OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION **B642/01**

GATEWAY SCIENCE

CHEMISTRY B

Unit 2 Modules C4 C5 C6 (Foundation Tier)

WEDNESDAY 18 JUNE 2008

Afternoon
Time: 1 hour

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

CUP/T50944

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

INFORMATION FOR CANDIDATES

- The number of marks for each question 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.

FOR EXAMINER'S USE		
Section	**Max.**	**Mark**
A	**20**	
B	**20**	
C	**20**	
TOTAL	**60**	

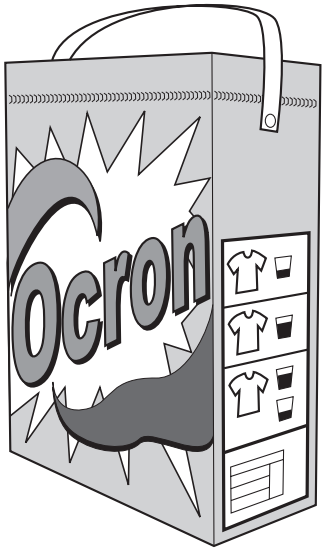
This document consists of **20** printed pages.

  [Turn over

Answer **all** the questions.

Section A – Module C4

1 Stowmarket Synthetics make a washing powder.



The washing powder is used to clean clothes in a washing machine.

It contains different ingredients.

Draw a straight line to join each **ingredient** to the **reason** it is used.

One line has been drawn for you.

ingredient	**reason why it is put into washing powder**
enzymes	removes coloured stains
optical brightener	gives a 'whiter than white' appearance
bleach	helps to remove food stains in low temperature washes
water softener	active cleaner
detergent	softens hard water

[3]

[Total: 3]

2 Diamond and graphite have different properties and different uses.

Look at the table.

It shows some information about the properties of diamond and graphite.

property	diamond	graphite
state at room temperature	solid	.....
appearance at room temperature	colourless, clear and lustrous	dull black
melting point	very high	.....
hardness	very hard	soft
solubility in water	insoluble	insoluble
electrical conductivity	does not conduct	good conductor

(a) Complete the table by writing in

- the state of graphite at room temperature
- the melting point of graphite. [2]

(b) Diamond is used in jewellery.

This is because diamond is colourless, clear and lustrous.

Diamond is also used to make cutting tools.

Write about **two** properties of diamond that make it suitable for making cutting tools.

Use the table to help you.

.....

.....

.....

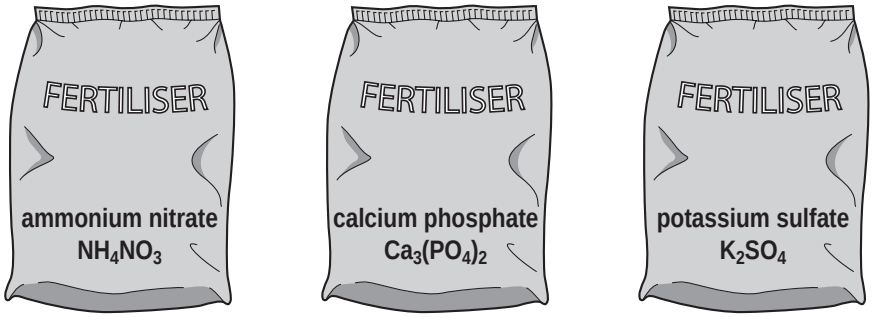
.....[2]

[Total: 4]

3 Natalie enjoys gardening.

She visits a garden centre and buys three bags of different chemical fertilisers.

The names of the fertilisers are shown.



(a) Natalie has to choose the correct fertiliser for her plants.

She uses the internet to find out about fertilisers.

(i) Natalie finds out that **nitrogen** is used to improve leaf and stem growth.

Which chemical fertiliser will improve leaf and stem growth?

Choose from the list.

ammonium nitrate, NH_4NO_3
calcium phosphate, $Ca_3(PO_4)_2$
potassium sulfate, K_2SO_4

answer .....[1]

(ii) Natalie finds out that **phosphorus** will improve root growth.

Which chemical fertiliser will improve root growth?

Choose from the list.

ammonium nitrate, NH_4NO_3
calcium phosphate, $Ca_3(PO_4)_2$
potassium sulfate, K_2SO_4

answer .....[1]

(b) Ammonium nitrate can be made by reacting an alkali with an acid.

(i) What is the name of the alkali needed?

.....[1]

(ii) What is the name of the acid needed?

.....[1]

[Total: 4]

4 Jack investigates sulfuric acid by using the internet.

He finds out that the formula of sulfuric acid is H_2SO_4.

(a) What is the **total** number of **atoms** in one molecule of sulfuric acid?

.....[1]

(b) Jack finds out that sulfuric acid is used to clean the surface of metals.

Write down one **other** use of sulfuric acid.

.....[1]

(c) Jack decides to do some experiments with dilute sulfuric acid.

(i) He measures the pH of dilute sulfuric acid.

Suggest a pH value for dilute sulfuric acid.

.....[1]

(ii) Jack adds some sodium hydroxide solution to dilute sulfuric acid.

Sodium hydroxide is an alkali.

The pH value of the acid changes as the sodium hydroxide is added.

Describe and explain what happens to the pH value.

.....

.....

.....[2]

(iii) A salt is made when sodium hydroxide reacts with dilute sulfuric acid.

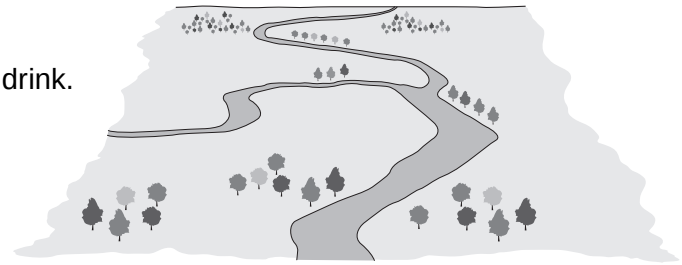
What is the name of this salt?

.....[1]

[Total: 6]

5 River water is sometimes polluted.

It must be purified before the water is safe to drink.



A sample of river water is analysed to see if it contains pollutants.

Look at the table. It shows the results of the analysis.

pollutant	mass of pollutant in the water sample in grams
lead ions	2.3
nitrate ions	96.1
pesticide	0.2
phosphate ions	48.1

(a) Which pollutant was found in the **least** amount in the water sample?

Choose from the table.

.....[1]

(b) River water may contain dangerous microbes.

These microbes are killed during water purification.

What is the name of the process that kills microbes?

Choose from the list.

chlorination

filtration

precipitation

sedimentation

answer .....[1]

(c) Water is an important industrial resource.

Suggest why.

.....[1]

[Total: 3]

Section B – Module C5

6 Tim wants to dilute a sample of concentrated sodium chloride solution.

(a) How can Tim dilute the concentrated solution?

.....[1]

(b) What is the unit for concentration?

Choose from the list.

dm^3

g / mol

mol / dm^3

answer .....[1]

(c) Liquid medicines given to children are usually diluted.

Suggest why.

.....

.....[1]

[Total: 3]

7 Sulfuric acid is made in the Contact Process.

Look at the word equation.

It describes one reaction that happens in the Contact Process.

sulfur dioxide + oxygen $\rightleftharpoons$ sulfur trioxide

(a) What is the meaning of the symbol $\rightleftharpoons$?

.....[1]

(b) The oxygen used in the Contact Process comes from a very cheap raw material.

What is the name of this raw material?

.....[1]

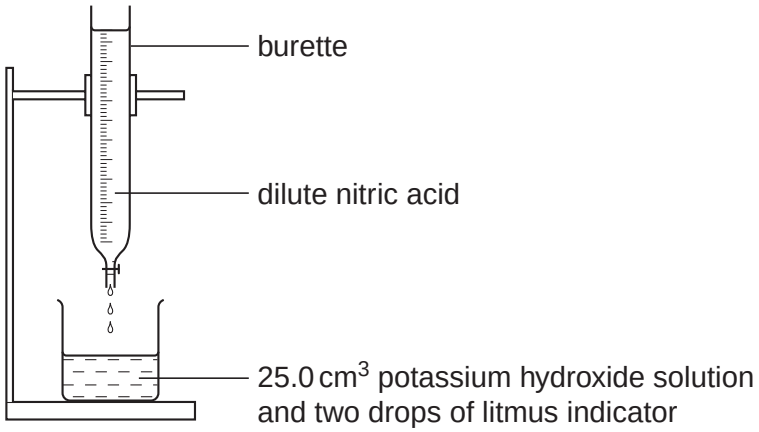
[Total: 2]

8 This question is about acid-base titrations.

Judy wants to find out the volume of dilute nitric acid needed to neutralise 25.0 cm^3 of an alkali.

The alkali used is potassium hydroxide solution.

Look at the apparatus she uses.



She adds dilute nitric acid slowly until the litmus changes colour.

(a) What is the colour of litmus in alkali and in acid?

colour in alkali .....

colour in acid .....[1]

(b) She repeats the experiment two more times.

Look at Judy's results table.

titration number	**1**	**2**	**3**
final burette reading in cm^3	29.7	27.0	34.8
initial burette reading in cm^3	8.5	6.9	14.9
volume of acid used (titre) in cm^3	.....	20.1	19.9

(i) Calculate the titre for titration number **1**.

Write your answer in the results table. [1]

(ii) Judy decides to only use the second and third titration results.

Explain why.

.....[1]

(iii) Calculate the **average** titre for titration numbers **2** and **3**.

.....

.....

.....

average titre = ... cm^3 [1]

[Total: 4]

9 Silicon dioxide and sodium ferrate have been discovered on the planet Mars.

(a) Silicon dioxide, SiO_2, has a molar mass of 60 g / mol.

Calculate the molar mass of sodium ferrate, Na_2FeO_4.

The relative atomic mass (A_r) for O is 16, for Na is 23, for Si is 28 and for Fe is 56.

.....

.....

.....

.....

molar mass = ... g / mol [1]

(b) Compound **X** has been discovered on the planet Mars.

Compound **X** has the empirical formula CH.

Which two formulae could be compound **X**?

Choose from the list.

$\mathbf{CH_4}$	$\mathbf{C_2H_2}$
$\mathbf{C_2H_6}$	$\mathbf{C_4H_8}$
$\mathbf{C_6H_6}$	$\mathbf{C_{10}H_{22}}$

answer ..... and .....[2]

[Total: 3]

10 Sulfamic acid solution is used to remove limescale in kettles.

Limescale is mostly calcium carbonate.

Sulfamic acid reacts with calcium carbonate as shown in the equation.

sulfamic acid + calcium carbonate → calcium sulfamate + carbon dioxide + water

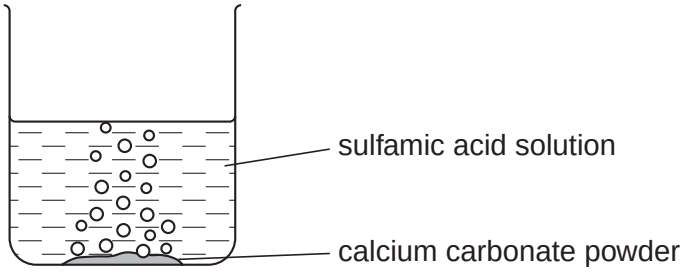
(a) One of the **products** of this reaction is a **gas**.

Which one?

.....[1]

(b) Robin investigates sulfamic acid solution.

(i) Look at the diagram.



Robin adds 1.0 g of calcium carbonate powder to 100 cm^3 of sulfamic acid solution.

There is a lot of fizzing, but after a minute the reaction stops.

Why does the reaction stop?

.....

.....[1]

(ii) Robin wants to find the pH value of the sulfamic acid solution.

One way is to use a pH probe and a pH meter.

Describe one **other** way Robin can find out the pH value.

.....

.....

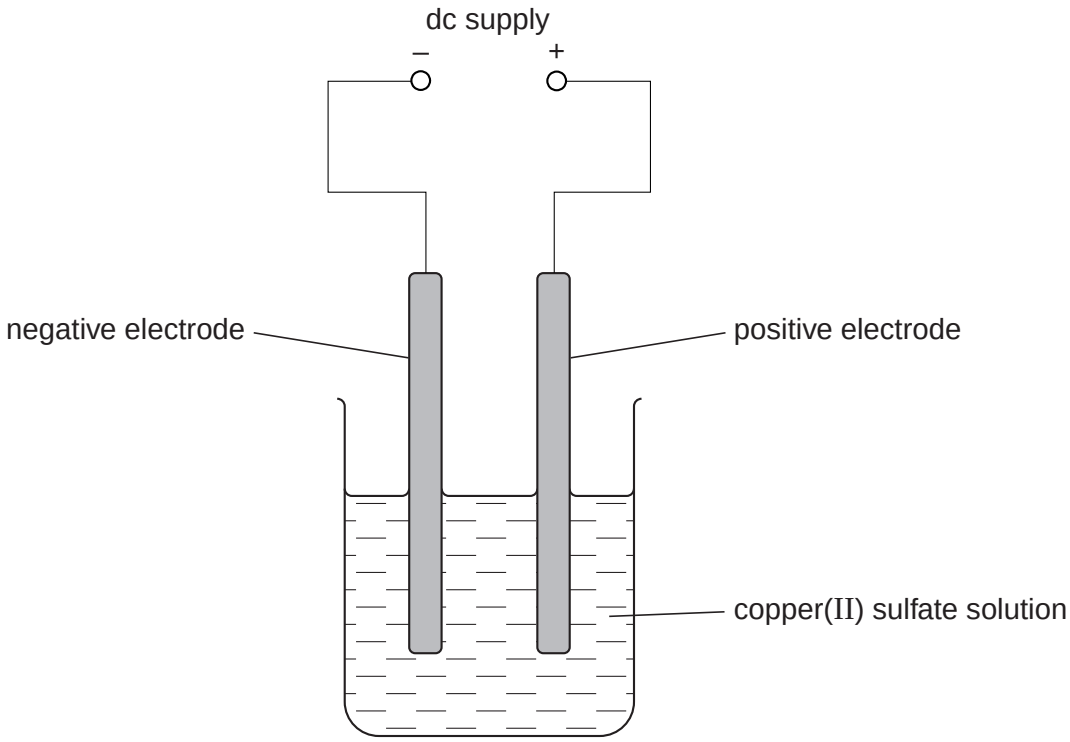
.....[2]

[Total: 4]

11 Azhar does an electrolysis experiment.

He uses copper(II) sulfate solution.

Look at the apparatus he uses.



Azhar uses copper electrodes.

(a) Look at this list of ions.

Cu^{2+}

H^{+}

OH^{-}

SO_4^{2-}

All these ions are in copper(II) sulfate solution.

Write down **one** ion that is attracted towards the negative electrode.

Choose from the list.

answer .....[1]

(b) Which **two** of the following observations are correct?

Put a tick (✔) next to each of the **two** correct answers.

The positive electrode gets plated with copper.	☐
A colourless gas is made at the negative electrode.	☐
The blue colour of the electrolyte becomes colourless.	☐
The negative electrode gains mass.	☐
The positive electrode loses mass.	☐

[2]

(c) Azhar decides to replace copper(II) sulfate solution with solid copper(II) sulfate.

Electrolysis does not happen.

Explain why.

.....

.....[1]

[Total: 4]

Section C – Module C6

12 This question is about hydrogen and oxygen.

(a) Look at the list.

It shows some tests that can be done on gases.

A A lighted splint burns with a squeaky pop.

B A glowing splint relights.

C Orange bromine water decolourises.

D Moist litmus paper is bleached.

(i) Which is the test for hydrogen?

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

answer ..... [1]

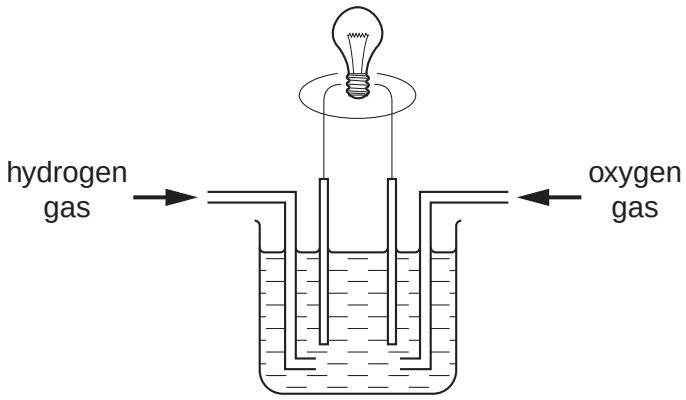
(ii) Which is the test for oxygen?

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

answer ..... [1]

(b) Hydrogen and oxygen are used in fuel cells.

Fuel cells make water and release energy.



Write a **word** equation for the reaction in a hydrogen-oxygen fuel cell.

..... + ... → ..... [1]

(c) Fuel cells release only a small amount of heat energy.

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

electrical

kinetic

sound

What is the **main** type of energy produced by a fuel cell?

Choose from the list.

answer .....[1]

(d) Fuel cells are used in spacecraft.

Write down one **advantage** of using fuel cells rather than batteries in spacecraft.

.....[1]

[Total: 5]

13 This question is about rusting.

(a) A piece of unprotected iron is left outside.

It quickly goes rusty.

Write down the names of **two** substances that are needed for iron to rust.

..... and .....[2]

(b) One way to stop iron rusting is to paint it.

(i) Why does painting stop the iron from going rusty?

.....

.....[1]

(ii) Write down two **other** ways that can be used to stop iron from rusting.

1 .....

2 .....[2]

(c) The rusting of iron involves both **oxidation** and **reduction**.

What is the name of this type of process?

Choose from the list.

displacement

fermentation

oxred

redox

answer .....[1]

[Total: 6]

14 This question is about fats and oils.

(a) Complete the following sentences.

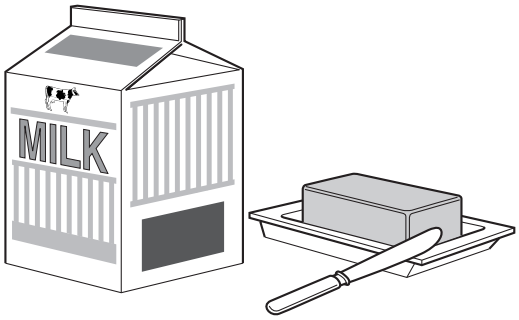
Choose words from the list.

gases **liquids** **solids**

Fats are ..... at room temperature.

Oils are ..... at room temperature. [2]

(b) Butter and milk are examples of emulsions.



What is an emulsion?

.....

.....

.....[2]

(c) Vegetable oil is used to make soap.

What substance reacts with the oil to make soap?

Choose from the list.

calcium carbonate

iron oxide

sodium nitrate

sodium hydroxide

answer .....[1]

[Total: 5]

15 Aspirin is an example of an **analgesic** drug.

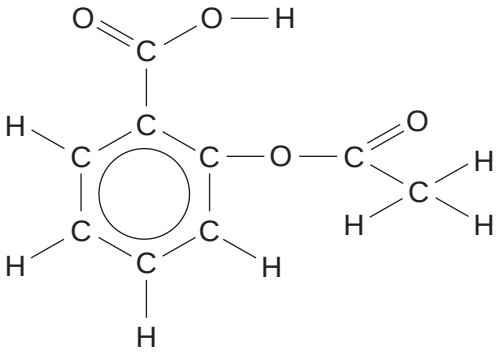
(a) What does analgesic mean?

.....[1]

(b) Write down the name of **another** analgesic drug.

.....[1]

(c) Look at the displayed formula of aspirin.



Put numbers into the boxes to complete the molecular formula for aspirin.

C ☐ H ☐ O ☐ [1]

(d) Many people use **soluble** aspirin.

Write down one **advantage** that soluble aspirin has compared to an insoluble aspirin tablet.

.....[1]

[Total: 4]

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.