Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						1	5	3	0	/	4	H	Signature	

Paper Reference(s)

1530/4H

Edexcel GCSE

Chemistry A [1530]

Paper 4H

Higher Tier

Thursday 21 June 2007 – 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

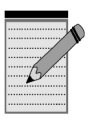
Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and 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 parts of questions are shown in round brackets: e.g. **(2)**.
This paper has six questions. There are no blank pages.

Advice to Candidates



This symbol shows where the quality of your written answer will also be assessed.

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THE PERIODIC TABLE

Period	1	2											3	4	5	6	7	0
1								1 H Hydrogen 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

Leave blank

1. A student carried out an experiment to test the amount of hardness in three different types of water, **A**, **B** and **C**.

In each test, some soap solution was added to the sample of water. The mixture was shaken vigorously and the height of the lather formed was measured.

(a) State **two** factors that must be kept the same for this to be a fair test to compare the hardness in the three samples.

1. .....

2. .....

(2)

(b) A sample of **A** produced 3 cm height of lather. Samples of **B** and **C** each produced no lather.

What do the results tell you about the hardness of waters **A**, **B** and **C**?

.....

.....

.....

.....

.....

.....

.....

(3)

(c) Fresh samples of water **B** and water **C** were boiled. After testing for hardness, boiled **B** produced 3 cm height of lather and boiled **C** produced no lather.

What can be deduced about the difference between the hardness in waters **B** and **C**?

.....

.....

(2)

(d) Some water **C** was passed through an ion exchange resin and a sample was collected. The test for hardness was carried out on this sample. 3 cm height of lather was formed.

State and explain the effect of the ion exchange resin on water **C**.

.....

.....

.....

(2)

(Total 9 marks)

Q1

Leave blank

2. Stainless steel, an alloy steel, plays an important part in our lives today, from cutlery and saucepans, to surgical instruments and chemical reactors. However, in 1900, the fate of all known steels exposed to the atmosphere was to end up as rusty scrap.

(a) Choose **two** of the uses of stainless steel mentioned and give the property of stainless steel that makes it suitable for each use.

use 1 .....

property .....

use 2 .....

property .....

(2)

(b) Aluminium is more reactive than iron. However, iron corrodes in the atmosphere but aluminium does not.

Explain why aluminium does not corrode.

.....

.....

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.....

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.....

.....

(3)

(c) What is meant by the term **alloy**?

.....

(1)

Leave blank

In 1912–13 Harry Brearley was investigating steels to use in rifle barrels. He wanted to make a hard wearing steel. He tested steels containing between 6% and 15% chromium. He left his used test samples outside the factory.

Six months later he passed the rusty pile of his samples and noticed that one of the samples was still shiny. This sample contained 12% chromium. Harry had discovered the first stainless steel.

(d) Suggest how Harry could have shared his findings with other scientists at that time.

.....

(1)

(e) What advantage does stainless steel have over mild steel?

.....

(1)

(f) What is the main advantage of mild steel over stainless steel?

.....

(1)

Q2

(Total 9 marks)

Leave blank

3. You are given five unlabelled bottles filled with liquids.

The liquids are copper sulphate solution, iron(II) chloride solution, sodium hydroxide solution, dilute sulphuric acid and pure water.

(a) Describe how you would use red or blue litmus paper to identify which bottle contains the sodium hydroxide solution.

.....

.....

(1)

(b) Sodium hydroxide solution is added to samples from each of the four remaining bottles.

Describe what you would **see**, if anything, when the sodium hydroxide solution is added to

copper sulphate solution .....

dilute sulphuric acid .....

iron(II) chloride solution .....

pure water .....

(4)

(c) In the presence of water, cobalt chloride paper changes colour from blue to pink.

Explain why this test could **not** be used to identify the pure water.

.....

.....

(2)

(d) (i) Describe the test for sulphate ions.

.....

.....

.....

.....

(3)

Leave blank

(ii) If the test for sulphate ions was carried out on all the liquids, which **two** of them would give a positive result?

1. .....

2. .....

(2)

Q3

(Total 12 marks)

Leave blank

4. The following is a description of a titration.

1. 25.0 cm^3 of sodium hydroxide solution, NaOH, (1.00 mol dm^{-3}) was measured in a measuring cylinder and poured into a clean conical flask.
2. A burette was rinsed and filled with dilute hydrochloric acid.
3. Three drops of phenolphthalein indicator were added to the flask.
4. The burette tap was opened to allow the acid to run into the flask.
5. The tap was turned off when the indicator changed colour.

(a) Suggest how the experiment could be made more accurate in

step 1 .....

(1)

step 5 .....

(1)

(b) What colour change is seen in step 5?

from ..... to .....

(1)

Leave blank

(c) The results of the titration are to be used to find the concentration of the hydrochloric acid.

(i) The volumes of hydrochloric acid used in a trial and two accurate titrations were:

trial = 20.60 cm^3
titre 1 = 20.05 cm^3
titre 2 = 19.95 cm^3

Calculate the volume of hydrochloric acid that should be used in the calculation.

.....

volume = ... cm^3
(1)

(ii) The equation for the reaction is

$$NaOH + HCl \rightarrow NaCl + H_2O$$

Calculate the concentration of the dilute hydrochloric acid in mol dm^{-3}.

.....

.....

.....

.....

.....

.....

.....

concentration = ... mol dm^{-3}
(3)

Q4

(Total 7 marks)

Leave blank

5. In the contact process the following reaction occurs.

$$2SO_2 + O_2 \rightleftharpoons 2\ SO_3$$

The conditions used in the industrial process are:

450 °C
2 atm pressure
vanadium(V) oxide catalyst.

(a) The forward reaction is exothermic.
Explain the effect of using a temperature lower than 450 °C.

.....

.....

.....

.....

.....

(3)

(b) Explain why a relatively low pressure of only 2 atm, rather than a higher pressure, is used.

.....

.....

(2)

(c) State the effect of using the catalyst on the equilibrium yield.

.....

(1)

Leave blank

(d) In a test run, 1 kg of sulphur dioxide is reacted.

(i) Calculate the volume, at room temperature and pressure, of this mass of sulphur dioxide.

(Relative atomic masses: O = 16.0; S = 32.0)
(1 mol of any gas at room temperature and pressure has a volume of 24.0 dm^3)

.....

.....

.....

.....

volume = ... dm^3
(3)

(ii) What is the maximum volume of sulphur trioxide that could be produced from 1 kg of sulphur dioxide?

.....

volume = ... dm^3
(1)

(iii) Calculate the minimum volume of air required to react completely with 1 kg of sulphur dioxide.
(Assume 20% of air, by volume, is oxygen.)

.....

.....

.....

.....

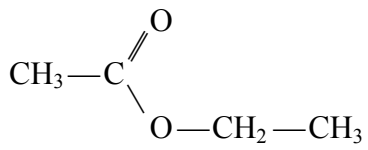
volume = ... dm^3
(2)

Q5

(Total 12 marks)

Leave blank

6. The structure of a molecule of ethyl ethanoate is shown.



(a) This compound reacts with water to produce an alcohol and ethanoic acid.

Write the balanced equation for this reaction.

.....

(3)

(b) Ethanoic acid is a member of an homologous series.

(i) Give the names of the first four members of this series.

.....

.....

.....

.....

(2)

(ii) What is meant by the term **homologous series**?

.....

.....

.....

(2)

(iii) State the products that are formed when ethanoic acid reacts with magnesium.

.....

(2)

(iv) Ethanoic acid reacts with sodium hydroxide solution in a neutralisation reaction.

Write the ionic equation for this reaction.

.....

(2)

Q6

(Total 11 marks)

TOTAL FOR PAPER: 60 MARKS

END