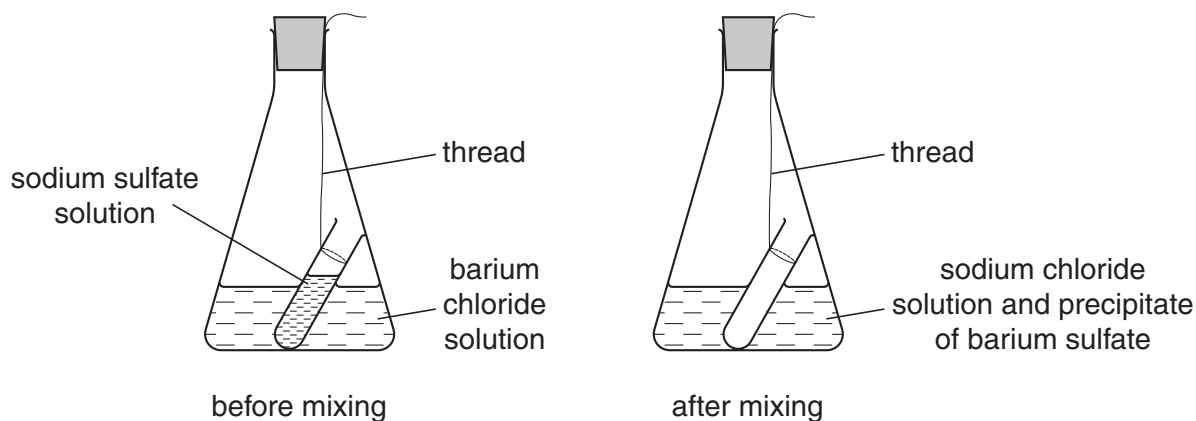
- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- The Periodic Table is printed on the back page.
- This document consists of **24** pages. Any blank pages are indicated.

2

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

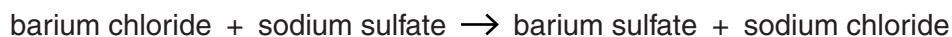
stays the same

answer [1]

3

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

Look at the word equation for this reaction.



- (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.

.....

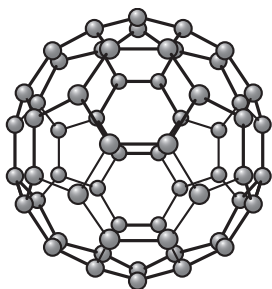
relative formula mass [1]

[Total: 5]

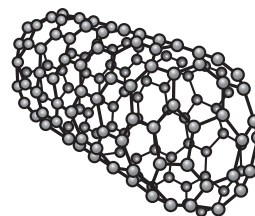
- 2 Buckminster fullerene and nanotubes are recently discovered substances.

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.

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

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

A cross (X) 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?

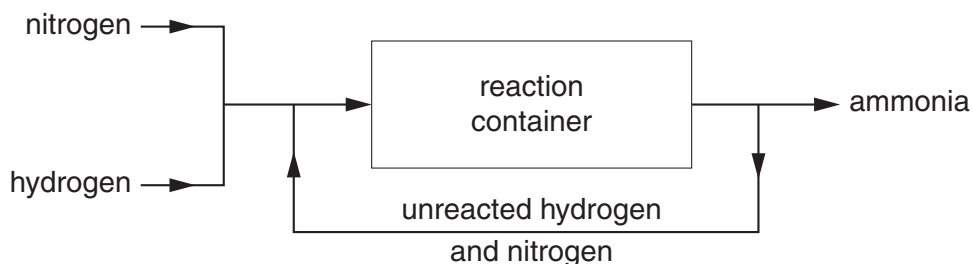
.....
 [1]

(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]

7

(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]

9

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.

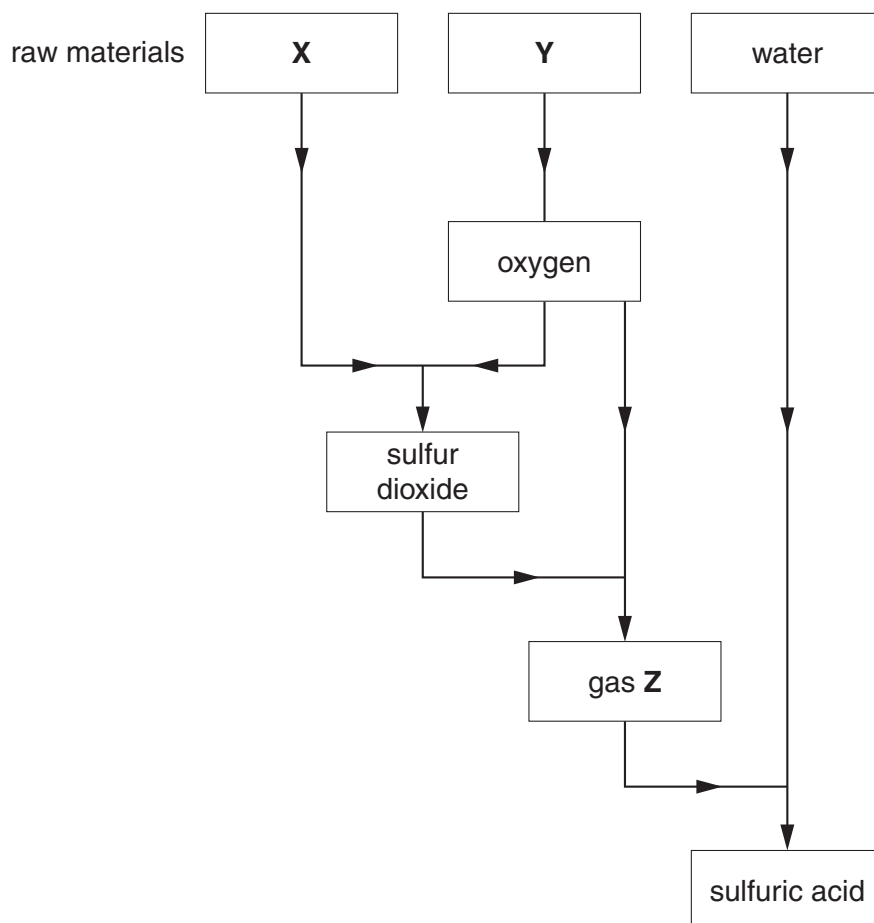
.....
.....
.....
..... [3]

[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**.



- (i)** What does the symbol \rightleftharpoons mean?

..... [1]

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

..... [1]

[Total: 4]

11

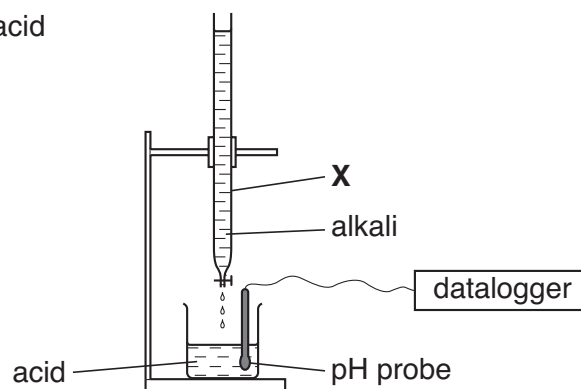
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Question 8 starts on page 12.

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12

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

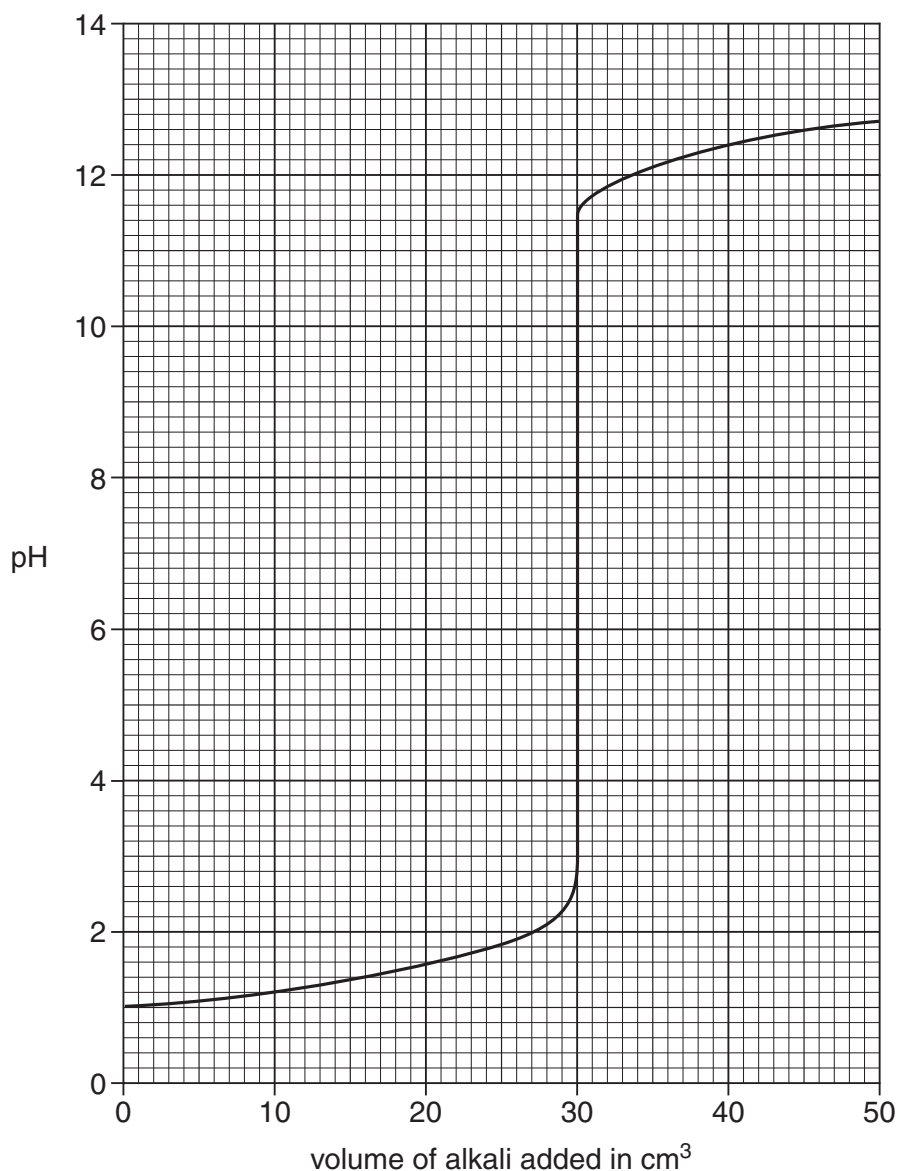


- (a) What is the name of the apparatus labelled X?

..... [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.



13

- (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

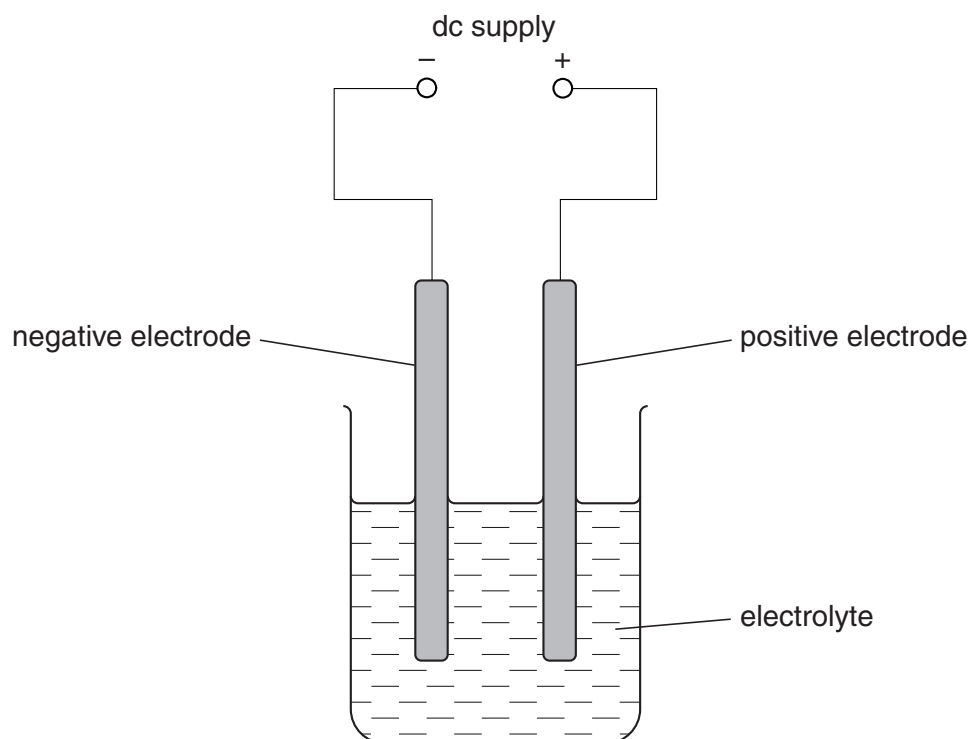
answer [1]

[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]

15

- (c) Dilute ethanoic acid contains particles.

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



- (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]

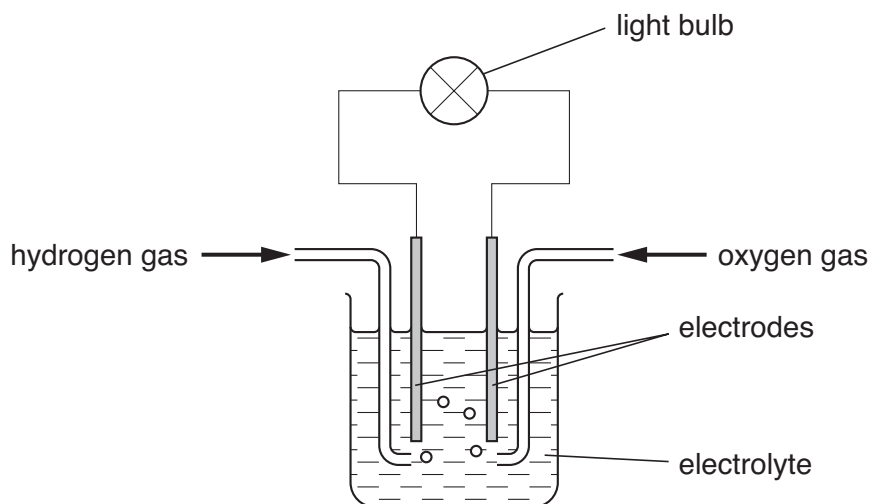
[Total: 4]

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]

17

- (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.

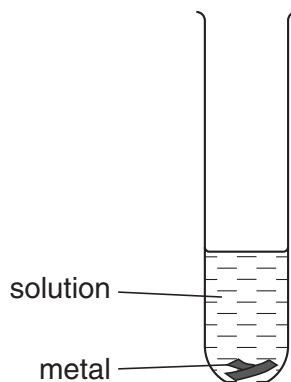
..... [1]

(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 (X) means there is no reaction.

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

Write down the order of reactivity of these four metals.

Use the table of results to help you.

most reactive

.....

.....

least reactive

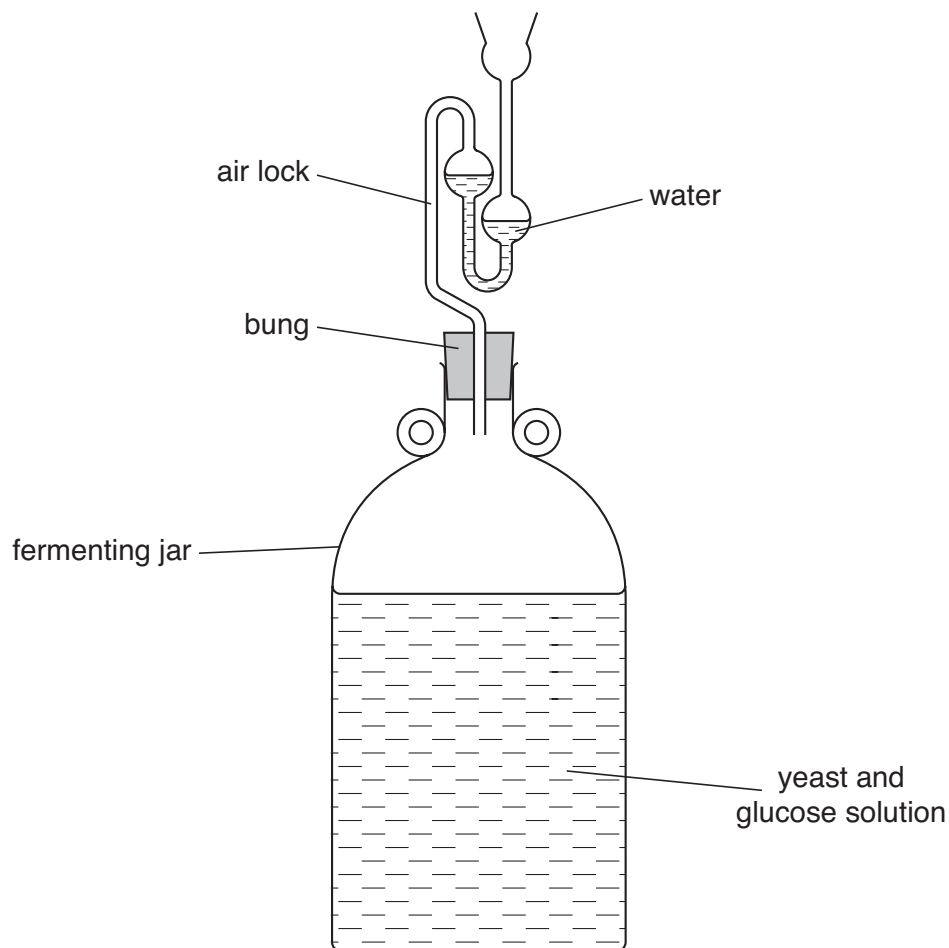
[1]

[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

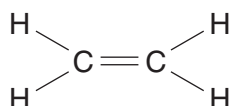
answer [1]

- (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 .



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

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The Periodic Table of the Elements

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1	2	Key										3	4	5	6	7	0				
		relative atomic mass atomic symbol name atomic (proton) number																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.