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 15 JUNE 2011: 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

DC (NF/JG) 11MEP06277 47701/1

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. Pencil may be used for graphs and diagrams only.**
- **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).**
- **Answer ALL the questions.**

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 Washing powder is used to clean clothes.

Look at the label on a box of biological washing powder.

INGREDIENTS
WATER SOFTENER
BLEACH
OPTICAL BRIGHTENER
DETERGENT
ENZYME

(a) (i) One ingredient helps to give clothes a 'whiter than white' appearance.

Which ingredient?

_____ **[1]**

(ii) What is the job of the bleach in the washing powder?

_____ **[1]**

(b) Milly investigates a biological washing powder.

Milly does several experiments.

Each time she adds washing powder to 1000 cm^3 of water.

She puts a tea-towel with a food stain into the water.

She times how long it takes for the food stain to be removed.

Milly then changes the temperature of the water and the mass of washing powder she uses.

Look at her table of results.

		mass of washing powder used		
		10 g	30 g	50 g
temperature of water	15 °C	25 min	20 min	15 min
	35 °C	10 min	8 min	4 min
	55 °C	15 min	10 min	6 min

Write down TWO conclusions Milly can make from these results.

_____

_____

_____

_____ **[2]**

(c) Write down one ADVANTAGE of using a low temperature wash.

_____

_____ **[1]**

[Total: 5]

2 Sea water contains many useful chemicals.

Ed uses the internet to find out the ions found in sea water.

Look at the table of information that Ed finds.

name of ion	formula of ion	percentage of dissolved ion in sea water
bromide	Br^-	0.2%
calcium	Ca^{2+}	1.2%
chloride	Cl^-	55.0%
magnesium	Mg^{2+}	3.7%
potassium	K^+	1.1%
sodium	Na^+	30.6%
sulfate	SO_4^{2-}	7.7%

(a) Which POSITIVE ion is present in the GREATEST amount in sea water?

Choose from the table.

_____ **[1]**

(b) Which solution is used to test for chloride ions in sea water?

Choose from the list.

ammonium sulfate

hydrochloric acid

potassium nitrate

silver nitrate

answer _____ [1]

(c) Barium chloride solution reacts with the sulfate ions in sea water.

A precipitate is made.

What is the colour of the precipitate?

Choose from the list.

blue

green

pale yellow

white

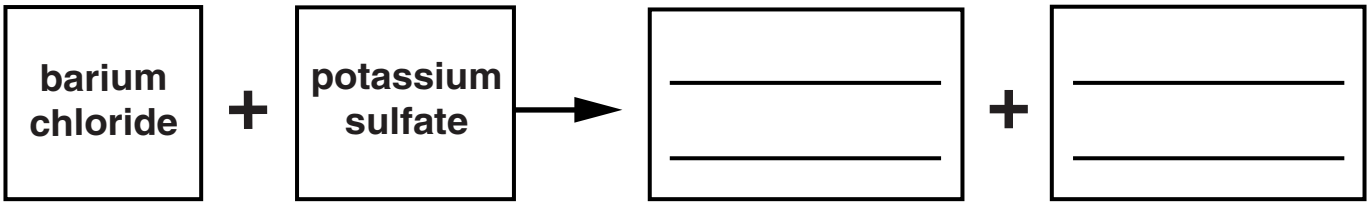
answer _____ [1]

(d) Barium chloride solution reacts with potassium sulfate solution.

This is a precipitation reaction.

Look at the word equation for this precipitation reaction.

Finish the word equation.



[1]

(e) In some parts of the world sea water is used to make clean water for drinking.

It is important that people in all parts of the world have a supply of clean water.

Explain why.

_____

_____ **[1]**

[Total: 5]

3 Stowmarket Synthetics own a chemical factory.

They want to make hydrogen peroxide.

Hydrogen peroxide can be made by two methods.

One method is a BATCH process and one is a CONTINUOUS process.

(a) What is the difference between a batch process and a continuous process?

_____

_____

_____ **[1]**

(b) Look at the table.

It gives some information about the two methods used to make hydrogen peroxide.

	method 1	method 2
starting materials	barium peroxide and sulfuric acid	hydrogen and oxygen
temperature	5 °C	45 °C
catalyst	none needed	catalyst needed
percentage yield	70 %	95 %
pollution problems	poisonous waste product made	no waste products made

There are many costs involved in making hydrogen peroxide.

One of these is the cost of energy.

Write down two OTHER costs of making hydrogen peroxide.

1 _____

_____

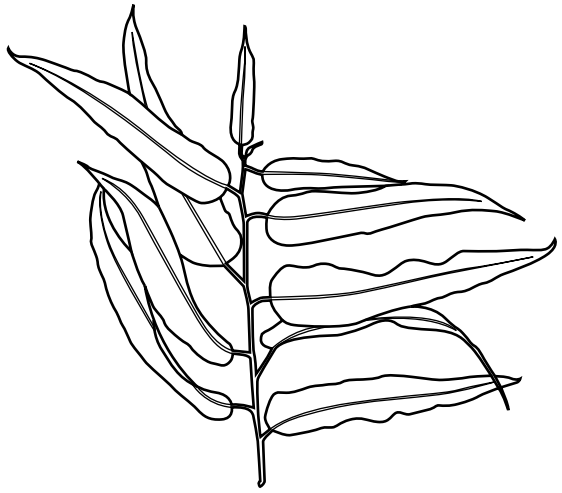
2 _____

_____ **[2]**

(c) Stowmarket Synthetics also make medicines.

They extract chemicals from the leaves of a plant.

They use these chemicals as the starting material.



Write about how chemicals can be extracted from plants.

_____

_____

_____

_____ **[2]**

[Total: 5]

4 Dylan is a farmer.

He uses fertilisers to make his plants grow faster and bigger.

Fertilisers contain one or more of the three ESSENTIAL ELEMENTS.

These essential elements are nitrogen, phosphorus and potassium.

Look at the diagram. It shows the bags of fertiliser that Dylan has bought.

(a) How many of the ESSENTIAL ELEMENTS are there in this fertiliser?

_____ **[1]**

(b) Dylan puts this fertiliser on his fields.

How does this fertiliser enter the plants?

_____ **[1]**

(c) Ammonium phosphate is a fertiliser made from ammonia.

(i) Which one of these fertilisers is also made from ammonia?

Choose from the list.

ammonium sulfate

phosphorus (V) oxide

potassium phosphate

potassium sulfate

answer _____ [1]

(ii) A solution of ammonium phosphate has a pH of 5.5.

What does this tell you about ammonium phosphate solution?

_____ [1]

(d) Urea is another fertiliser that can be made from ammonia.

Urea has the formula $(NH_2)_2CO$.

What is the relative formula mass, M_r, for urea?

The relative atomic mass, A_r, of N is 14, of H is 1, of C is 12 and of O is 16.

_____

_____

_____

relative formula mass = _____ [1]

[Total: 5]

SECTION B – MODULE C5

5 Kim investigates the neutralisation reaction between ethanoic acid and potassium hydroxide.

(a) Look at the symbol equation for this reaction.

$$CH_3COOH + KOH \rightarrow CH_3COOK + H_2O$$

(i) Write down the formula of the SALT in this reaction.

_____ **[1]**

(ii) Kim uses a solution of potassium hydroxide, KOH, in water.

What is the correct state symbol for a solution of KOH in water?

Choose from the list.

(aq)

(g)

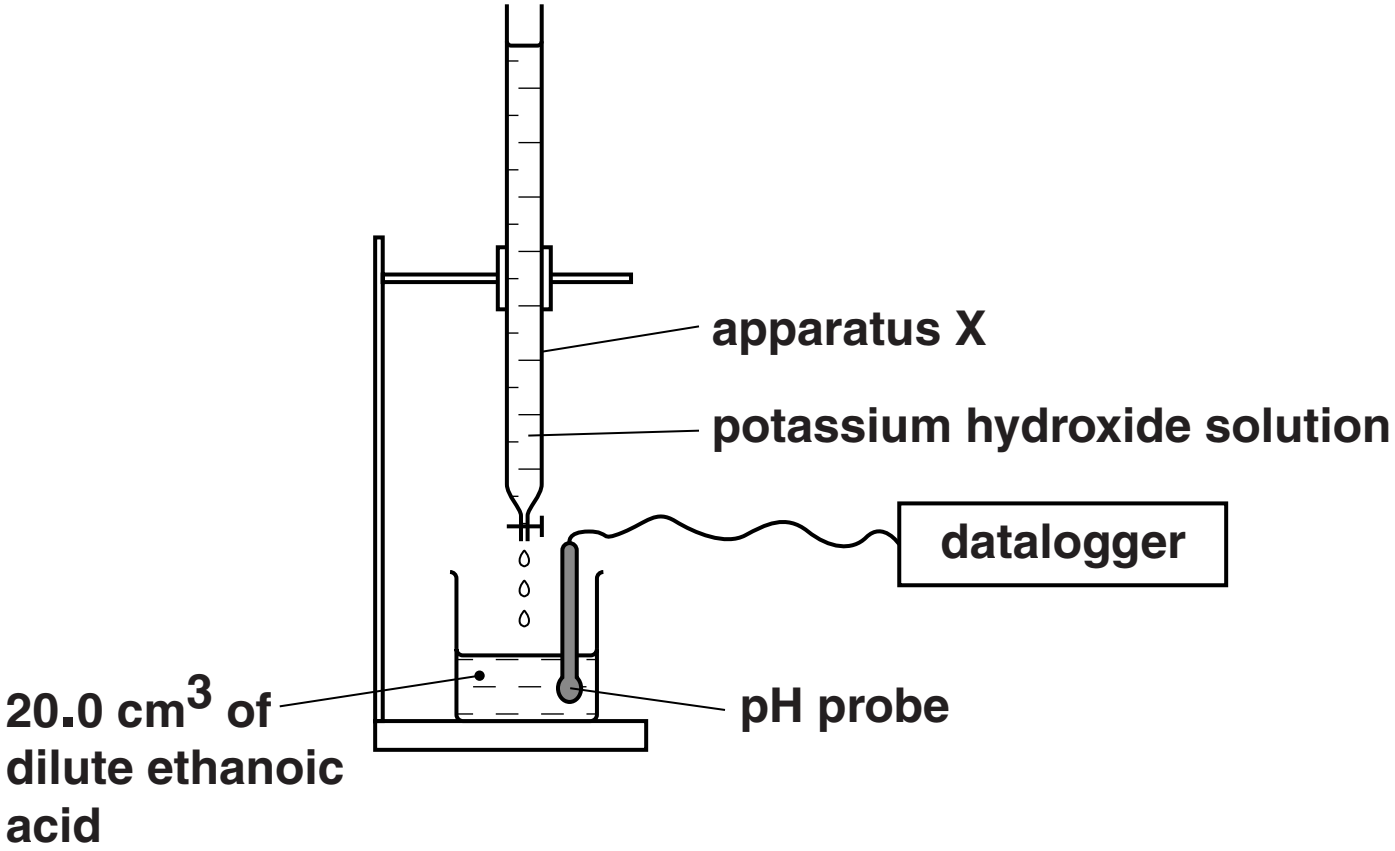
(l)

(s)

answer _____ [1]

(b) Kim slowly adds potassium hydroxide solution to the dilute ethanoic acid.

Look at the diagram. It shows the apparatus she uses.

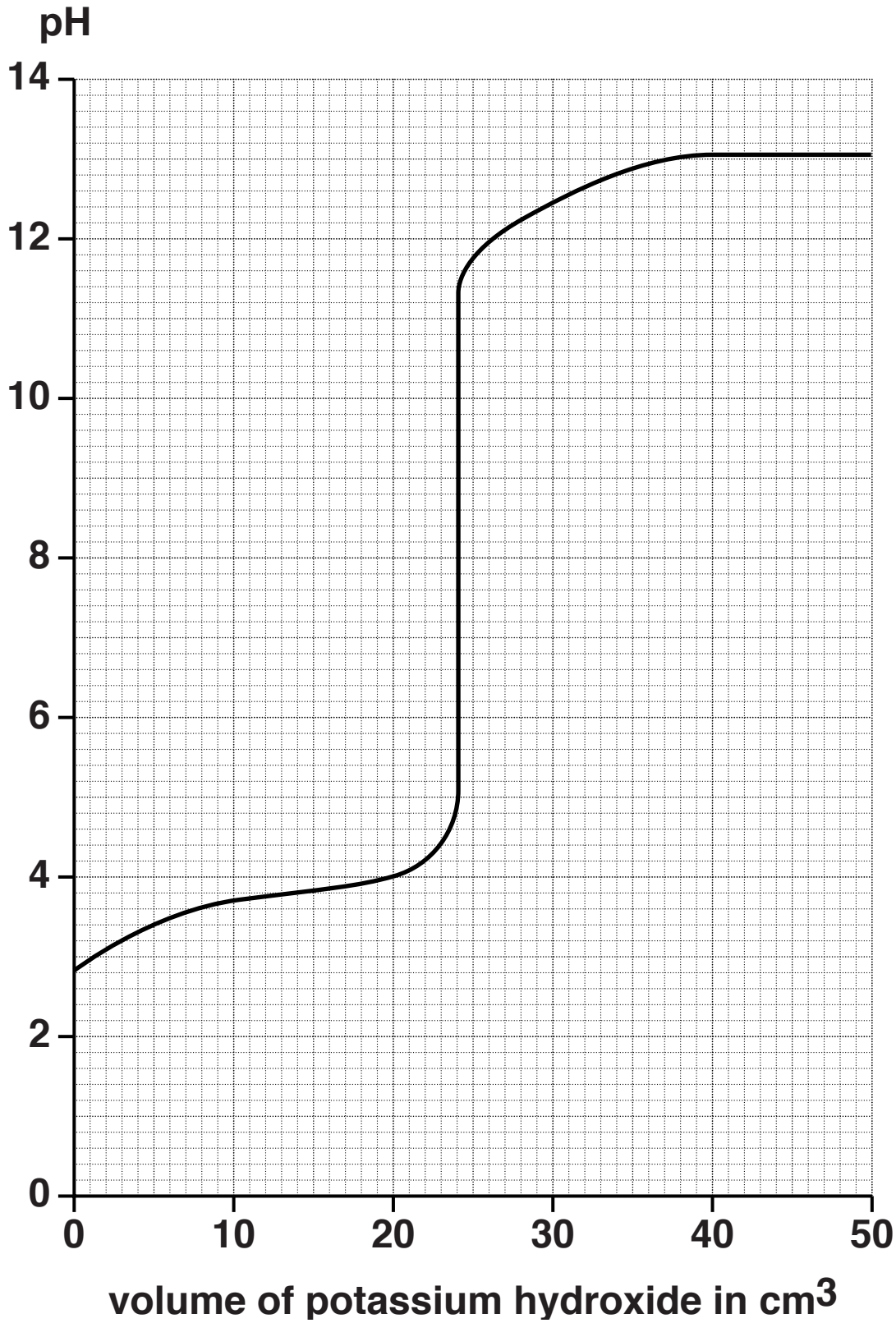


What is the name of apparatus X?

_____ **[1]**

(c) Kim uses a pH probe (pH meter) to find the pH of the solution in the beaker.

Look at the graph. It shows how the pH of the solution in the beaker changes as more potassium hydroxide solution is added.



(i) Kim adds 10.0 cm^3 of potassium hydroxide solution.

What is the pH of the solution in the beaker?

_____ [1]

(ii) What volume of potassium hydroxide must be added to just neutralise the ethanoic acid?

_____ cm^3 [1]

(d) Kim repeats the investigation.

This time she uses phenolphthalein to tell when the ethanoic acid has been neutralised.

Phenolphthalein is an indicator.

Finish the sentences about phenolphthalein.

Choose words from the list.

blue

colourless

green

pink

yellow

In acid, phenolphthalein is

_____ .

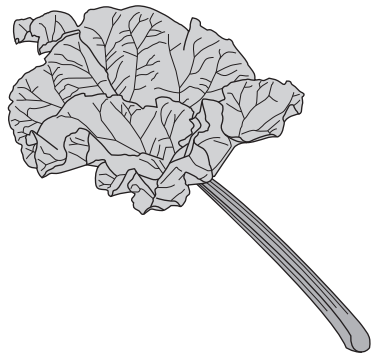
In alkali, phenolphthalein is

_____ . [2]

[Total: 7]

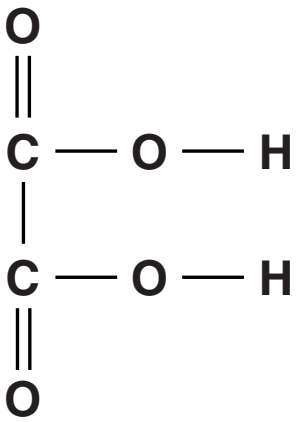
6 Chen is a research chemist.

He extracts a poisonous acid from rhubarb leaves.



The name of the acid is oxalic acid.

Look at the displayed formula for oxalic acid.



(a) What is the molecular formula for oxalic acid?

_____ **[1]**

(b) Oxalic acid is a weak acid.

Oxalic acid ionises in water.

Which one of these ions is made?

Choose from the list.

Cl^- H^+ OH^- SO_4^{2-}

answer _____ [1]

(c) Suggest ONE property of hydrochloric acid which is different from oxalic acid.

_____ [1]

(d) Ethanoic acid is another weak acid.

Dilute ethanoic acid can be used to descale kettles.

This is because ethanoic acid reacts with the calcium carbonate (limescale).

(i) A gas is made when ethanoic acid reacts with calcium carbonate.

Which gas?

_____ [1]

(ii) Hydrochloric acid is not used to descale kettles.

Explain why.

_____

_____ **[1]**

[Total: 5]

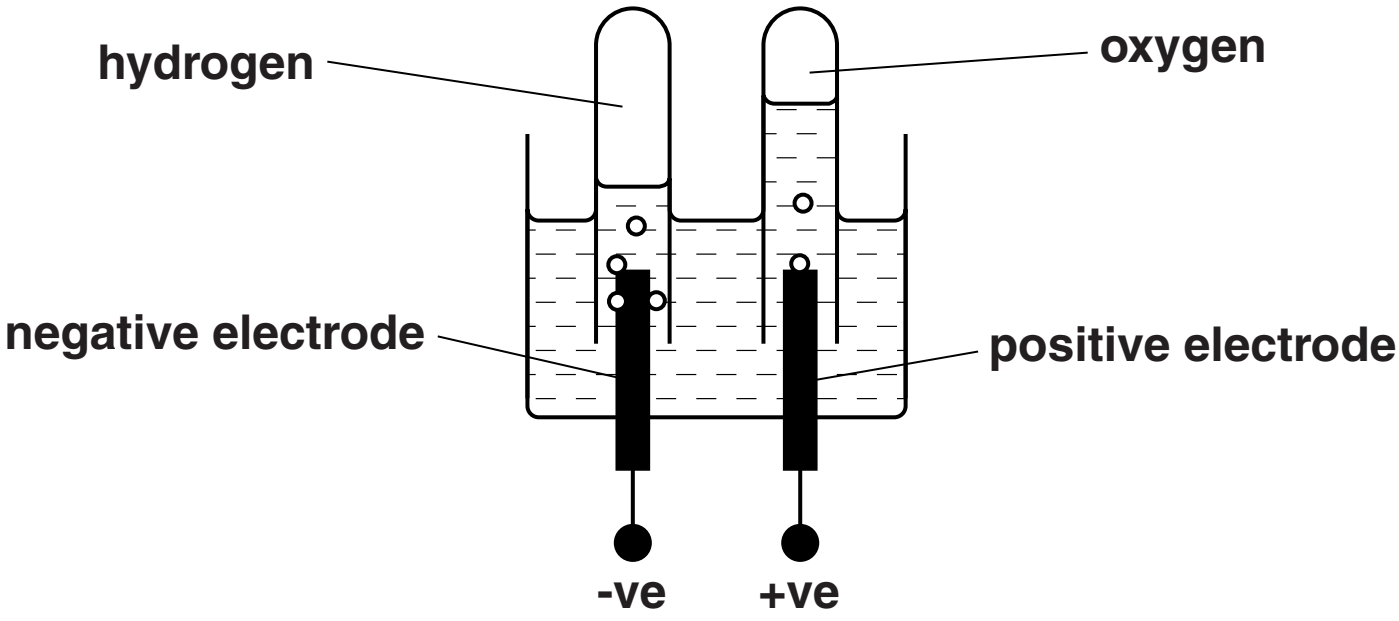
7 Electrolysis is a type of chemical reaction.

During electrolysis, an electric current is passed through a liquid.

The liquid is broken down (decomposed).

(a) Cameron investigates the electrolysis of potassium sulfate solution.

Look at the apparatus he uses.



(i) The positive electrode is called the anode.

What is the negative electrode called?

_____ **[1]**

(ii) Potassium sulfate solution contains the following particles.

H^+

H_2O

K^+

OH^-

SO_4^{2-}

One ion reacts (is discharged) at the positive electrode.

Which ion?

Choose from the list.

answer _____ [1]

(b) Cameron uses the internet to find out about the electrolysis of melted solids.

Look at the table. It shows some of the information he finds.

melted solid	product made at the negative electrode	product made at the positive electrode
aluminium oxide	aluminium	oxygen
lead bromide	lead	bromine
potassium chloride	_____	_____

What are the products of the electrolysis of melted potassium chloride?

Write your answers in the table. **[2]**

[Total: 4]

8 Sulfuric acid, H_2SO_4, is made by the Contact Process.

Write about the Contact Process.

You may include

- **the names of the raw materials used**
- **the chemical reactions that happen**
- **the conditions used.**

_____

_____

_____

_____ **[2]**

[Total: 2]

9 Potassium superoxide is used to provide emergency supplies of oxygen in submarines.

Look at the word equation.

It shows the reaction of potassium superoxide that makes oxygen.

potassium superoxide + carbon dioxide → potassium carbonate + oxygen

Anthony reacts 71 g of potassium superoxide with 22 g of carbon dioxide.

He finds that 69 g of potassium carbonate is made.

What mass of oxygen is made at the same time?

_____

_____

_____

mass of oxygen = _____ g [2]

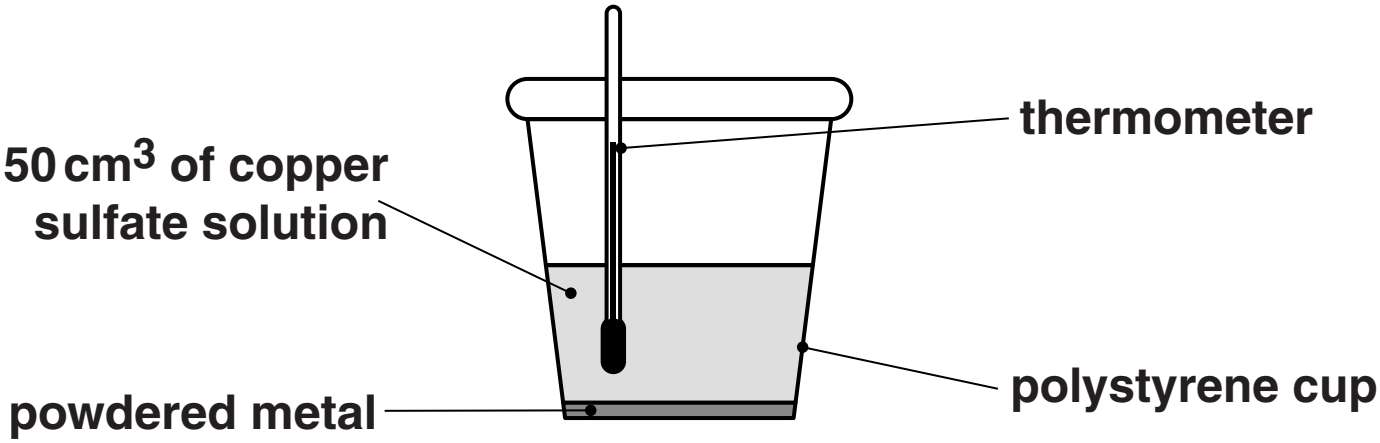
[Total: 2]

SECTION C – MODULE C6

10 This question is about the reactivity of metals.

(a) Amanda and Ken investigate the reactivity of iron, magnesium, tin and zinc.

Look at the diagram. It shows the apparatus they use.



Look at their table of results.

metal	starting temperature in °C	highest temperature in °C	temperature rise in °C
iron	20	52	32
magnesium	21	71	50
tin	22	41	
zinc	19	60	41

(i) Calculate the temperature rise for tin.

Write your answer in the table. **[1]**

(ii) Zinc reacts with copper sulfate solution to make copper.

A solution of zinc sulfate is also made.

Write down the WORD equation for this reaction.

_____ **[1]**

(b) Write down iron, magnesium, tin and zinc in order of reactivity.

MOST reactive metal _____

_____

_____

LEAST reactive metal _____

[1]

(c) Oil and grease are used to prevent rusting of iron.

Write down TWO other ways that can be used to prevent iron rusting.

1 _____

_____

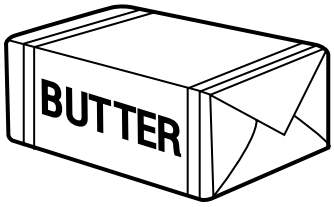
2 _____

_____ **[2]**

[Total: 5]

11 This question is about oils and fats.

(a) Look at the pictures.



butter, a fat **olive oil, an oil**

Fats and oils are the same type of chemical.

What is the difference between fats and oils at room temperature?

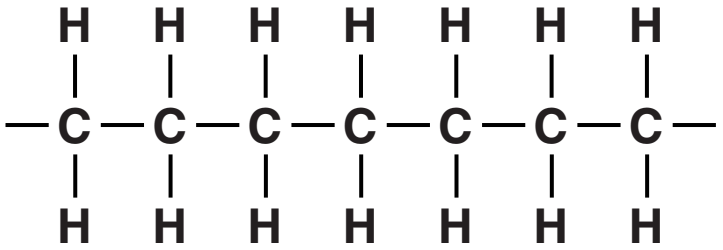
_____

_____ **[1]**

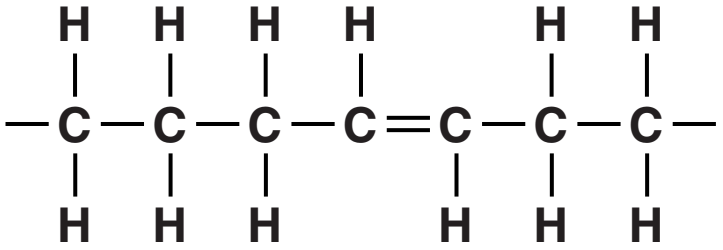
(b) (i) Butter contains saturated and unsaturated fats.

Fats A and B are both found in butter.

Look at parts of the structures of fats A and B.



fat A



fat B

Fat B is unsaturated.

How can you tell from its structure?

_____ **[1]**

(ii) Jill wants to find out if olive oil is unsaturated.

Write about the experiment she does.

Your answer should include

- **the chemical she uses**
- **any colour change.**

_____

_____

_____

_____ **[2]**

(c) Adam shakes olive oil with water. The oil does not dissolve in the water.

The tiny droplets of oil spread throughout the water.

What is the name of this type of mixture?

Choose from the list.

alloy

emulsion

precipitate

resin

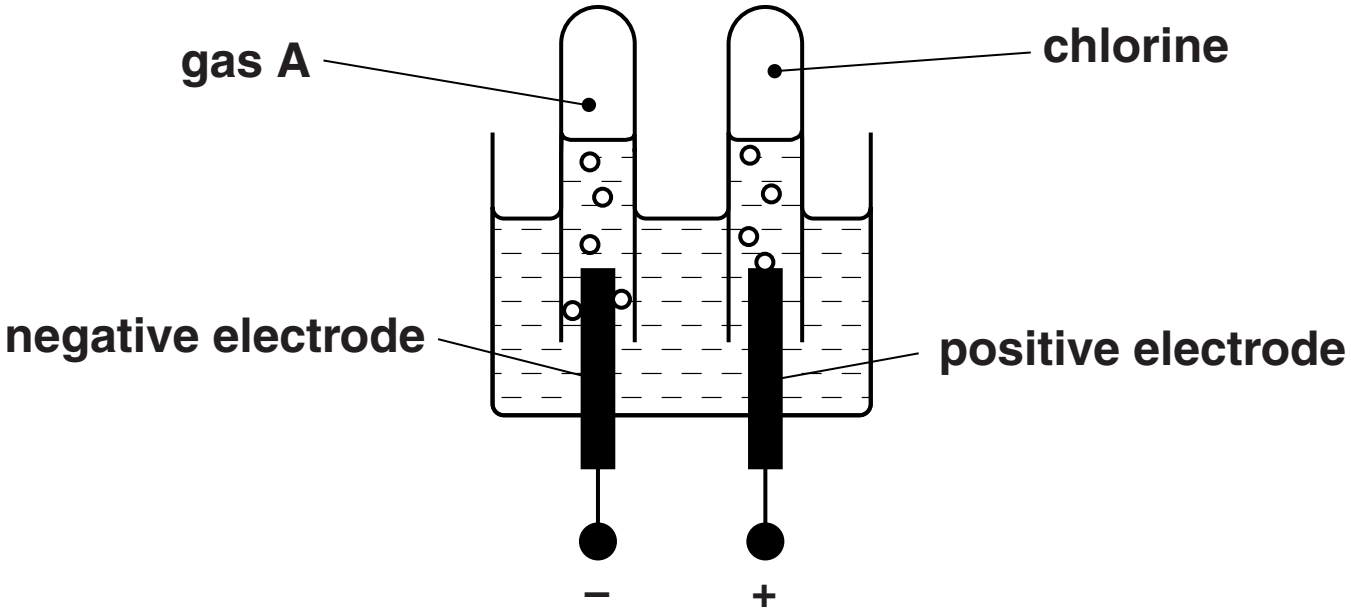
solution

answer _____ [1]

[Total: 5]

12 (a) Sarah investigates the electrolysis of concentrated sodium chloride solution.

Look at the apparatus she uses.



Bubbles of gas are made at both electrodes.

Sarah tests the gases.

Look at her results.

name of gas	test	observations
gas A is _____	light gas with a lighted splint	squeaky pop
chlorine	hold moist litmus paper in gas	_____ _____

Complete the table by

- **writing in the name of gas A**
- **describing what happens to the moist litmus paper.** **[2]**

(b) Sodium chloride is an important raw material.

The electrolysis of molten sodium chloride makes chlorine gas.

Write down one large-scale use of chlorine gas.

answer _____ [1]

[Total: 3]

13 Look at the molecular formulas of some compounds.

C_2H_5OH C_2H_4 CF_2Cl_2

(a) (i) The compound CF_2Cl_2 is an example of a chlorofluorocarbon.

Write down the NAMES of the elements in this compound.

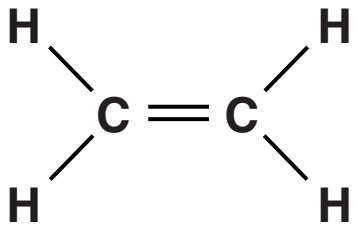
The Periodic Table may help you.

_____ **[1]**

(ii) Write down the total number of ATOMS in a molecule of C_2H_5OH.

answer _____ **[1]**

(iii) **Look at the DISPLAYED formula of ethene, C_2H_4.**



Draw the DISPLAYED formula of ethanol, C_2H_5OH.

[1]

(b) Ethanol is made from ethene.

ethene + water → ethanol

Write down the name of this TYPE of reaction.

Choose from the list.

dehydration

electrolysis

fermentation

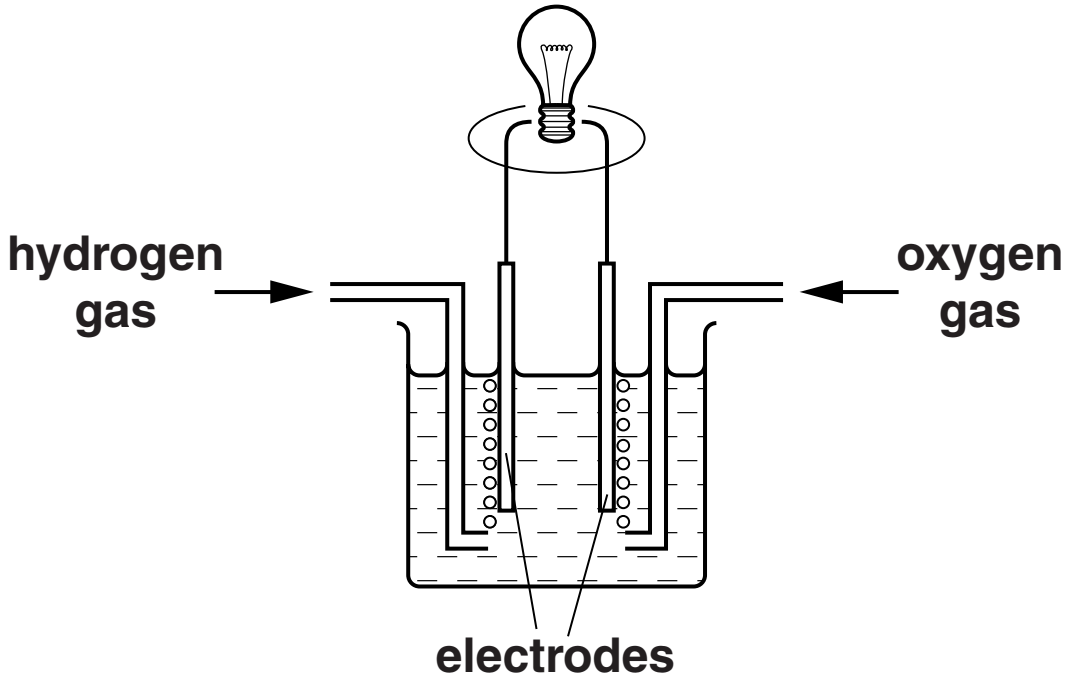
hydration

answer _____ [1]

[Total: 4]

14 This question is about fuel cells.

The diagram shows how a fuel cell works.



(a) Fuel cells produce energy.

Look at the list. It shows different types of energy.

electrical

heat

kinetic

sound

Write down the name of the MAIN type of energy made in a fuel cell.

Choose from the list.

answer _____ [1]

(b) Look at the word equation for the reaction in this fuel cell.

hydrogen + oxygen → water

Petrol and fuel cells can both be used to power cars.

Burning petrol makes carbon dioxide and water.

Write down ONE reason why using a fuel cell is better for the environment than burning petrol.

_____

_____ **[1]**

(c) Fuel cells are used in spacecraft instead of batteries.

Write down ONE advantage of using fuel cells instead of batteries.

_____

_____ **[1]**

[Total: 3]

END OF QUESTION PAPER

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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.