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

Paper Reference(s)

6246/01B

Schools, Colleges, International Teaching Institutions and International Centres

Examiner's use only

Team Leader's use only

Edexcel GCE

Chemistry

Advanced

Unit Test 6A: Practical Test

Thursday 22 May 2008 – Morning

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 marks for individual questions and parts of questions are shown in round brackets: e.g. **(2)**.
There are 4 questions in this question paper. The total mark for this paper is 50.
There are 12 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 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.

1. You are provided with:

- Solution **F**, aqueous sodium thiosulphate, $Na_2S_2O_3$, of concentration 0.110 mol dm^{-3}.
- Solution **G**, aqueous potassium manganate(VII), $KMnO_4$.
- Dilute sulphuric acid, H_2SO_4.
- Aqueous potassium iodide, KI.
- Aqueous starch.

You are required to add excess aqueous potassium iodide to an acidified portion of aqueous potassium manganate(VII) and then titrate the iodine produced with aqueous sodium thiosulphate using starch indicator to detect the end-point.

$$2MnO_4^-(aq) + 16H^+(aq) + 10I^-(aq) \longrightarrow 2Mn^{2+}(aq) + 5I_2(aq) + 8H_2O(l)$$

$$2S_2O_3^{2-}(aq) + I_2(aq) \longrightarrow S_4O_6^{2-}(aq) + 2I^-(aq)$$

(a) **Procedure**

1. Rinse out the burette with a small amount of solution **F**, and then fill the burette with solution **F**.
2. Rinse out the pipette with a small amount of solution **G**. Transfer 25.0 cm^3 of solution **G** to a conical flask.
3. Use a measuring cylinder to add 15 cm^3 of dilute sulphuric acid to the conical flask.
4. Use a different measuring cylinder to add 15 cm^3 of aqueous potassium iodide to the conical flask. Swirl the flask and then stand it on a white tile under the burette.
5. Titrate the mixture in the conical flask with solution **F** until the brown iodine colour has faded to pale yellow. Now add about 15 drops of aqueous starch to the mixture in the conical flask. Continue to titrate until the blue-black colour disappears to leave a colourless solution.
6. Record your burette readings and titre in **Table 1**.
7. 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 numbers	1	2	3	4	5
Burette reading (final) / cm^3					
Burette reading (initial) / cm^3					
Titre / cm^3					

Leave blank

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 thiosulphate, solution **F**, react with the iodine produced by 25.0 cm^3 of solution **G**.

(10)

(b) **Calculation**

Calculate the concentration of potassium manganate(VII) in solution **G**, in mol dm^{-3}. Give your answer to **three** significant figures.

(3)

(c) A student carrying out the titration forgets to add starch indicator. What colour change would the student observe at the end-point?

.....

(1)

Q1

(Total 14 marks)

Leave blank

2. You are provided with aqueous solutions of two compounds, **H** and **I**. Each compound contains one cation and one anion. The anion is the same in both **H** and **I**.

Carry out the following tests, recording your observations and inferences in the spaces provided.

(a) To 1 cm^3 of the solution of **H** in a test tube, add dilute sodium hydroxide drop by drop until no further change occurs.

In the inference column, suggest what information your observations give you about the metal cation in **H**.

Observations	Inference

(3)

(b) To 2 cm^3 of the solution of **H** in a test tube, add about 6 drops of Universal Indicator solution.

In the inferences column suggest, with a reason, the identity of the cation in **H**.

Observation	Inferences

(3)

(c) To 2 cm^3 of the solution of **H** in a test tube, add dilute aqueous ammonia drop by drop until no further change occurs. You may assume that when the test tube is about half full the ammonia is in excess.

In the inference column, identify the compound observed.

Observations	Inference

(3)

Leave blank

(d) To 2 cm^3 of the solution of **H** in a test tube, add 6 drops of dilute nitric acid followed by 6 drops of aqueous silver nitrate.

In the inference column, suggest the identity of the anion in **H**.

Observation	Inference

(2)

(e) Suggest the formula of compound **H**.

(1)

(f) To 2 cm^3 of the solution of **I** in a boiling tube, add dilute aqueous ammonia drop by drop, while shaking the test tube gently, until there is no further change.

In the inferences column, suggest the formula of each new species observed.

Observations	Inferences

(5)

(g) Suggest the formula of compound **I**.

(1)

(Total 18 marks)

Q2

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3. You are provided with an organic compound, **J**. Carry out the following tests on **J**, recording your observations and inferences in the spaces provided.

(a) To 2 cm^3 of aqueous 2,4-dinitrophenylhydrazine in a test tube, add 6 drops of **J** and shake the tube gently. Allow the test tube to stand for a few minutes.

In the inference column, state what information this gives you about **J**.

Observation	Inference

(2)

(b) To 8 drops of **J** in a test tube, add 2 cm^3 of dilute sulphuric acid, followed by about 8 drops of aqueous potassium dichromate(VI). Stand the test tube in a beaker of warm water for about three minutes.

In the inferences column, suggest the homologous series to which **J** belongs. Explain your answer.

Observation	Inferences

(3)

(c) To 4 cm^3 of the aqueous 0.50 mol dm^{-3} sodium hydroxide in a test tube, add 4 drops of **J**. Then add aqueous iodine drop by drop until a faint brown colour remains. Allow the test tube to stand for a few minutes.

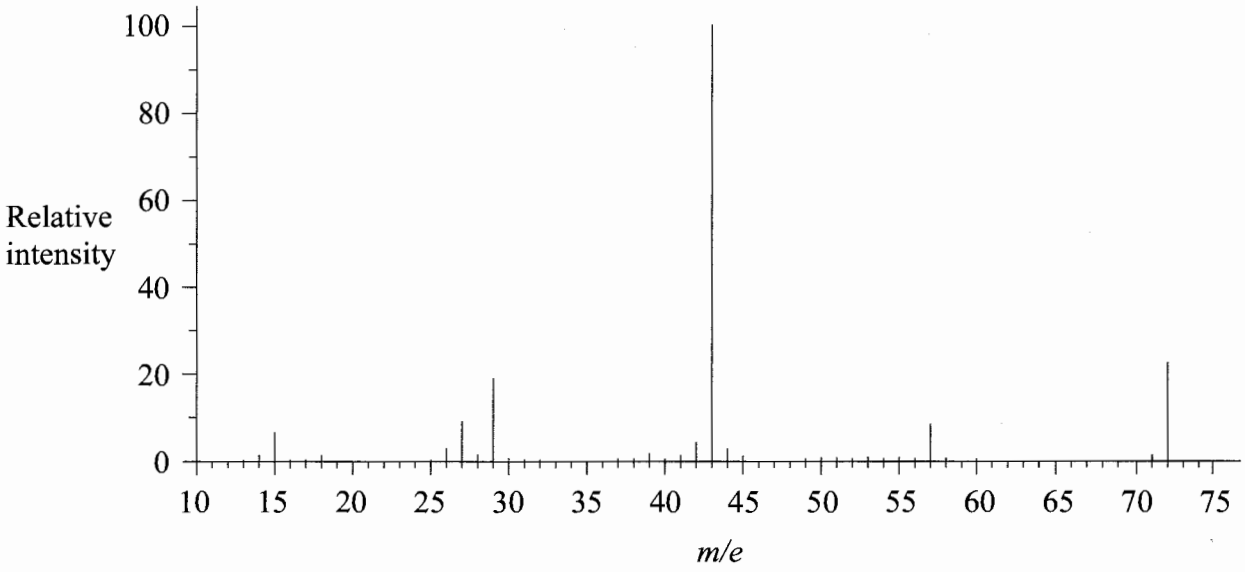
In the inferences column, suggest the identity of the compound observed and state what further information this gives you about **J**.

Observation	Inferences

(3)

Leave blank

(d) The mass spectrum of compound **J** is shown below.



(i) Suggest a structural formula of compound **J** based on the *m/e* value of the molecular ion and the results of the tests in (a) to (c).

m/e value of the molecular ion	Structural formula

(2)

(ii) Give the formula of the species responsible for the peak with *m/e* value of 57.

Formula of species

(1)

Q3

(Total 11 marks)

Leave blank

4. Assume you are given five unlabelled, colourless, aqueous solutions.

$AgNO_3(aq)$ $ZnCl_2(aq)$ $NH_3(aq)$ NaCl(aq) $BaCl_2(aq)$

You are provided with a labelled bottle of dilute aqueous sodium sulphate, $Na_2SO_4(aq)$, and have access to test tubes and dropping pipettes **but no other chemicals, test papers or apparatus**.

Plan a series of **chemical tests** to identify the five unlabelled solutions.

You should **begin by adding aqueous sodium sulphate to each** of the five colourless solutions.

You do not need to give volumes of reagents. In your answer, describe what you would expect to observe in your planned tests.

You are not required to carry out your tests.

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Q4

(Total 7 marks)

TOTAL FOR PAPER: 50 MARKS

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