Centre No.					
Candidate No.					

Paper Reference (complete below)						
				/		

Surname	Initial(s)
Signature	

Paper Reference(s)

1036/4H

Edexcel GCSE

Science: Chemistry

Paper 4H

Higher Tier

Wednesday 19 June 2002 – Afternoon

Time: 1 hour

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
5	
6	
Total	

Materials required for examination
Calculator

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, surname and initials, the paper reference and your signature. The paper reference is shown above.
Answer ALL questions in the spaces provided in this book.
Show all stages in any calculations and state the units. Calculators may be used.
Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for the various questions are shown in round brackets: e.g. (**2**).
This paper has six questions. There are three blank pages.

Turn over

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THE PERIODIC TABLE

Period	Group 1	2											3	4	5	6	7	0
1																		4 He Helium 2
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
3	23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
4	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
5	85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	99 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
6	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	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
7	223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															

Key

Relative atomic mass
Symbol
Name
Atomic number

1. (a) Equal volumes of different samples of water were shaken with equal volumes of soap solution in three separate test tubes.
The height of the lather in each test tube was measured.

Leave blank

sample of water	height of lather (cm)
A	0
B	6
C	6

(i) What is formed in the mixture of **A** and soap solution instead of lather?

.....

(1)

(ii) What is the name of the type of water that does not form a lather with soap solution?

.....

(1)

(iii) How could you treat another sample of **A** so that it would form a lather when shaken with soap solution?

.....

(1)

(iv) Which of the samples could be pure water?

.....

(1)

(b) Describe and explain what you would **see** when the following solutions are shaken with soap solution.

(i) calcium nitrate solution .....

.....

(2)

(ii) lithium nitrate solution .....

.....

(2)

Q1

(Total 8 marks)

Leave blank

2. Silver chloride (AgCl) can be prepared by reacting silver nitrate ($AgNO_3$) solution with sodium chloride solution. Silver chloride is insoluble.

(a) Complete the balanced equation, including state symbols, for this reaction.

$AgNO_3(.....)$ + ...(.....) ⟶ $AgCl(.....)$ + $NaNO_3(.....)$

(3)

(b) Describe how you would obtain a pure, dry sample of silver chloride from silver nitrate solution and sodium chloride solution.

.....

.....

.....

.....

(3)

(c) Three test tubes contain solutions of potassium chloride, potassium bromide and potassium iodide.

Dilute nitric acid and silver nitrate solution are added to each solution.
A precipitate is formed in each test tube.

Draw a line to join each solution to the result of the test.

solution	**test result**
potassium chloride •	• cream precipitate
potassium bromide •	• red precipitate
potassium iodide •	• white precipitate
	• yellow precipitate

(3)

(d) Describe a test to show the presence of potassium in solid potassium chloride.

Leave blank

.....

.....

.....

(2)

Q2

(Total 11 marks)

TURN OVER FOR QUESTION 3

Leave blank

3. Calcium hydroxide and calcium carbonate are white solids.

(a) In an experiment, a small powdered sample of each of these solids is shaken with water in a test tube. Calcium hydroxide forms a solution and calcium carbonate forms a suspension.
Describe what you would **see** in each test tube.

(i) calcium hydroxide

.....

.....

.....

(2)

(ii) calcium carbonate

.....

.....

.....

(2)

(b) (i) Describe and explain what you would **see** when some Universal indicator solution is added to calcium hydroxide solution.

.....

.....

.....

(2)

(ii) Why is calcium hydroxide used in agriculture?

.....

(1)

(c) Draw a line to join each compound to the formula of the main substance present in it.

Leave blank

compound	formula
marble	$CaCO_3$
gypsum	$CaSiO_3$
slag	$CaCl_2$
	$CaSO_4$

(3)

Q3

(Total 10 marks)

TURN OVER FOR QUESTION 4

Leave blank

4. Sulphuric acid is manufactured by the Contact process.

(a) The sulphur used in this process can be obtained by burning hydrogen sulphide in a limited supply of air.

Write the balanced equation for the combustion of hydrogen sulphide (H_2S) to form sulphur and water.

.....

(2)

(b) A later stage in the Contact process is the catalytic oxidation of sulphur dioxide to sulphur trioxide. This reversible reaction takes place at a pressure of about two atmospheres and a temperature of about 450 °C.

The equation for the catalytic oxidation of sulphur dioxide is

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

(i) Name the catalyst used in this reaction.

.....

(1)

(ii) Calculate the volume of sulphur dioxide and the volume of oxygen needed to produce 100 dm^3 sulphur trioxide.

(You should assume 100% conversion and that all volumes are measured at the same temperature and pressure.)

.....

.....

.....

.....

volume of sulphur dioxide = ...

volume of oxygen = ...

(2)

(iii) State **one** advantage of using a pressure higher than two atmospheres for the oxidation of sulphur dioxide.
Explain your answer.

Leave blank

.....

.....

.....

.....

.....

(3)

(iv) Give **one** reason why a higher pressure is **not** used.

.....

.....

(1)

Q4

(Total 9 marks)

TURN OVER FOR QUESTION 5

Leave blank

5. The concentration of a solution of sodium hydroxide was found by titrating the solution with 0.200 mol dm^{-3} sulphuric acid.
25.0 cm^3 of the sodium hydroxide solution required 31.5 cm^3 of the sulphuric acid for complete reaction.

The equation for the reaction is

$$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$$

(a) (i) Explain why Universal indicator is **not** a suitable indicator for use in titrations.

.....

.....

(1)

(ii) Name a suitable indicator for this titration.

.....

(1)

(b) (i) Calculate the concentration, in mol dm^{-3}, of sodium hydroxide in the solution.

.....

.....

.....

.....

.....

.....

.....

.....

(3)

(ii) Calculate the concentration, in g dm^{-3}, of sodium hydroxide in the solution.

(Relative atomic masses: H = 1.0; O = 16; Na = 23)

.....

.....

.....

(2)

(c) Sodium hydroxide solution is used to test for copper(II) ions in solution.

Leave blank

(i) Describe what you would **see** in this test.

.....

.....

(2)

(ii) Write the ionic equation for this reaction.

.....

(3)

Q5

(Total 12 marks)

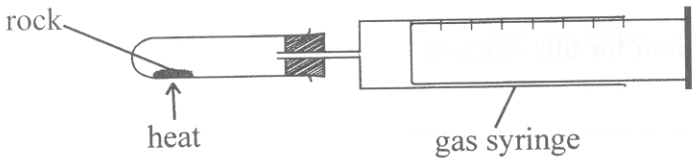
TURN OVER FOR QUESTION 6

Leave blank

6. Two groups of students investigated the percentage of calcium carbonate in identical samples of rock. Each group heated the same mass of rock at the same temperature for the same length of time. The equation for the only reaction taking place was

$$CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$$

(a) The first group of students used the apparatus shown.



They heated 1.00 g of rock and, after allowing the apparatus to cool, found 230 cm^3 of gas had collected.

(i) Calculate the mass of calcium carbonate present in the sample of rock.

(Relative atomic masses: C=12; O=16; Ca=40)

(1 mol of gas occupies 24 dm^3 at room temperature and atmospheric pressure)

.....

.....

.....

.....

.....

.....

.....

(3)

(ii) Calculate the percentage of calcium carbonate these students found to be present in the sample of rock.

.....

.....

.....

(2)

(iii) Explain why it was necessary to allow the apparatus to cool before measuring the volume of carbon dioxide.

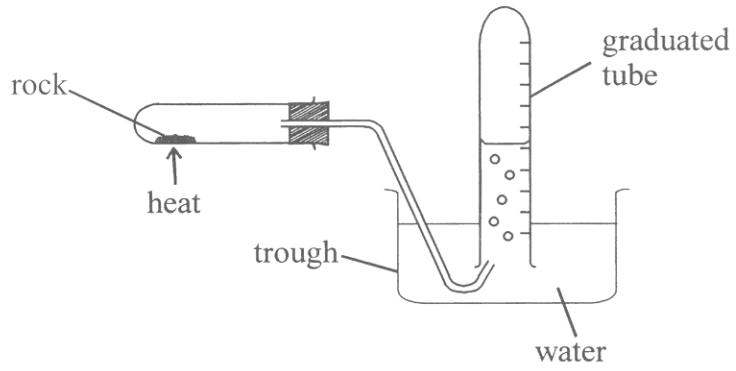
Leave blank

.....

.....

(1)

(b) The second group of students used the apparatus shown below for the experiment.



They heated 1.00 g of rock but collected a smaller volume of carbon dioxide than the first group of students. Subsequently they calculated that the sample of rock contained 0.915 g of calcium carbonate.

(i) Calculate the percentage of calcium carbonate these students found to be present in the rock.

.....

.....

(1)

(ii) Suggest why the method used by this group of students resulted in a lower reading for the volume of carbon dioxide.

.....

(1)

(c) Suggest another experiment the students could have carried out to find the percentage of calcium carbonate in the rock without collecting any gas.

.....

.....

.....

(2)

Q6

(Total 10 marks)

TOTAL FOR PAPER: 60 MARKS

END