

Candidate Forename						Candidate Surname				
Centre Number						Candidate Number				

**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.

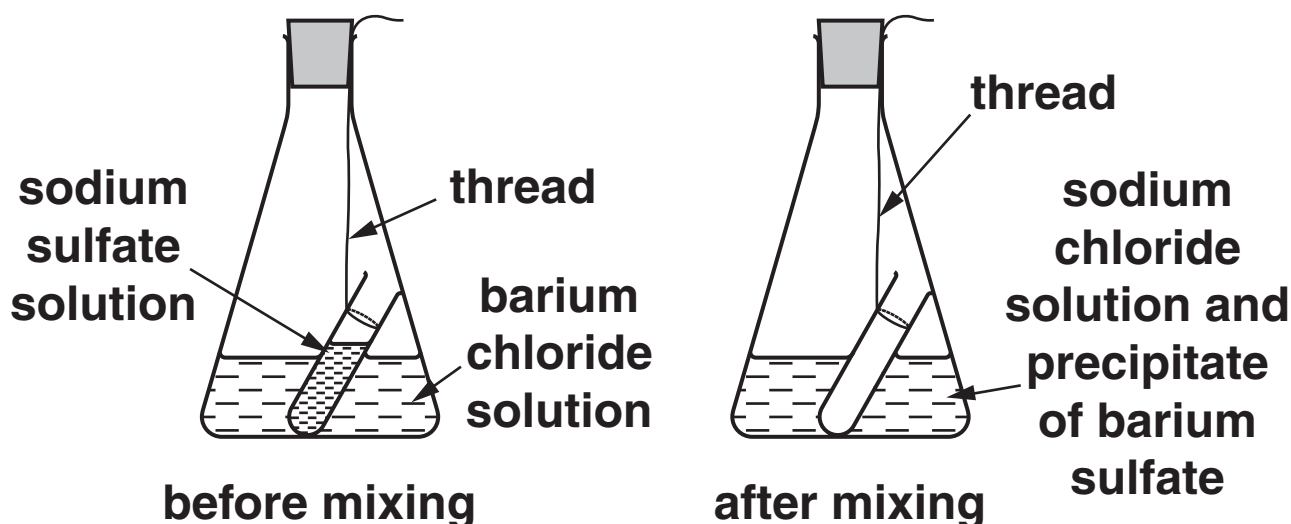
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Answer ALL the questions.

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	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.

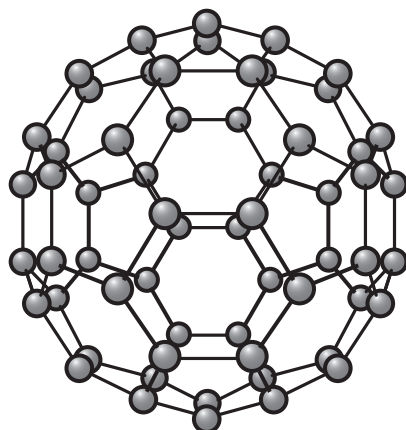
relative formula mass _____ [1]

[Total: 5]

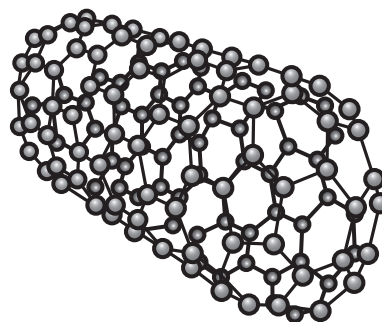
- 2 Buckminster fullerene and nanotubes are recently discovered substances.

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.

	<u>TYPE OF STAIN</u>			
<u>SOLVENT</u>	<u>FOOD</u>	<u>GREASE</u>	<u>PAINT</u>	<u>WAX</u>
<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?

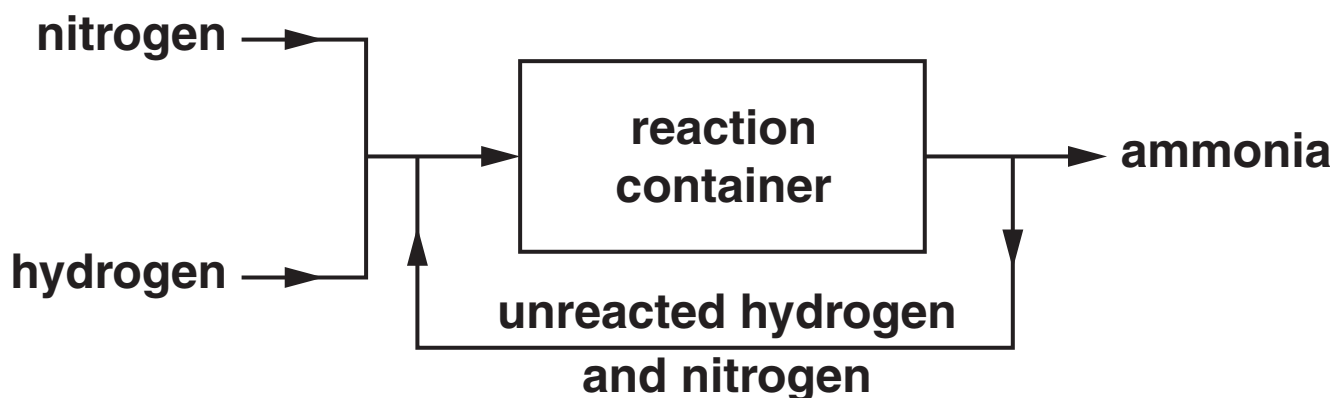
_____ [1]

(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 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.

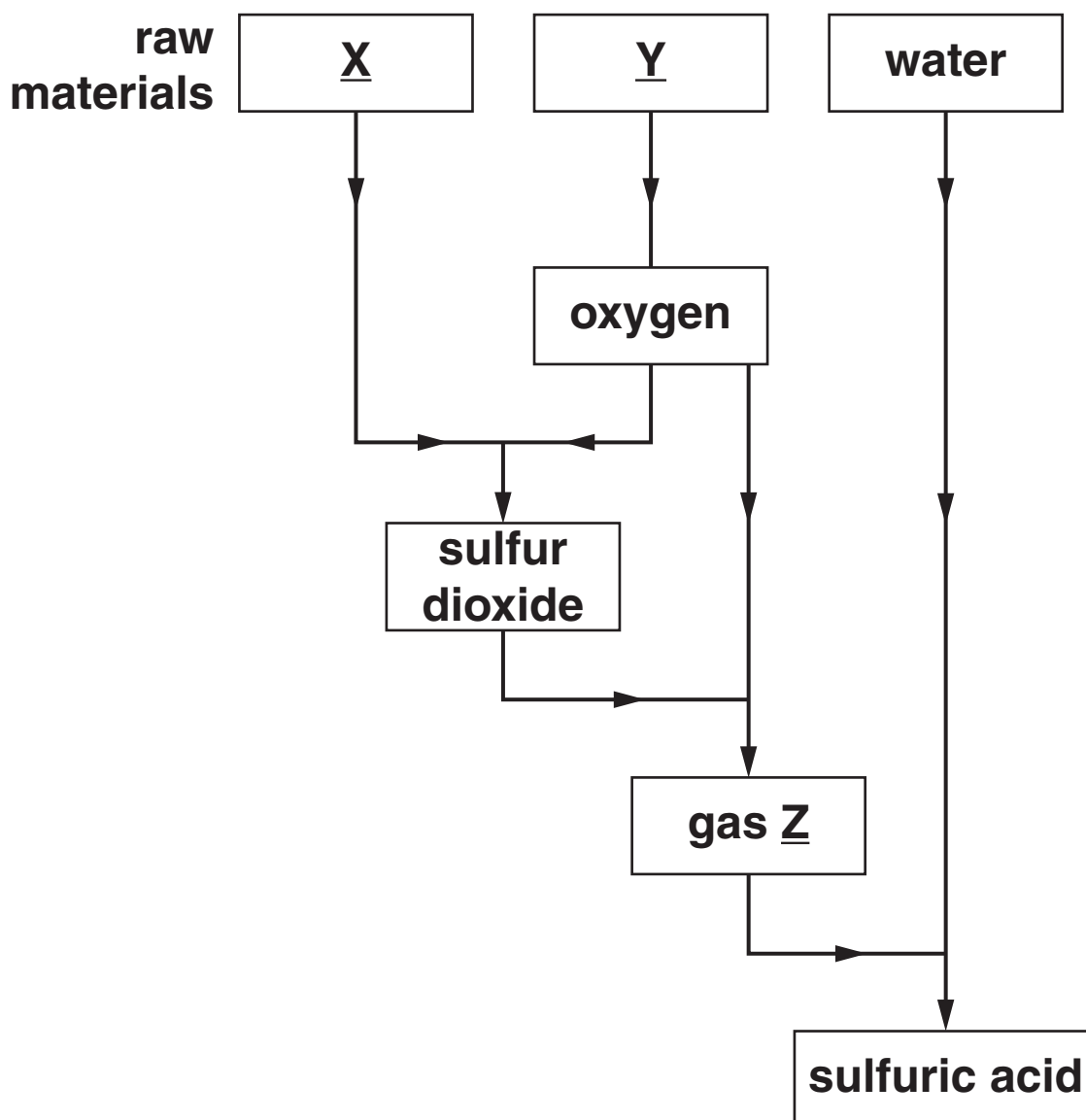
[3]

[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?

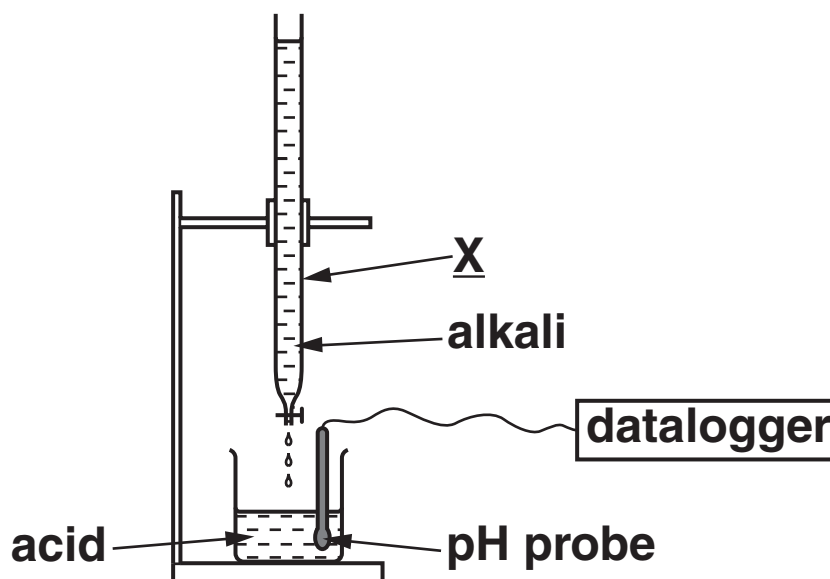
_____ [1]

(ii) What is the name of gas Z?

_____ [1]

[Total: 4]

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

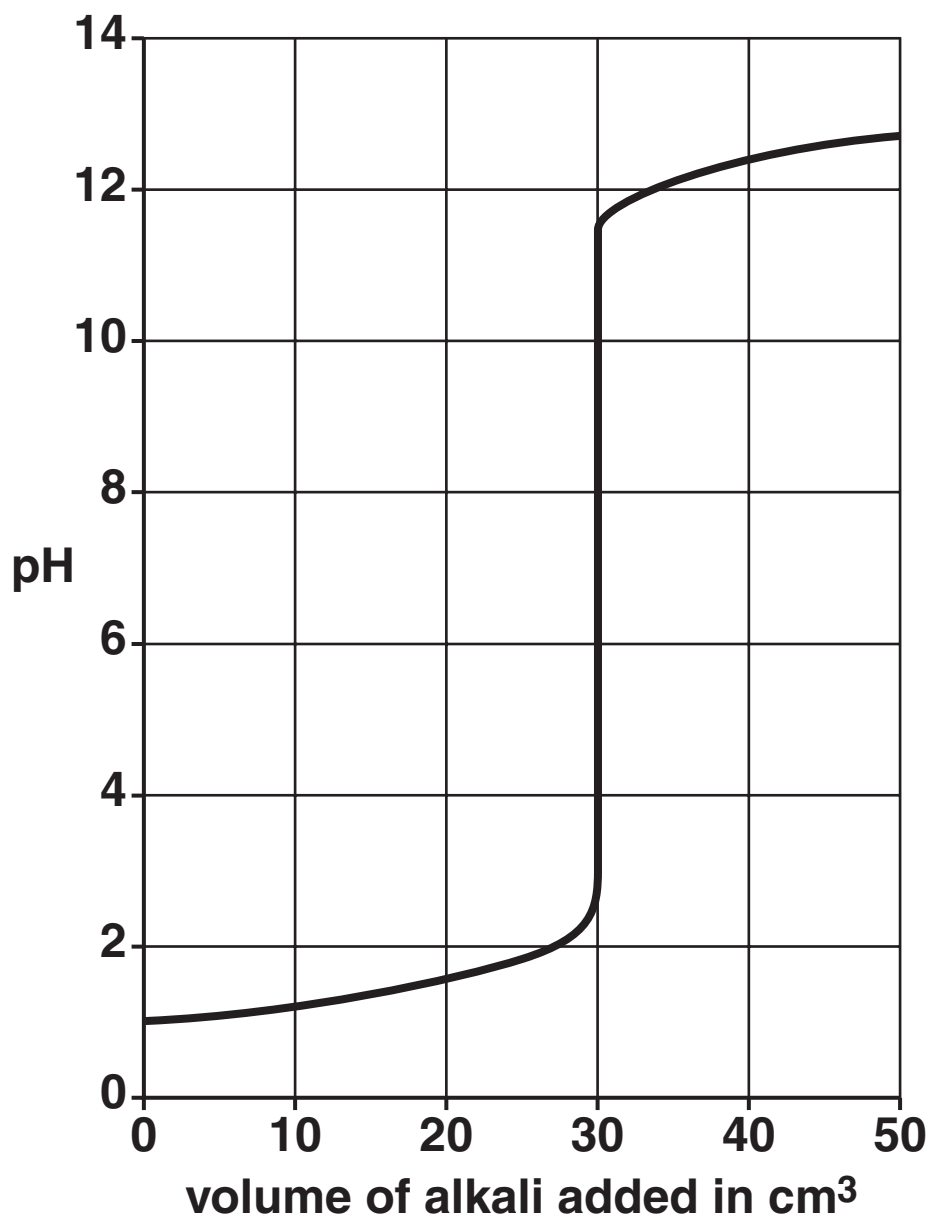


- (a) What is the name of the apparatus labelled X?

_____ [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 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 cm³ of sodium hydroxide has been added?

_____ [1]

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

_____ cm³ [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

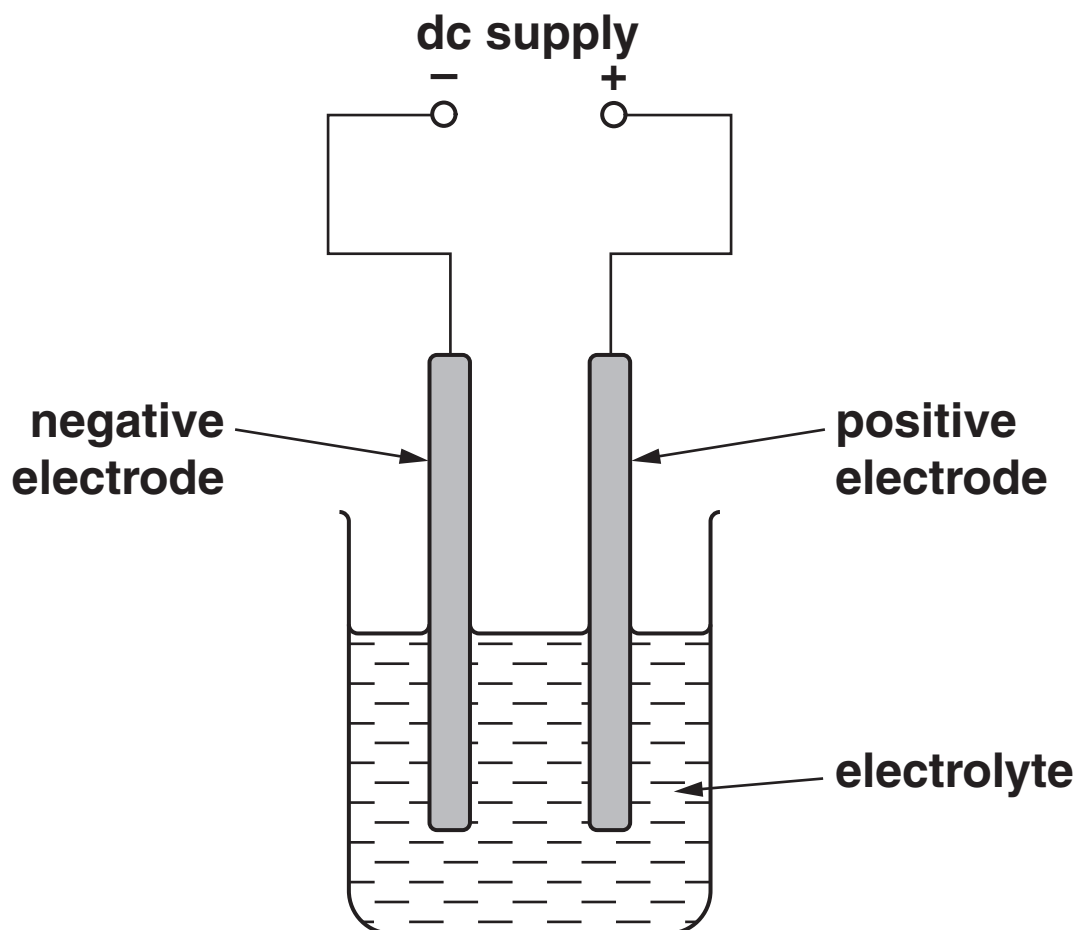
answer _____ [1]

[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.



- (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]

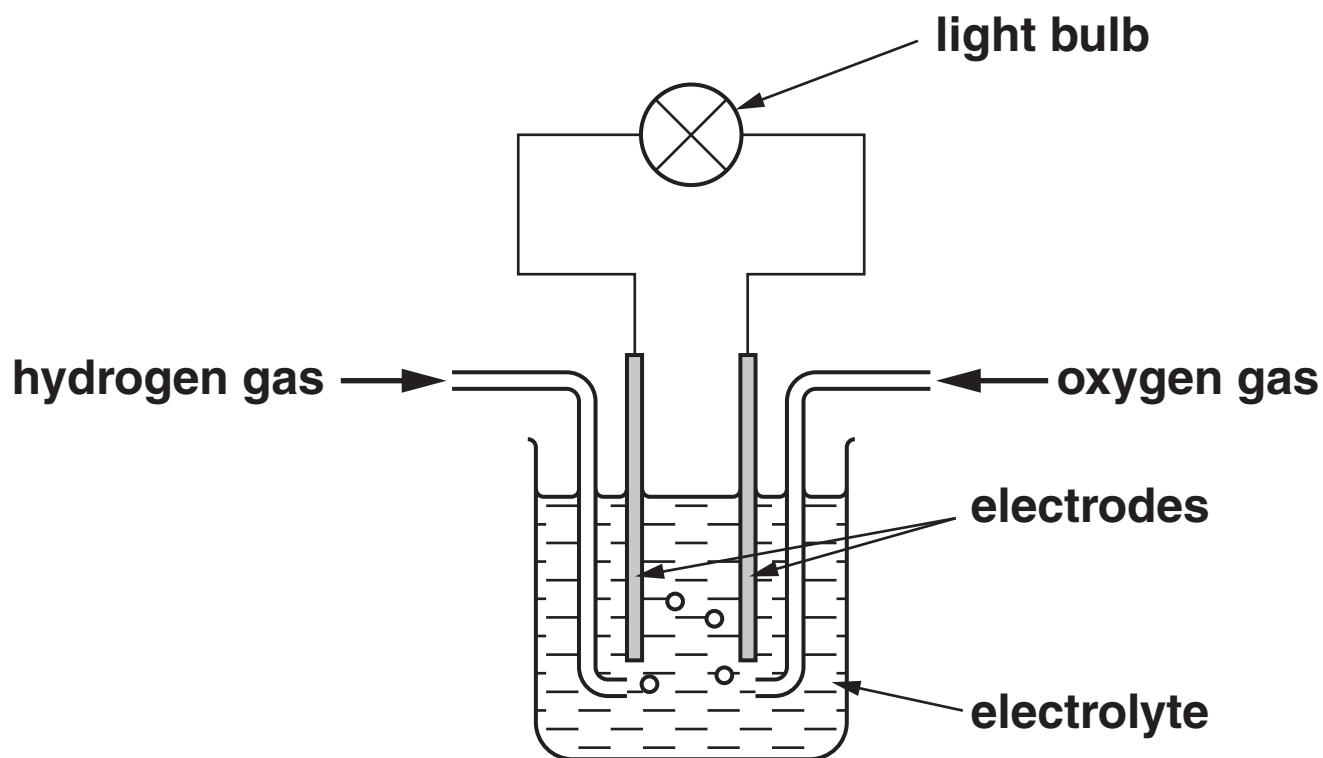
[Total: 4]

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, 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]

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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.**

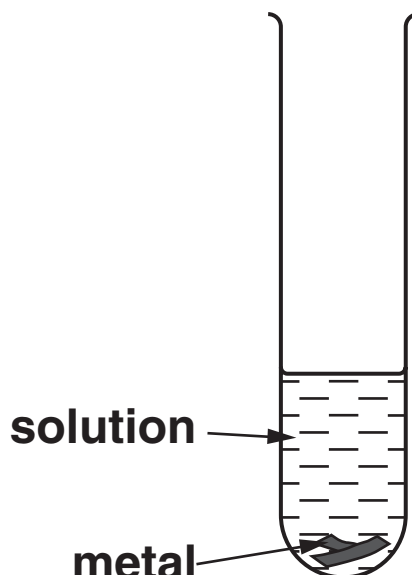
_____ [1]

- (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 _____

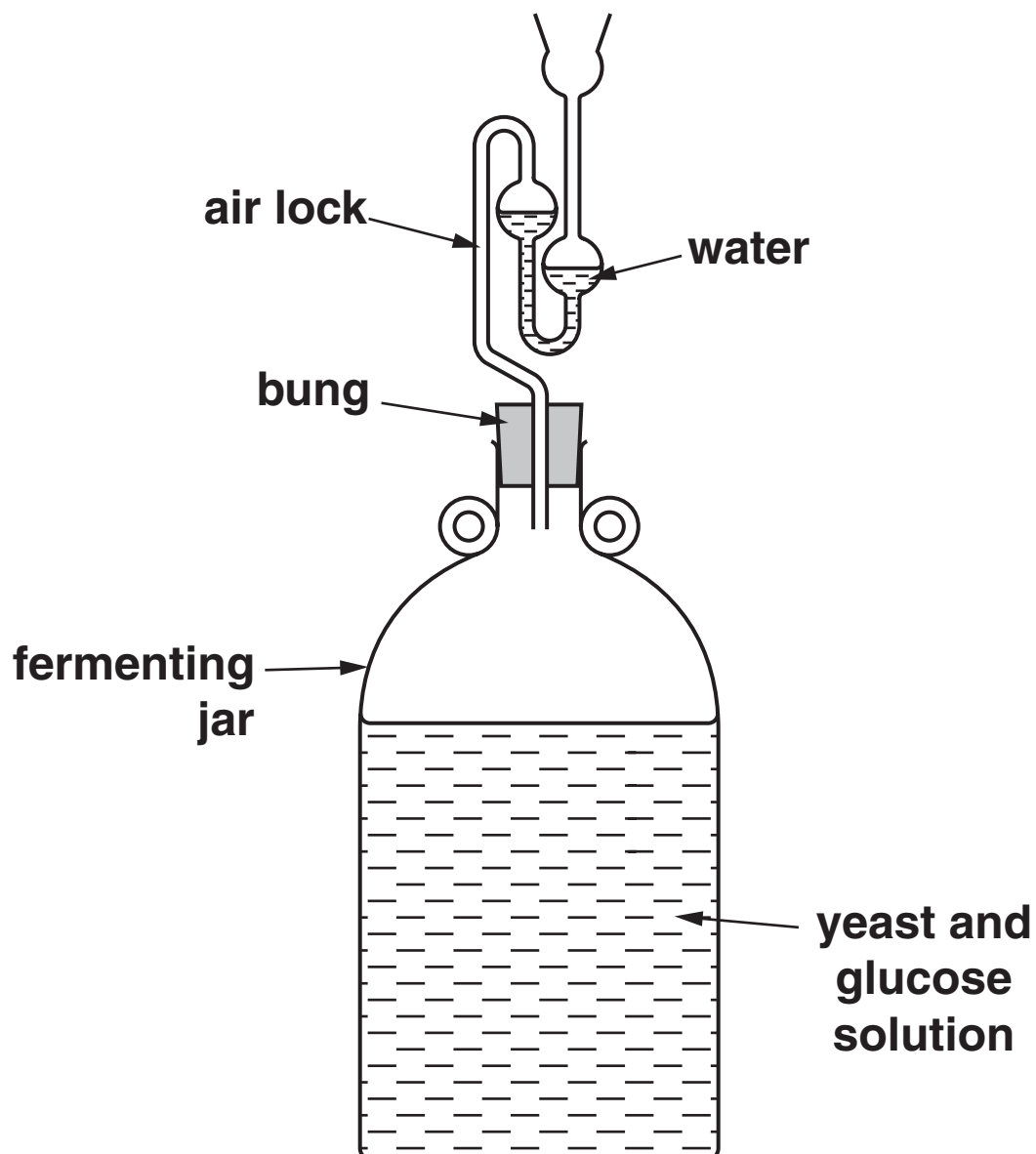
[1]

[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

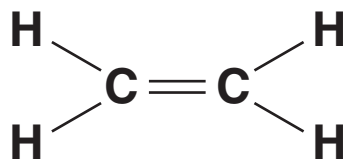
answer _____ [1]

(b) Write about TWO different uses of ethanol.

_____ [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, $\text{C}_2\text{H}_5\text{OH}$, 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	3	4	5	6	7	0
7 Li lithium 3	9 Be beryllium 4	<div>Key</div> <div>relative atomic mass atomic symbol name atomic (proton) number</div>					4 He helium 2
23 Na sodium 11	24 Mg magnesium 12	11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
39 K potassium 19	40 Ca calcium 20	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
85 Rb rubidium 37	88 Sr strontium 38	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
133 Cs caesium 55	137 Ba barium 56	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
[223] Fr francium 87	[226] Ra radium 88	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	[210] At astatine 85	[222] Rn radon 86
[227] Ac* actinium 89	[262] Db dubnium 105	[261] Rf rutherfordium 104	[264] Bh bohrium 107	[266] Sg seaborgium 106	[277] Hs hassium 108	Elements with atomic numbers 112-116 have been reported but not fully authenticated	
89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47
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 Ni nickel 28	63.5 Cu copper 29
59 Co cobalt 27	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	75 As arsenic 33	79 Se selenium 34
192 Ir iridium 77	190 Os osmium 76	192 Ir iridium 77	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83
[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111					

* 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.