Centre No.						Paper Reference						Surname	Initial(s)
Candidate No.						6	2	4	3	/	01A	Signature	

Paper Reference(s)

6243/01A

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Edexcel GCE

Chemistry

Advanced Subsidiary

Unit Test 3A: Practical Test

Monday 12 May 2008 – Afternoon

Time: 1 hour 45 minutes

Question Number	Leave Blank
1	
2	
3	
4	
Total	

Materials required for examination

See Confidential Instructions (already issued to centres) relating to this practical test.

Items included with question papers

Nil

Candidates are allowed the use of textbooks and their own class notes during the practical test. Candidates may also 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. 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.
Final answers to calculations should be given to an appropriate number of significant figures.

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 12 pages in this question paper. All blank pages are indicated.

Advice to Candidates

You are reminded of the importance of clear English and careful presentation in your answers.
You are reminded that you should take all usual safety precautions when working in a chemistry laboratory.

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Answer ALL the questions.

Write your answers in the spaces provided in this question paper.

1. You are provided with approximately 0.5 g of a solid labelled **X**, and 3 cm^3 of an aqueous solution of compound **Y**.

Each compound contains a single anion and a single cation.

Carry out the following tests, recording your observations and answers to the questions in the appropriate boxes.

(a) Carry out a flame test on a small portion of solid **X**. In the inference box state the identity of the ion in **X** which is identified by this test.

Observation	Inference

(2)

(b) (i) Tip the remainder of **X** into 5 cm^3 of distilled water in a test tube. Stopper the tube and shake well to dissolve **X**.

To 1 cm^3 of the solution of **X**, add 1 cm^3 of dilute hydrochloric acid. Then add 10 drops of aqueous barium chloride.

In the inference box, state the identity of the ion in **X** which is identified by this test.

Observation	Inference

(2)

(ii) Explain the purpose of adding dilute hydrochloric acid in the test in (i).

.....

.....

(1)

Leave blank

(c) Suggest the formula of compound **X**.

(1)

(d) (i) To 1 cm^3 of the solution of **Y** in a boiling tube, add 0.5 cm^3 of aqueous sodium hydroxide. **Keep the mixture for test (d)(ii).**

Observation

(1)

(ii) To the mixture from test **(d)(i)**, add a small piece of aluminium foil and warm the mixture gently. Test the gas evolved with damp red litmus paper.

In the inferences box, identify the gas and indicate which ion(s) in **Y** could be identified from this test.

Observation	Inferences

(3)

(e) To 1 cm^3 of the solution of **Y** in a test tube, add 0.5 cm^3 of aqueous potassium iodide.

In the inferences box, identify the ion in **Y** that could be identified by this test, and write the formula of the product observed.

Observation	Inferences

(3)

Q1

(Total 13 marks)

Leave blank

2. You are provided with:

- Solution **B**, aqueous sodium hydroxide of concentration 0.150 mol dm^{-3};
- Solution **C**, an aqueous solution of a monobasic acid **HZ** of concentration 13.5 g dm^{-3};
- Phenolphthalein indicator

You are required to titrate portions of solution **C** with solution **B**.

$$HZ(aq) + NaOH(aq) \rightarrow NaZ(aq) + H_2O(l)$$

(a) **Procedure**

1. Rinse out the burette with a small amount of solution **B** and fill the burette with solution **B**.
2. Rinse out the pipette with a small amount of solution **C**, then use the pipette to transfer 25.0 cm^3 of the solution **C** to a conical flask. Add 4 drops of phenolphthalein indicator to the conical flask.
3. Titrate solution **C** with solution **B** until the end-point is reached.
4. Record your burette readings and titre in **Table 1**.
5. Repeat the procedure until you obtain **two** titres that differ by no more than 0.20 cm^3. Record all your burette readings and titres in **Table 1**.

Table 1

Titration number	1	2	3	4	5
Burette reading (final)/cm^3					
Burette reading (initial)/cm^3					
Titre/cm^3					

List the numbers of the titrations that you will use to calculate the mean (or average) titre.

Calculate the mean titre.

Write the value of your mean titre in the space below.

.....cm^3 of aqueous sodium hydroxide, solution **B**, react with 25.0 cm^3 of solution **C**.

(12)

Leave blank

(b) **Calculations**

(i) Calculate the amount (moles) of sodium hydroxide in the mean titre.

(1)

(ii) Calculate the amount (moles) of acid **HZ** in 25.0 cm^3 of solution **C**.

(1)

(iii) Calculate the amount (moles) of acid **HZ** in 1 dm^3 of solution **C**.

(1)

(iv) Hence determine the molar mass of the acid **HZ**.

(1)

(v) A student does this exercise but overshoots the end-point on the first titration, and does not rinse out the conical flask after emptying it. This flask is then used for the next titration.

State and explain what effect, if any, this would have on the next titre.

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(2)

Q2

(Total 18 marks)

Leave blank

3. You are provided with a specimen tube containing a sample of a Group 1 compound, **D**.

You are required to find the molar enthalpy change when **D** dissolves in water.

(a) **Procedure**

1. Use the 50 cm^3 measuring cylinder to measure 40 cm^3 of distilled water into a dry polystyrene cup held securely in a beaker. Place the thermometer in the distilled water.
2. Weigh, to at least two decimal places, the specimen tube containing **D**. Record the mass of the tube and **D** in **Table 2**.
3. Measure the temperature of the water in the cup to an accuracy of at least 0.5 °C. Record this temperature in **Table 3**.
4. Empty the sample of **D** from the specimen tube into the cup, stirring continuously until all of the solid has dissolved. The temperature of the mixture will change and then become steady. Measure this steady temperature of the solution of **D** to an accuracy of at least 0.5 °C. Record this temperature in **Table 3**.
5. Weigh the emptied specimen tube and record its mass in **Table 2**.

Table 2

Mass of specimen tube + **D** / g	
Mass of emptied specimen tube / g	
Mass of **D** transferred / g	

(2)

Table 3

Temperature of water before addition of **D**, T_1	°C
Steady temperature of the solution of **D**, T_2	°C

Calculate the change in temperature by subtracting T_1 from T_2.

$\Delta T = T_2 - T_1 =$ ..... °C

(6)

Leave blank

(b) **Calculations**

(i) Calculate the molar enthalpy change when **D** dissolves in water using the formula below:

$$\Delta H = \frac{-14.2 \times \Delta T}{\text{Mass of } \mathbf{D}} \text{ kJ mol}^{-1}$$

Include a sign with your value of ΔH, which should be given to an appropriate number of significant figures.

(3)

(ii) The experiment is repeated and a very similar figure is obtained. State, with a reason, whether this means that the value is accurate.

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(1)

Q3

(Total 12 marks)

Leave blank

4. A sample of magnesium carbonate is believed to be contaminated. The magnesium carbonate decomposes when heated strongly to give magnesium oxide and carbon dioxide, but the contaminant remains unchanged.

$$MgCO_3(s) \rightarrow MgO(s) + CO_2(g)$$

You are required to plan an experiment the results of which may be used to calculate the percentage by mass of magnesium carbonate in the sample.

You are provided with a Bunsen burner and tripod, crucible with tongs, spatula and a laboratory balance.

You may use these pieces of apparatus ONLY, and no other chemicals.

Include in your plan:

- The procedure you would follow
- The measurements you would make (you are **not** expected to invent data)
- An explanation of how you would use your measurements to calculate the percentage by mass of magnesium carbonate in the sample.

  [molar mass / g mol^{-1}: C = 12, O = 16, Mg = 24]

You are not required to carry out your plan.

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Q4

(Total 7 marks)

TOTAL FOR PAPER: 50 MARKS

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