Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						6	2	4	3	/	0	2	Signature	

Paper Reference(s)

6243/02

Edexcel GCE

Chemistry

Advanced Subsidiary

Unit Test 3B

Wednesday 4 June 2008 – Morning

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
Nil

Items included with question papers
Nil

Candidates may use a calculator.

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper. The paper reference is shown above.
Answer **ALL** the questions in the spaces provided in this question paper.
Do not use pencil. Use blue or black ink.
Show all the steps in any calculations and state the units.

Information for Candidates

The total mark for this paper is 50. The marks for individual questions and parts of questions are shown in round brackets: e.g. **(2)**. There are 16 pages in this question paper. All blank pages are indicated.
A Periodic Table is printed on the back cover of this booklet.

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.
You will be assessed on your Quality of Written Communication in this paper.

Printer's Log. No.
M30398A
W850/R6243/57570 7/7/7/3/1

M 3 0 3 9 8 A 0 1 1 6

Turn over

edexcel
advancing learning, changing lives

Leave blank

Answer ALL the questions. Write your answers in the spaces provided.

1. (a) (i) Describe the test for hydrogen and give the positive result.

.....

.....

(2)

(ii) Describe the test for oxygen and give the positive result.

.....

.....

(2)

(b) A student dissolved a sample of a substance, **A**, in distilled water. The student then added barium chloride solution followed by dilute hydrochloric acid.

(i) The student concluded from the test that **A** was a sulphate. Describe the observations that led to this conclusion.

.....

.....

.....

(2)

(ii) How would the student's observation differ if **A** were a sulphite?

.....

.....

(1)

(iii) Describe how the student would have tested for the presence of ammonium ions in **A**. State the observation that indicates the positive result of this test.

.....

.....

.....

.....

(2)

Leave blank

(c) The student then carried out a flame test on a sample of potassium chloride.

(i) State the colour of the flame.

.....

(1)

(ii) A sample of potassium chloride is contaminated with sodium chloride.

Explain why the presence of a sodium compound makes a flame test an unsatisfactory test for potassium ions.

.....

.....

.....

.....

(1)

Q1

(Total 11 marks)

BLANK PAGE

Leave blank

2. 2-chloro-2-methylpropane may be prepared from 2-methylpropan-2-ol by direct reaction with concentrated hydrochloric acid.

The equation for the reaction is

$$(CH_3)_3COH + HCl \rightarrow (CH_3)_3CCl + H_2O$$

The method for a preparation is as follows:

- 10 cm^3 (7.9 g) of 2-methylpropan-2-ol was placed in a separating funnel and 20 cm^3 of concentrated hydrochloric acid (an excess) added 4 cm^3 at a time.
- When all the hydrochloric acid had been added the mixture was allowed to stand for 20 minutes, with gentle shaking at intervals.
- The organic and aqueous layers were separated and the aqueous layer discarded.
- Sodium hydrogencarbonate solution was added a little at a time to the organic layer and on each addition the separating funnel was inverted and the tap opened.
- The aqueous layer was then discarded.
- Solid anhydrous sodium sulphate was added to the organic layer and the mixture swirled for a few minutes before the liquid was decanted into a flask and then distilled.

Data on the organic reactant and product are given below.

	2-methylpropan-2-ol	2-chloro-2-methylpropane
Molecular formula	$(CH_3)_3COH$	$(CH_3)_3CCl$
Molar mass/g mol^{-1}	74	92.5
Boiling temperature/°C	82	51
Density/g cm^{-3}	0.79	0.84

(a) (i) In the preparation, 5.8 g of 2-chloro-2-methylpropane was obtained from 7.9 g of 2-methylpropan-2-ol.

Calculate the percentage yield of 2-chloro-2-methylpropane.

(3)

Leave blank

(ii) Suggest why the yield obtained is less than 100%.

.....

.....

(1)

(b) (i) Draw a diagram of a separating funnel indicating clearly the aqueous layer and the layer of 2-chloro-2-methylpropane that would be observed at the end of the first stage of the reaction.

(2)

(ii) Suggest why it is necessary to periodically open the tap of the separating funnel when sodium hydrogencarbonate is added.

.....

.....

(1)

Leave blank

(c) Suggest a suitable temperature **range** over which to collect the final product.

.....

(1)

(d) Describe a **chemical** test and its result which could be used to show that the dry 2-chloro-2-methylpropane produced was **not** contaminated by 2-methylpropan-2-ol.

.....

.....

.....

.....

.....

(2)

Q2

(Total 10 marks)

Leave blank

3. Wine is an aqueous solution of ethanol with traces of other organic compounds which give the wine its characteristic flavour and aroma. Once opened, oxidation of the ethanol in the wine produces ethanoic acid.

- A white wine with an ethanol concentration of 2.25 mol dm^{-3} was opened and allowed to stand at room temperature for 2 weeks.
- A 25.0 cm^3 sample of the wine was transferred to a clean conical flask and phenolphthalein indicator added.
- Aqueous sodium hydroxide of concentration 0.205 mol dm^{-3} was added from a burette until the colour of the indicator changed.
- The titration was repeated and the titre values in cm^3 were 26.35, 26.90 and 26.45.

The equation for the neutralisation reaction is

$$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$$

(a) (i) Name the piece of apparatus used to measure 25.0 cm^3 of wine.

.....

(1)

(ii) State how the burette should be rinsed.

.....

.....

.....

(1)

(iii) State the colour change at the end-point.

From ..... **to** .....

(2)

(b) (i) Explain, by reference to appropriate error limits, what is meant by the term **concordant results**.

.....

.....

.....

(1)

Leave blank

(ii) Calculate the mean (average) titre which will be used to calculate the concentration of ethanoic acid.

(1)

(iii) Calculate the number of moles of sodium hydroxide reacting with 25.0 cm^3 of the wine.

(1)

(iv) Hence calculate the concentration of the ethanoic acid, in mol dm^{-3}.

(2)

(v) Calculate the percentage of the ethanol that has oxidised, given that one mole of ethanol forms one mole of ethanoic acid.

(1)

(c) Suggest why this method would **not** be effective for the analysis of the acid content of a red wine.

.....

.....

(1)

Q3

(Total 11 marks)

Leave blank

4. (a) Describe a chemical test and its result that would show the presence of the carbon-carbon double bond in hex-1-ene.

.....

.....

.....

(2)

(b) Suggest a physical test to confirm that the sample was hex-1-ene, rather than one of its isomers.

.....

.....

.....

(1)

Q4

(Total 3 marks)

Leave blank

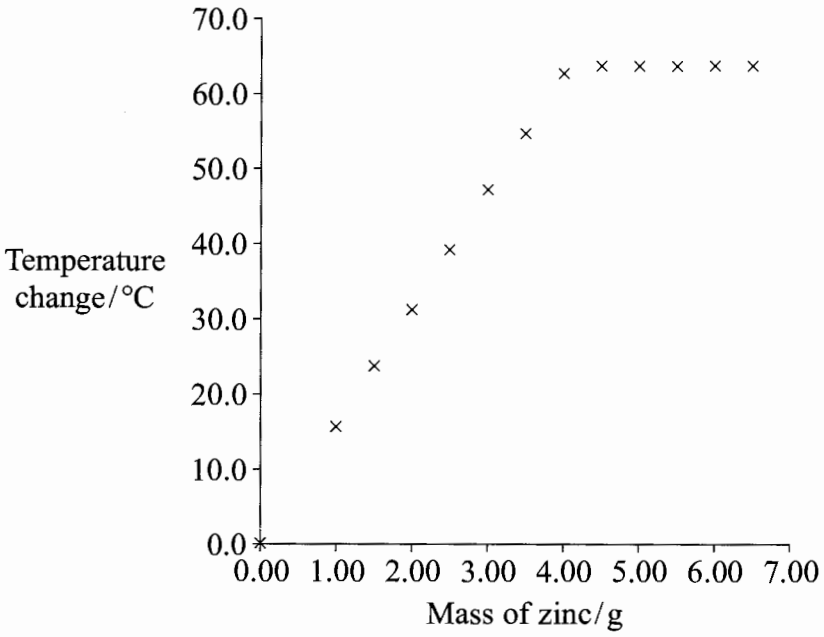
5. An experiment was carried out to measure the enthalpy change for the reaction of zinc with aqueous copper(II) sulphate.

The equation for the reaction is

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$$

- A measuring cylinder was used to transfer separate 50 cm^3 samples of 1.25 mol dm^{-3} copper(II) sulphate solution into polystyrene cups.
- Weighed amounts of zinc powder were added to each sample in turn.
- Each mixture was stirred thoroughly and the temperature rise noted with a thermometer accurate to 0.5 °C.

The results of this experiment are summarised on the graph below.



(a) Explain why the graph initially shows a rise in temperature and then levels off.

.....

.....

.....

.....

.....

(2)

Leave blank

(b) (i) Suggest why the mass of metal is **not** used in the calculation of the heat change.

.....

.....

.....

(1)

(ii) The graph shows that the maximum temperature change is 63.5 °C. Use this value to calculate the maximum heat change, in joules, in this reaction.

You should assume that the density of the solution is 1.00 g cm^{-3} and its heat capacity is the same as water, 4.18 J g^{-1} $°C^{-1}$.

(1)

(iii) From the heat change calculated in (b)(ii) calculate the enthalpy change, in kJ mol^{-1}, for the reaction. Include the appropriate sign and give your answer to **three** significant figures.

(4)

Leave blank

(c) (i) It is suggested that the precision of the experiment would be improved by using a thermometer accurate to 0.1 °C.

Explain why this suggestion is incorrect.

.....

.....

.....

(1)

(ii) Suggest a simple practical change to the **method** that would make the experiment more accurate.

.....

.....

.....

(1)

Q5

(Total 10 marks)

Leave blank

6. Group II carbonates decompose on heating according to the general equation:

$$MCO_3 \rightarrow MO + CO_2$$

Plan an experiment to show that the thermal stability of the carbonates increases as the group is descended.

You may assume that you have pure samples of each of the anhydrous Group II carbonates and access to the usual laboratory equipment and chemicals.

In your plan you should:

- Outline the method and the apparatus that you would use. It may be helpful to draw a diagram. [Detailed descriptions of experimental methods are **not** required]
- State the measurements you would make.
- Explain how you would deduce the order of stability from your data.
- State the steps that you would take to ensure that your results allow a valid comparison of the different carbonates.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Leave blank

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Q6

(Total 5 marks)

TOTAL FOR PAPER: 50 MARKS

END

THE PERIODIC TABLE

Period	1	2											3	4	5	6	7	0
	Group																	
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	65.4 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

Molar mass g mol^{-1}
Symbol
Name
Atomic number

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	(147) Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	163 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	(231) Pa Protactinium 91	238 U Uranium 92	(237) Np Neptunium 93	(242) Pu Plutonium 94	(243) Am Americium 95	(247) Cm Curium 96	(245) Bk Berkelium 97	(251) Cf Californium 98	(254) Es Einsteinium 99	(253) Fm Fermium 100	(256) Md Mendelevium 101	(254) No Nobelium 102	(257) Lr Lawrencium 103