

<b>Candidate Forename</b>						<b>Candidate Surname</b>				
<b>Centre Number</b>						<b>Candidate Number</b>				

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS  
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**B642/01**

**GATEWAY SCIENCE  
CHEMISTRY B**

**Unit 2 Modules C4 C5 C6  
(Foundation Tier)**

**WEDNESDAY 17 JUNE 2009: Morning  
DURATION: 1 hour**

**SUITABLE FOR VISUALLY IMPAIRED CANDIDATES**

**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)**

**READ INSTRUCTIONS OVERLEAF**

## **INSTRUCTIONS TO CANDIDATES**

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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.**

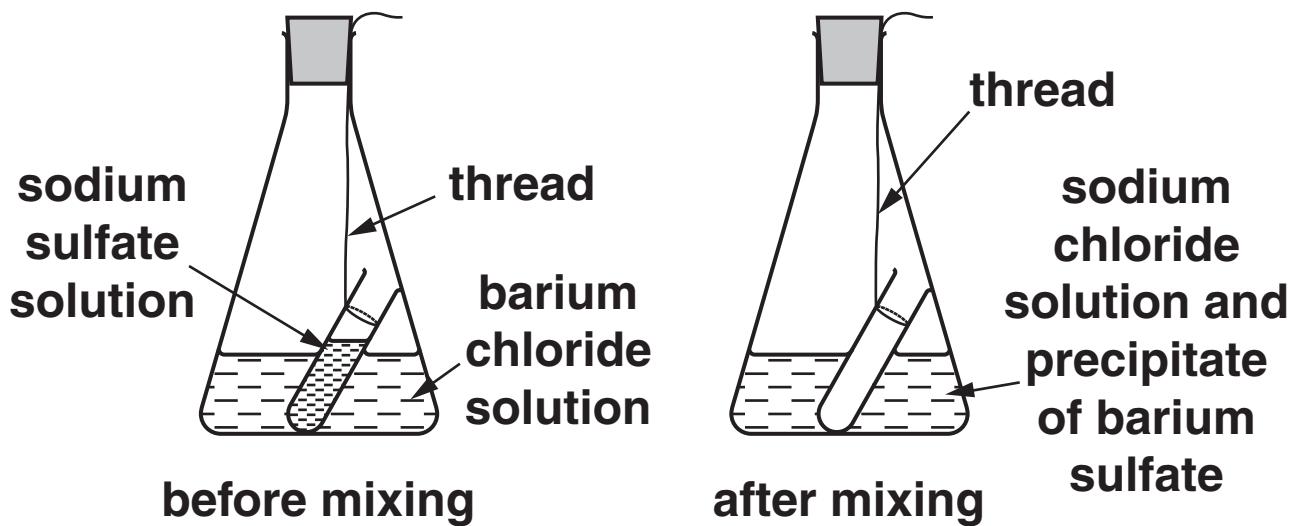
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Answer **ALL** the questions.

**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.



**(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	$\text{BaCl}_2$
barium sulfate	$\text{BaSO}_4$
sodium chloride	$\text{NaCl}$
sodium sulfate	$\text{Na}_2\text{SO}_4$

(i) TWO compounds in the table contain three elements.

Which two?

\_\_\_\_\_ and \_\_\_\_\_ [1]

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

What is the relative formula mass of sodium sulfate,  $\text{Na}_2\text{SO}_4$ ?

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

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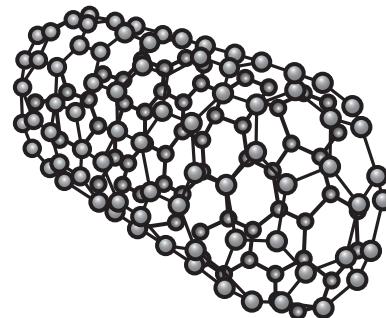
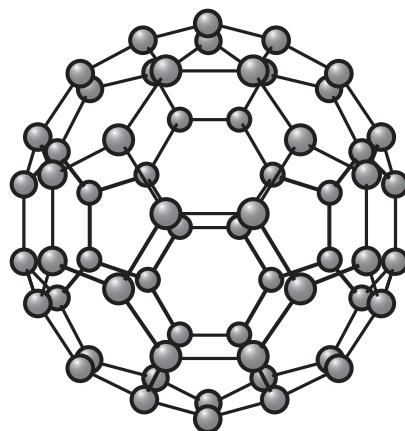
relative formula mass \_\_\_\_\_ [1]

[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?

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[1]

(d) Nanotubes are very strong and conduct electricity.

One use for nanotubes is as industrial catalysts.

Describe ONE OTHER use of nanotubes.

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[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.**

	<b>TYPE OF STAIN</b>				
<b>SOLVENT</b>	<b>FOOD</b>	<b>GREASE</b>	<b>PAINT</b>	<b>WAX</b>	
<u>A</u>	X	✓	X	✓	
<u>B</u>	X	X	X	X	
<u>C</u>	✓	X	X	X	
<u>D</u>	✓	✓	✓	✓	
<u>E</u>	✓	✓	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?

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[1]

(ii) What is a BATCH process?

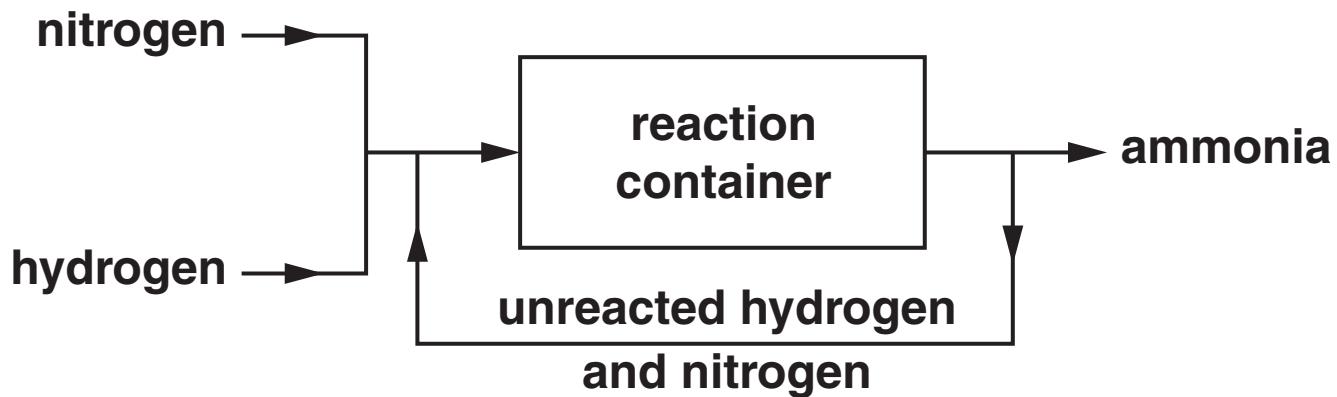
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[1]

**(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.

13

(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 100g 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 100g of cornflakes?

Choose from the table.

[1]

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

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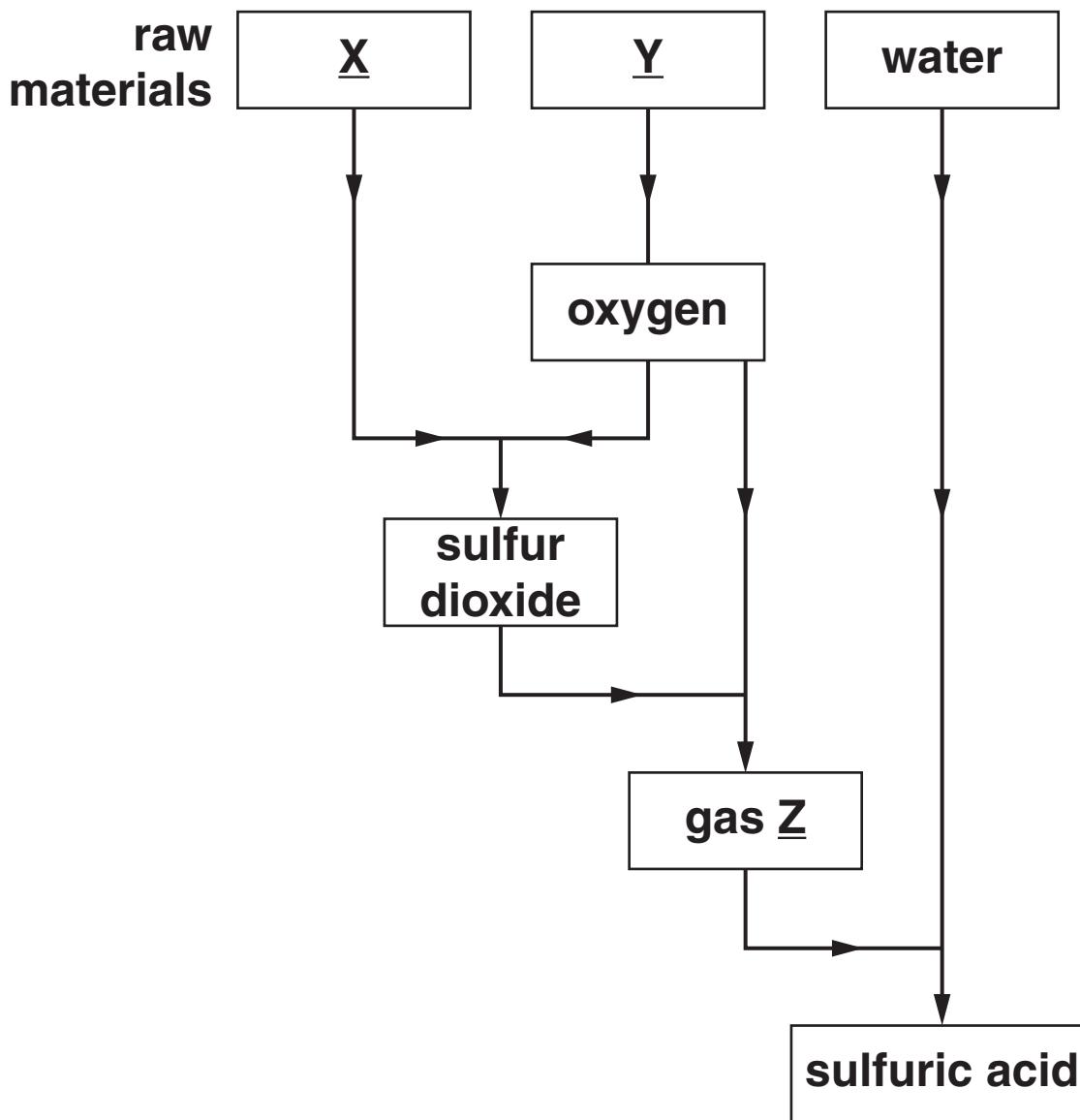
**[3]**

**[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?**

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[1]

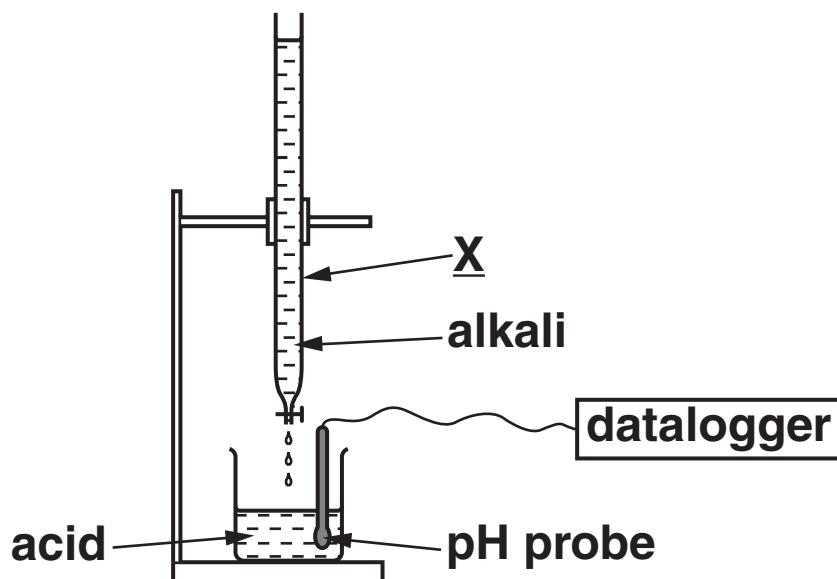
**(ii) What is the name of gas Z?**

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[1]

**[Total: 4]**

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



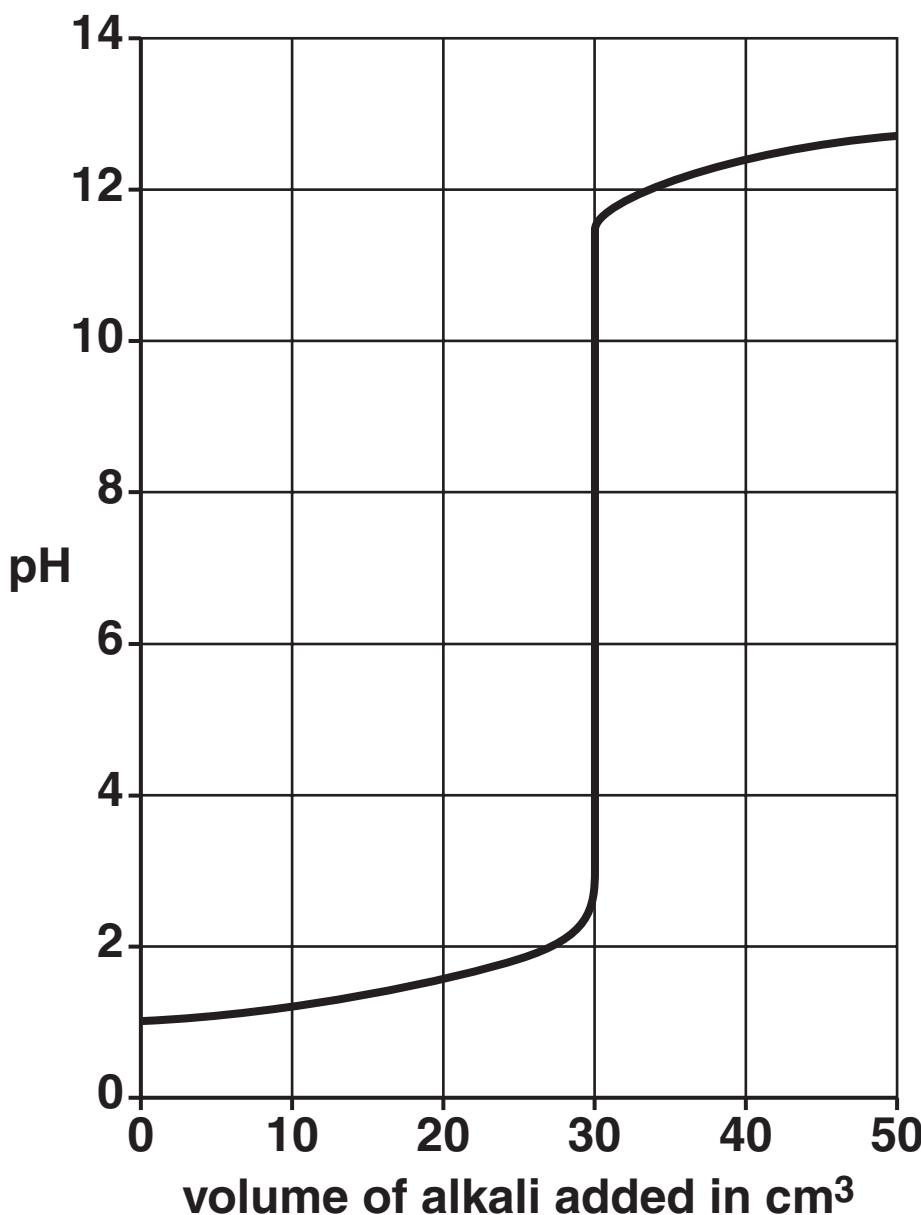
(a) What is the name of the apparatus labelled X?

[1]

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(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 opposite 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<sup>3</sup> of sodium hydroxide has been added?

---

[1]

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

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cm<sup>3</sup> [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**

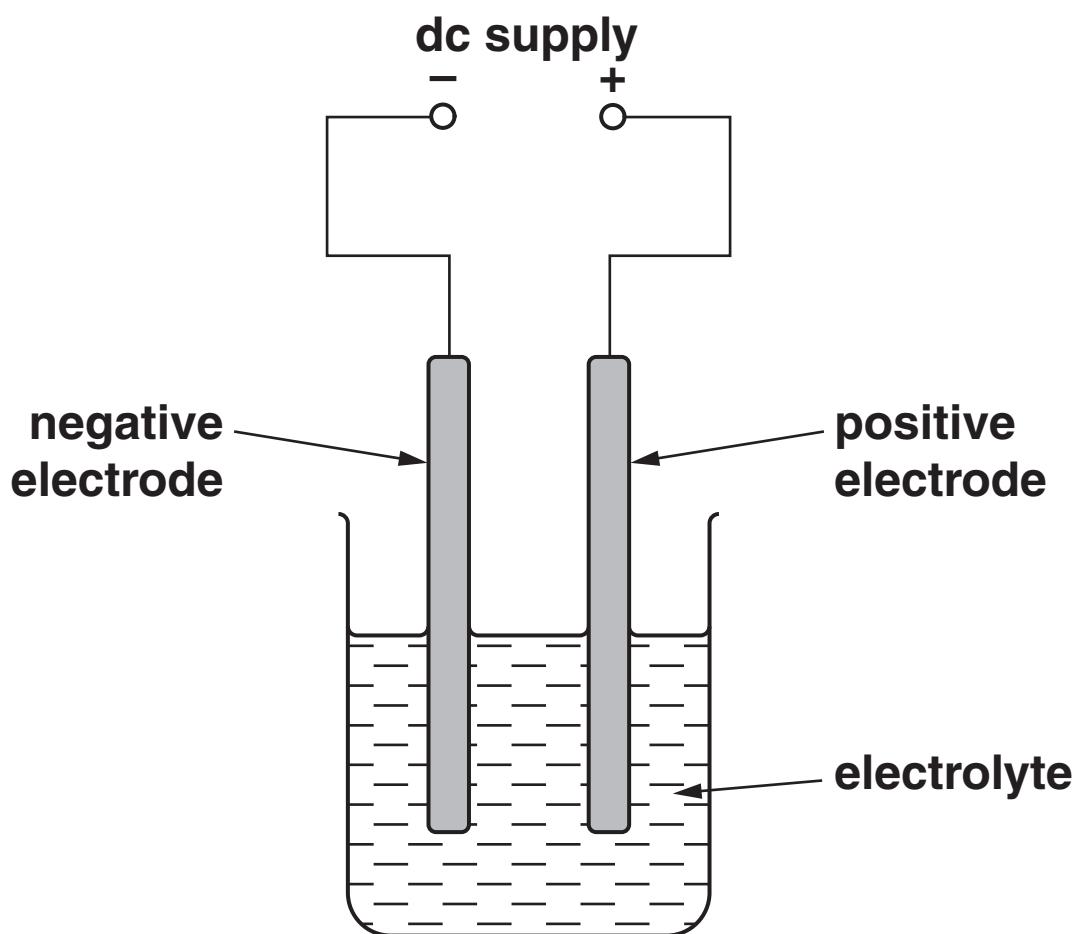
answer \_\_\_\_\_ [1]

[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?

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[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.**



**(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]

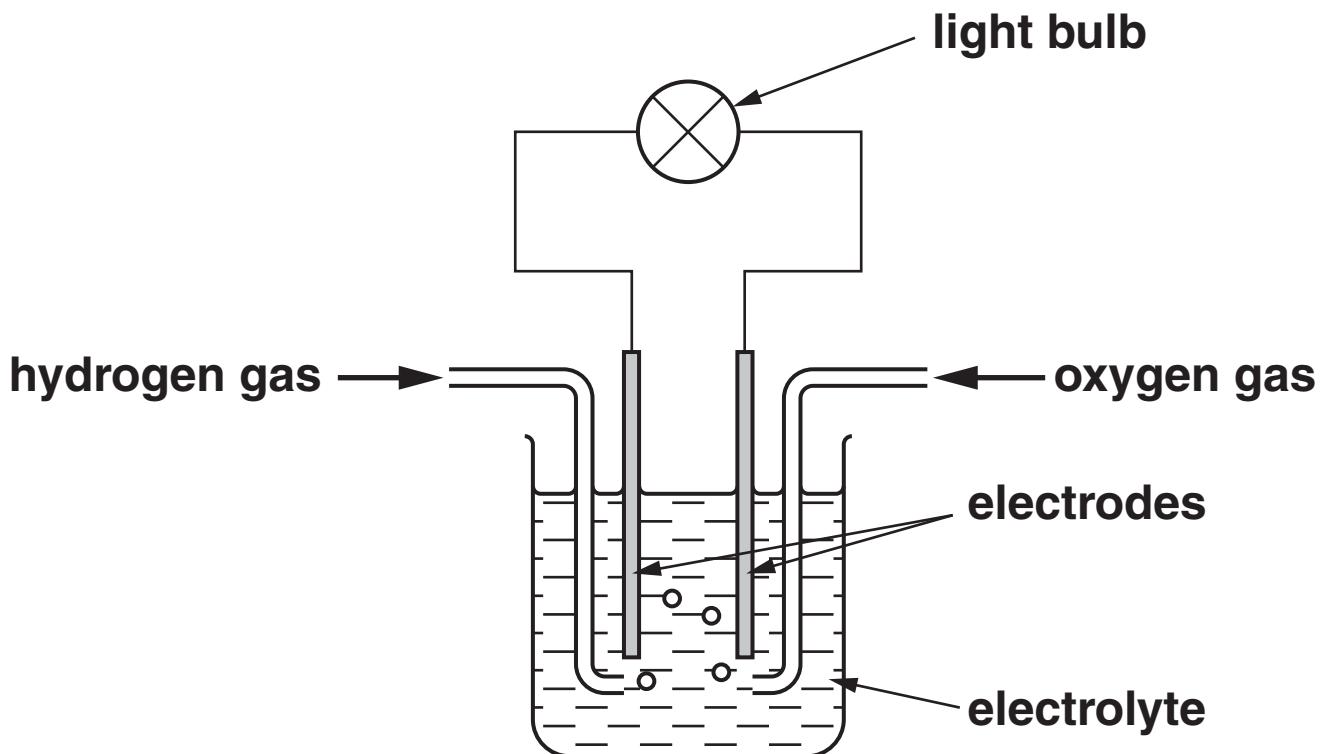
**[Total: 4]**

## SECTION C – MODULE C6

10 This question is about fuel cells.

Look at the diagram.

It shows a fuel cell.



(a) In a fuel cell, hydrogen and oxygen react 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.

Other than cost, write down TWO reasons for doing this.

1 \_\_\_\_\_

2 \_\_\_\_\_ [2]

[Total: 6]

11 This question is about calcium carbonate and hard water.

Limescale can develop inside a kettle.

(a) Hard water causes limescale.

(i) What is hard water?

\_\_\_\_\_ [1]

(ii) Limescale contains calcium carbonate,  $\text{CaCO}_3$ .

What is the total number of ATOMS in the formula  $\text{CaCO}_3$ ?

\_\_\_\_\_ [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.**

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**[Total: 4]**

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**12 This question is about reactions of metals.**

**(a) This question is about a large statue made from iron. It 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.**

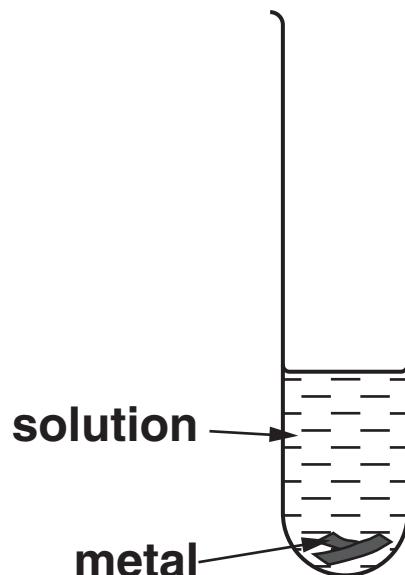
\_\_\_\_\_ **[1]**

**(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** \_\_\_\_\_

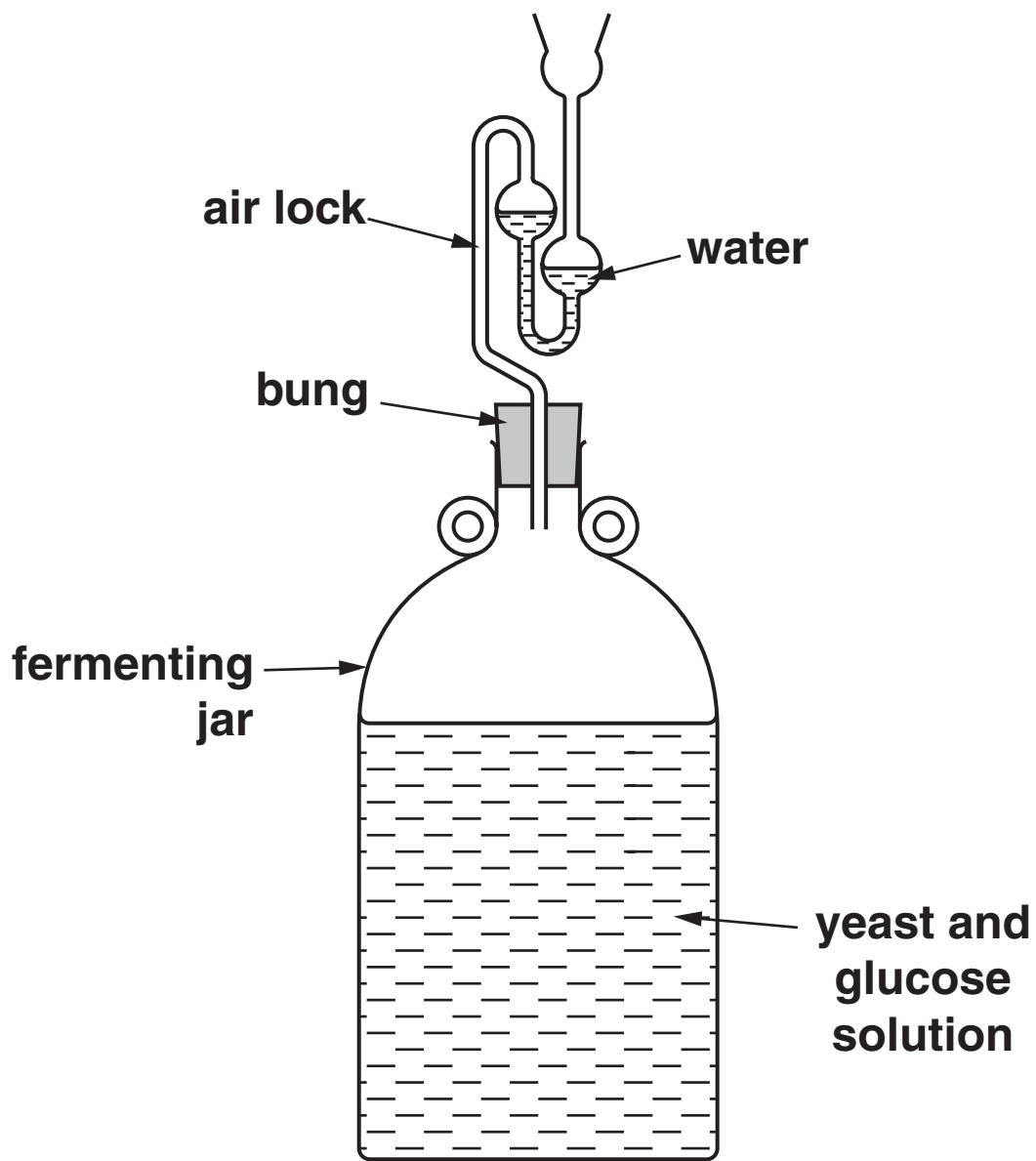
**[1]**

**[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.



**At the end of the process, the fermenting jar contains a mixture of ethanol and water.**

**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.**

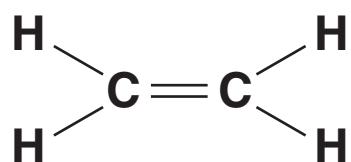
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[2]

(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

1	2	Key																	
7	9	relative atomic mass atomic symbol name atomic (proton) number																	
Li lithium 3	Be beryllium 4	1 H hydrogen																	
23	24	2 He helium																	
39	40	45	48	51	52	55	56	59	59	63.5	65	70	73	75	79	80	84	84	
K potassium 19	Ca calcium 20	Sc scandium 21	Ti titanium 22	V vanadium 23	Cr chromium 24	Mn manganese 25	Fe iron 26	Co cobalt 27	Ni nickel 28	Cu copper 29	Zn zinc 30	Ge germanium 31	As arsenic 32	Se selenium 33	Br bromine 34	Kr krypton 35	36		
85	88	89	91	93	96	[98]	101	103	106	108	112	115	119	122	128	131			
Rb rubidium 37	Sr strontium 38	Y yttrium 39	Zr zirconium 40	Nb niobium 41	Mo molybdenum 42	Tc technetium 43	Ru ruthenium 44	Rh rhodium 45	Pd palladium 46	Ag silver 47	Cd cadmium 48	In indium 49	Sn tin 50	Sb antimony 51	Te tellurium 52	I iodine 53	Xe xenon 54		
133	137	139	178	181	184	186	190	192	195	197	201	204	207	209	[209]	[210]	[222]		
Cs caesium 55	Ba barium 56	La* lanthanum 57	Hf hafnium 72	Ta tantalum 73	W tungsten 74	Re rhenium 75	Os osmium 76	Ir iridium 77	Pt platinum 78	Au gold 79	Hg mercury 80	Tl thallium 81	Pb lead 82	Bi bismuth 83	[Po] polonium 84	[At] astatine 85	Rn radon 86		
[223]	[226]	[227]	[261]	[262]	[266]	[264]	[277]	[268]	[271]	[272]									
Fr francium 87	Ra radium 88	Ac* actinium 89	Rf rutherfordium 104	Db dubnium 105	Sg seaborgium 106	Bh bohrium 107	Hs hassium 108	Mt meitnerium 109	Ds darmstadtium 110	Rg roentgenium 111									

Elements with atomic numbers 112-116 have been reported but not fully authenticated

\* 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.