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

Paper Reference(s)

6246/01A

International Teaching Institutions and International Centres

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Edexcel GCE

Chemistry

Advanced Level

Unit Test 6A: Practical Test

Monday 14 January 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.
Answer **ALL** the questions. Write your answers in the spaces provided in this question paper.
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)**.
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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Leave blank

Answer ALL the questions.

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

1. You are provided with approximately 1 g of a solid, labelled **S**.

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

(a) Observe and record the colour of **S**. In the inference box, state in which block of the Periodic Table the metal in **S** belongs.

Observation	Inference

(2)

(b) Take approximately half of the sample of **S** and place it in a test tube.

Heat the tube and test the gas produced with limewater.

Record your observations.

In the inferences box, identify the gas produced and the ion giving rise to its formation.

Observations	Inferences

(4)

Leave blank

(c) Add the remainder of the sample of **S** to a boiling tube. Then add just enough dilute hydrochloric acid to obtain a clear solution. **Keep this solution for the tests in part (d).**

Record **all** your observations in the box below.

Observations

(1)

(d) Place about 2 cm^3 of the solution from part (c) into each of two test tubes. Use these portions for the following tests.

(i) To one portion add dilute aqueous ammonia, drop by drop, until there is no further change. In the inference box, identify the cation in **S**.

Observations	Inference

(3)

(ii) To the second portion, add 4 drops of aqueous potassium iodide, followed by 3 drops of aqueous starch.

Name the substance identified by this test and state the nature of the reaction which led to its formation.

Observations	Inferences

(4)

Leave blank

(e) (i) Suggest the formula of compound **S**.

(1)

(ii) State the change of oxidation state of the cation in **S** in the reaction in test (d)(ii).

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

(2)

Q1

(Total 17 marks)

N 2 9 2 6 6 A 0 4 1 2

Leave blank

2. You are provided with an organic liquid **P**, which contains one functional group.

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

(a) To 1 cm^3 of 2,4-dinitrophenylhydrazine add 4 drops of **P**.

In the inference box, state what information this gives you about **P**.

Observation	Inference

(2)

(b) To 2 cm^3 of aqueous potassium dichromate(VI) add 1 cm^3 dilute sulphuric acid and then add 10 drops of **P**.

Warm the tube in a beaker of hot water for about a minute and observe the contents after this time.

In the inferences box state, with a reason, what additional information this test provides about **P**.

Observation	Inferences

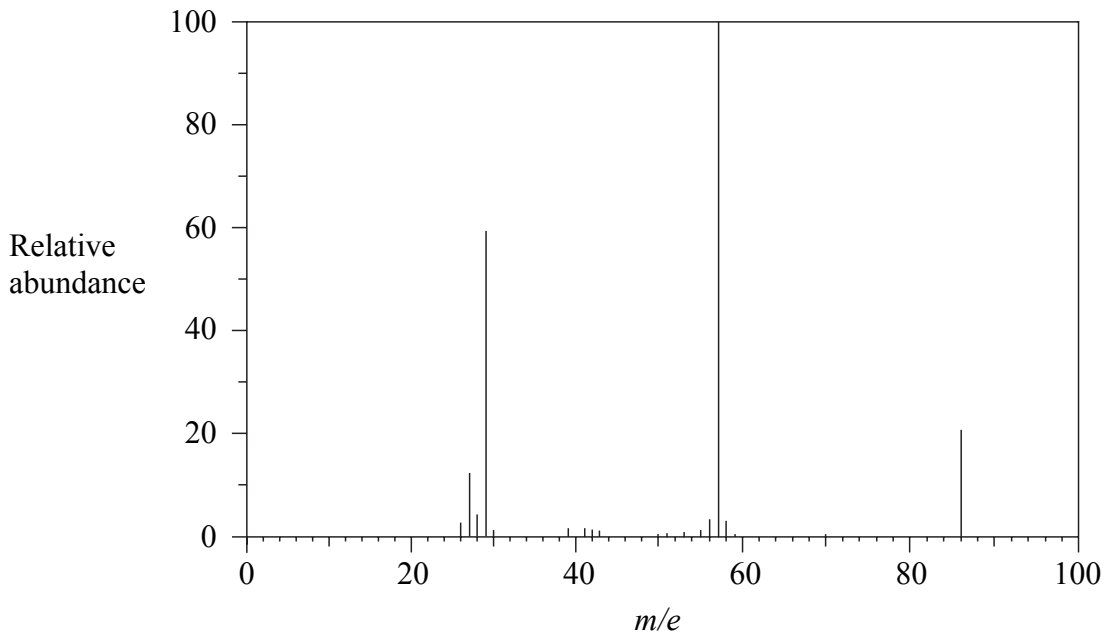
(3)

Leave blank

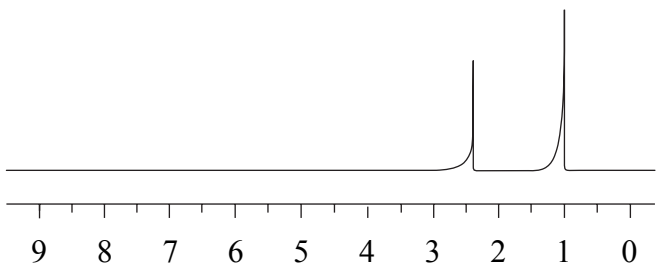
(c) The mass spectrum of compound **P** is given below. Give the *m/e* value of the likely molecular ion peak.

.....

(1)



(d) The low resolution proton nmr spectrum of **P** is given below.



What information about **P** is given by the fact that there are only two peaks in its nmr spectrum?

.....

(1)

N 2 9 2 6 6 A 0 6 1 2

Leave blank

(e) (i) Use the results of the chemical tests and the data obtained from both spectra to suggest a structure for compound **P**.

(1)

(ii) Explain why the areas under the peaks in the nmr spectrum are in the ratio 3:2.

.....

.....

(1)

Q2

(Total 9 marks)

N 2 9 2 6 6 A 0 7 1 2

Leave blank

3. You are provided with

- Solution **Q**, aqueous sodium nitrite, $NaNO_2$.
- Solution **R**, aqueous potassium manganate(VII), $KMnO_4$, of concentration 0.0200 mol dm^{-3}.
- Dilute sulphuric acid.

Carry out the following titration in order to calculate the concentration of solution **Q**.

(a) **Procedure**

1. Rinse out the burette with a small amount of solution **Q** and then fill the burette with solution **Q**.
2. Rinse out the pipette with a small amount of solution **R**. Transfer 25.0 cm^3 of solution **R** to a conical flask.
3. Use a measuring cylinder to add 25 cm^3 of dilute sulphuric acid to the conical flask.
4. Warm the contents of the flask to approximately 40 °C and titrate with solution **Q** until the purple colour has passed through pink to finally the colourless end-point.
5. Record your burette readings and titre in **Table 1**.
6. 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.

Leave blank

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

..... cm^3 of aqueous sodium nitrite, solution **Q**, reacts with 25.0 cm^3 of 0.0200 mol dm^{-3} potassium manganate(VII), solution **R**.

(10)

(b) **Calculations**

$$5NO_2^-(aq) + 2MnO_4^-(aq) + 6H^+(aq) \rightarrow 5NO_3^-(aq) + 2Mn^{2+}(aq) + 3H_2O(l)$$

Calculate the concentration of sodium nitrite, $NaNO_2$, in solution **Q**, in mol dm^{-3}, and hence in g dm^{-3}.
[Molar mass/g mol^{-1}: Na = 23.0, N = 14.0, O = 16.0]

(4)

Leave blank

(c) Titrations involving potassium manganate(VII) are normally carried out by adding it from the burette to an acidified reducing agent contained in the conical flask.

(i) To 2 cm^3 of the remaining solution **Q** in a test tube add 10 drops of the dilute sulphuric acid. Record your observations in the box below.

Observations

(2)

(ii) Using the observations, explain the effect on the accuracy of the titration if potassium manganate(VII) is used in the burette and acidified sodium nitrite in the conical flask.

.....

.....

(2)

Q3

(Total 18 marks)

N 2 9 2 6 6 A 0 1 0 1 2

Leave blank

4. There are many isomers of formula C_9H_{12}.

(a) How does this formula suggest that these compounds are unsaturated molecules?

.....

.....

(1)

(b) Plan a procedure to determine whether TWO of these isomers have the same number of C═C double bonds.

You are not required to carry out your plan.

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(4)

This question continues on the next page

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(c) Suggest a structure for ONE isomer of formula C_9H_{12}, which contains a benzene ring.

(1)

Q4

(Total 6 marks)

TOTAL FOR PAPER: 50 MARKS

END

N 2 9 2 6 6 A 0 1 2 1 2