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

Friday 16 January 2009 – Morning

Time: 1 hour

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
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 your signature.
Check that you have the correct question paper. The paper reference is shown above.
Answer **ALL** the questions. Write your answers 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

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

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.
N33917RA
W850/R6243/57570 7/7/7/3/1000/2/5200

N 3 3 9 1 7 R 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) **A** is a colourless, corrosive liquid which is miscible with water. On adding **A** to water, a large amount of heat is liberated. Complete the inferences column in the table below.

Test	Observation	Inferences
A dilute aqueous solution of **A** is added to a piece of magnesium ribbon.	Fizzing. When the gas is tested with a lighted splint, there is a squeaky pop.	Gas evolved is ..... **A** contains ..... ions
A few drops of dilute hydrochloric acid are added to a dilute aqueous solution of **A**. Then barium chloride solution is added.	White precipitate is formed.	The precipitate is .....

(3)

(ii) Write the formula of liquid **A** .....

(1)

(b) (i) **B** is a white solid. Complete the column in the table below to show the **formulae** of the ions present in **B**.

Test	Observation	Formula of ion
Flame test.	Lilac flame.	
Solid **B** is dissolved in water and acidified with dilute nitric acid. Silver nitrate solution is added.	Yellow precipitate.	

(2)

Leave blank

(ii) Give the ionic equation, **with state symbols**, for the reaction between an aqueous solution of **B** and silver nitrate solution.

.....

(1)

(iii) A further test can be carried out on the yellow precipitate to confirm its identity. Give the reagent added to the yellow precipitate and state what you would see.

Reagent .....

Observation.....

(2)

(c) When liquid **A** was added to solid **B**, a reaction took place during which the mixture became hot. Give TWO other observations you would expect to make.

First observation .....

Second observation.....

(2)

(d) Suggest one safety precaution you would take when mixing **A** and **B**. State a reason for the precaution.

Precaution .....

Reason.....

.....

(1)

Q1

(Total 12 marks)

Leave blank

2. Zinc reacts with aqueous copper(II) sulphate in an exothermic reaction.

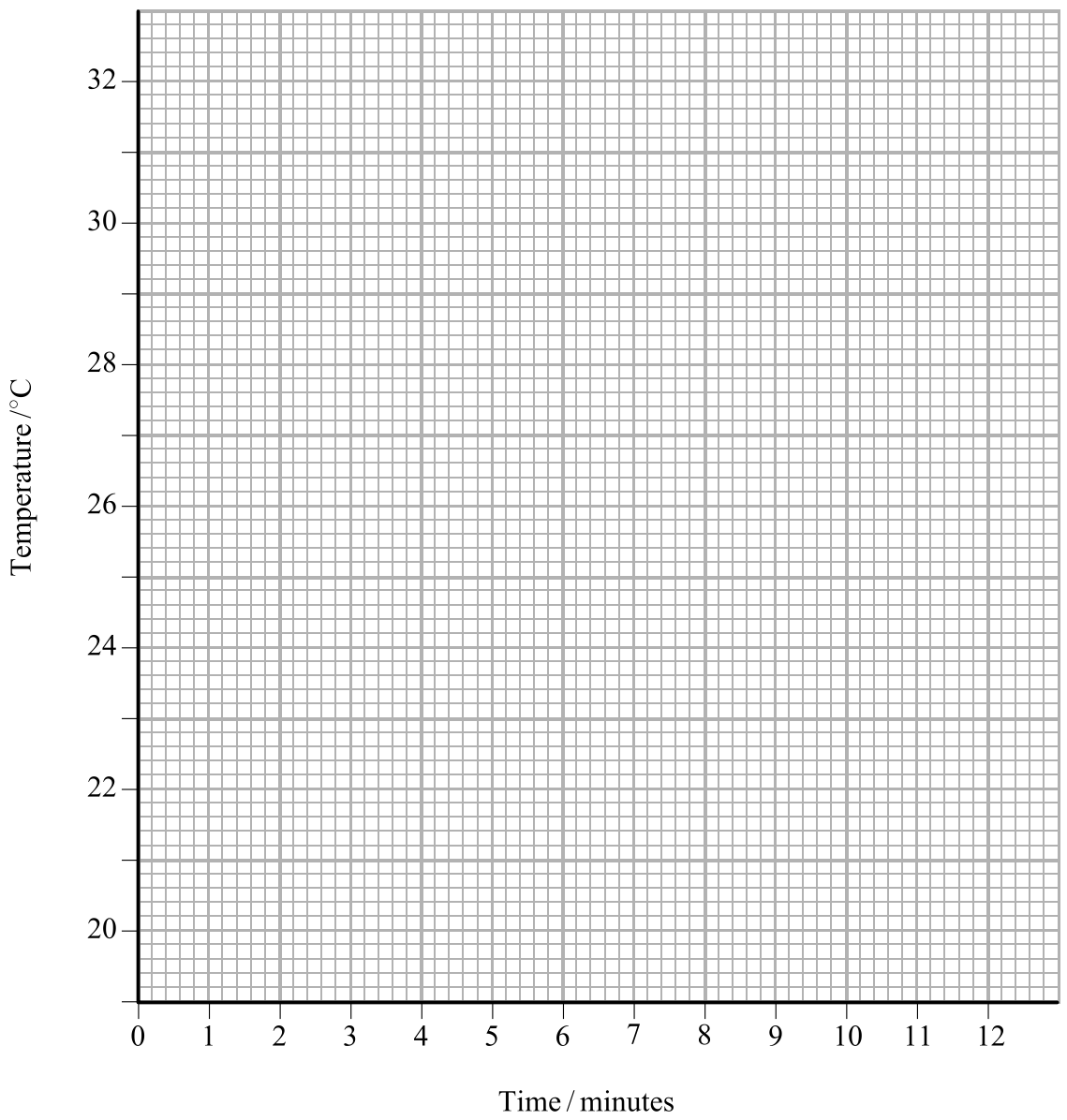
$$Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$$

In an experiment to find the enthalpy change for the reaction, a student weighed out 1.25 g of zinc powder. The student then used a burette to measure out 25.0 cm^3 of 0.800 mol dm^{-3} copper(II) sulphate solution into a polystyrene cup. The temperature of the solution in the cup was measured every minute for 12 minutes, with the zinc being added after four minutes.

The temperature readings obtained are shown in the table below.

Time /minutes	0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0
Temperature /°C	20.2	20.2	20.2	20.2		29.3	30.7	30.2	29.8	29.4	29.0	28.6	28.2

(a) (i) Plot the points on the grid below.



(1)

Leave blank

(ii) Draw a line of best fit for the points before the fourth minute and another line for those points between the sixth and the twelfth minutes.

(1)

(iii) Use the graph to calculate the maximum temperature rise, ΔT. Show clearly on the graph how you obtained your answer.

ΔT = ... °C

(2)

(b) (i) Calculate the heat given out in the reaction, in joules. The solution has a density of 1.00 g cm^{-3} and a specific heat capacity of 4.18 J g^{-1} °C^{-1}.

(1)

(ii) Calculate the amount (moles) of zinc present in 1.25 g.

(1)

(iii) Calculate the amount (moles) of copper(II) sulphate, $CuSO_4$, in 25.0 cm^3 of a 0.800 mol dm^{-3} solution.

(1)

(iv) State which of the two reactants, zinc or copper(II) sulphate, is in excess. Justify your answer.

.....

.....

(1)

Leave blank

(v) Calculate the enthalpy change for the reaction in kJ mol^{-1}. Give your answer to **three** significant figures. Include a sign with your answer.

(2)

(c) Identify a major source of error, **other than heat loss**, in this experiment. Suggest ONE improvement to minimise this source of error.

Major source of error .....

.....

Improvement .....

.....

(2)

(d) The accuracy of the balance used to weigh a weighing bottle, first when empty and then containing the zinc powder, was ±0.01 g. Calculate the percentage error in the mass of zinc used in the experiment.

(1)

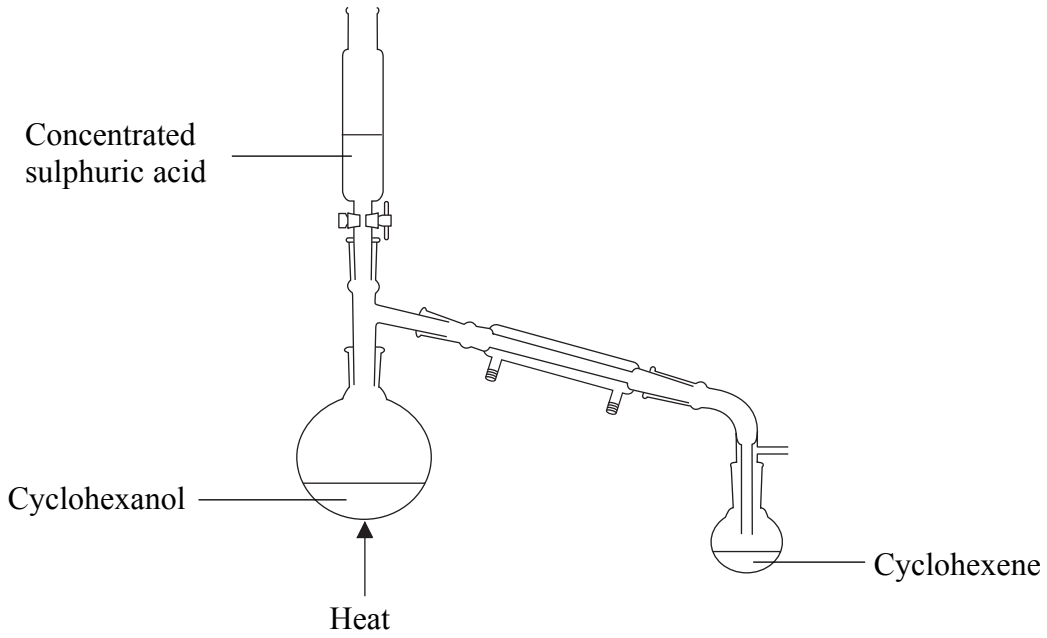
Q2

(Total 13 marks)

BLANK PAGE

Leave blank

3. In an experiment to prepare cyclohexene, C_6H_{10}, concentrated sulphuric acid was reacted with 10.0 g of cyclohexanol, $C_6H_{11}OH$, in the apparatus shown below.



An impure liquid, consisting of two immiscible layers, distilled over into the collection flask. Some black solid formed in the reaction flask.

The equation for this reaction is

$$C_6H_{11}OH(l) \rightarrow C_6H_{10}(l) + H_2O(l)$$

After purifying the liquid in the collection flask, 4.10 g of cyclohexene was collected.

(a) Calculate the percentage yield of cyclohexene in this experiment.

(3)

Leave blank

(b) (i) Suggest the identity of an impurity that could have been present with the cyclohexene in the collection flask before purification.

.....

(1)

(ii) Suggest the identity of the black solid formed in the reaction flask.

.....

(1)

(iii) Why does the formation of the solid in (ii) lower the yield of cyclohexene?

.....

.....

.....

(1)

(iv) The upper organic layer from the collection flask, which contains cyclohexene, is removed using a separating funnel. In order to purify the cyclohexene, four further steps are necessary. Identify these steps in the correct sequence.

Step 1 .....

.....

Step 2 .....

.....

Step 3 .....

.....

Step 4 .....

.....

(4)

Leave blank

(c) (i) Suggest a reagent which could be used to test for the presence of an –OH group in a sample of pure cyclohexanol. Give the expected result of this test.

Reagent .....

Result .....

(2)

(ii) Suggest a chemical test which could be used to show the presence of the C=C bond in a sample of pure cyclohexene. Give the expected result of the test.

Reagent .....

Result .....

(2)

Q3

(Total 14 marks)

Leave blank

4. A water-soluble organic acid, H_2X, is a solid at room temperature.

In an experiment to determine the molar mass of the acid, 2.95 g of solid H_2X was dissolved in water and made up to exactly 500 cm^3 of solution.

25.0 cm^3 of the H_2X solution was then titrated with aqueous sodium hydroxide of concentration 0.100 mol dm^{-3}. The titre was 25.00 cm^3.

$$H_2X(aq) + 2NaOH(aq) \rightarrow Na_2X(aq) + 2H_2O(l)$$

(a) Phenolphthalein is an indicator which is colourless in acidic solution and red in alkaline solution.

Give the colour change you would expect to observe at the end-point of the titration described above.

From ..... to .....

(1)

(b) Describe the essential steps you would take in order to dissolve the solid acid, H_2X, and make up exactly 500 cm^3 of solution ready for the titration. Your description should include the names of any apparatus required.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4)

Leave blank

(c) (i) Calculate the amount (moles) of NaOH in 25.0 cm^3 of 0.100 mol dm^{-3} solution.

(1)

(ii) Calculate the amount (moles) of H_2X in 25.0 cm^3 of solution.

(1)

(iii) Calculate the amount (moles) of H_2X in 500 cm^3 of solution.

(1)

(iv) From your answer to (iii) and the mass of solid acid, H_2X, calculate the molar mass of H_2X in g mol^{-1}.

(1)

Leave blank

(d) The organic acid, H_2X, may be represented by the formula $HOOC(CH_2)_nCOOH$.

Use your answer to (c)(iv) to determine the value of n.

(2) **Q4**

(Total 11 marks)

TOTAL FOR PAPER: 50 MARKS

END

BLANK PAGE

BLANK PAGE

THE PERIODIC TABLE

Period	1	2	Group										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	65.4 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