23.6.3   Chemistry Paper 3 (233/3)

Name .... Index No. ..../..........

233/3
CHEMISTRY
Paper 3
PRACTICAL
Oct./Nov. 2006
$2\frac{1}{4}$ hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL
Kenya Certificate of Secondary Education
CHEMISTRY
Paper 3
PRACTICAL
$2\frac{1}{4}$ hours

Write your name and index number in the spaces provided above.
Answer ALL the questions in the spaces provided in the question paper.
You are NOT allowed to start working with the apparatus for the first 15 minutes of the $2\frac{1}{4}$ hours
allowed for this paper. This time is to enable you to read the question paper and make sure you have
all the chemicals and apparatus that you may need.
All working MUST be clearly shown where necessary.
Mathematical tables and electronic calculators may be used.

For Examiner's use only

Question	Max. Score	Score
1	21	
2	13	
3	06	
Total Score	40	

**Candidates should check the question paper to ensure that all
the pages are printed as indicated and no questions are missing.**

                   Turn over

1   You are provided with:

- 4.5 g of solid A in a boiling tube.
- Solution B, 0.06 M acidified Potassium manganate (VII)

You are required to determine:

(1)   the solubility of solid A at different temperatures

(2)   the number of moles of water of crystallisation in solid A.

Procedure

(a)   Using a burette, add 4 cm³ of distilled water to solid A in the boiling tube. Heat the mixture while stirring with the thermometer to about 70°C. When all the solid has dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid A first appear. Record this temperature in table 1.

(b)   Using the burette, add 2 cm³ of distilled water to the contents of the boiling tube. Warm the mixture while stirring with the thermometer until all the solid dissolves. Allow the mixture to cool while stirring. Note and record the temperature at which crystals of solid A first appear.

(c)   Repeat procedure (b) two more times and record the temperatures in table 1.
Retain the contents of the boiling tube for use in procedure (e).

(d)   (i)   Complete table 1 by calculating the solubility of solid A at the different temperatures. The solubility of a substance is the mass of that substance that dissolves in 100 cm³ (100 g) of water at a particular temperature.

Table 1

Volume of water in the boiling tube (cm³)	Temperature at which crystals of solid A first appear (°C)	Solubility of solid A (g/100 g water)
4		
6		
8		
10		

(6 marks)

(ii)   On the grid provided, plot a graph of the solubility of solid A (vertical axis) against temperature.   (3 marks)
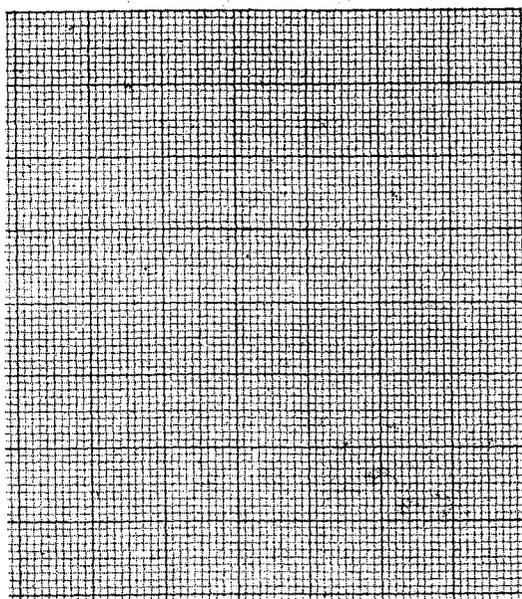
(iii) Using your graph, determine the temperature at which 100 g of solid **A** would dissolve in 100 cm³ of water.   (1 mark)

(e) (i) Transfer the contents of the boiling tube into a 250 ml volumetric flask. Rinse both the boiling tube and the thermometer with distilled water and add to the volumetric flask. Add more distilled water to make up to the mark. Label this solution ˊA. Fill a burette with solution **B**. Using a pipette and a pipette filler, place 25.0 cm³ of solution **A** into a conical flask. Warm the mixture to about 60°C. Titrate the hot solution **A** with solution **B** until a permanent pink colour persists. Record your readings in table 2. Repeat the titration two more times and complete table 2. (**Retain the remaining solution B for use in question 3 b(i)).**

Table 2

	I	II	III
Final burette reading			
Initial burette reading			
Volume of solution **B** used (cm³)			

(3 marks)

(ii) Calculate the:

I   average volume of solution **B** used   (1 mark)

II   number of moles of potassium manganate (VII) used   (1 mark)

III   number of moles of A in 25 cm³ of solution A given that 2 moles of potassium manganate (VII) react completely with 5 moles of A
                                                                    (1 mark)

IV   relative formula mass of A.   (3 marks)

(iii) The formula of A has the form $D.xH_2O$. Determine the value of x in the formula given that the relative formula mass of D is 90.0 and atomic masses of oxygen and hydrogen are 16.0 and 1.0 respectively.   (2 marks)

2   You are provided with solid E. Carry out the tests below. Write your observations and inferences in the spaces provided.

(a)   Place about one third of solid E in a clean dry test-tube and heat it strongly.

Observations	Inferences
(1 mark)	(1 mark)

(b)   Place the remaining solid E in a boiling tube. Add about 10 cm³ of distilled water. Shake the mixture thoroughly for about one minute. Filter and divide the filtrate into four portions.

Observations	Inferences
(1 mark)	(1 mark)

(i)   To the first portion, add 2 drops of phenolpthalein indicator.

Observations	Inferences
(1 mark)	(1 mark)

(ii)   To the second portion, add 2 cm³ of dilute hydrochloric acid.

Observations	Inferences
(1 mark)	(1 mark)

(iii)   To the third portion, add 5 cm³ of aqueous sodium sulphate.

Observations	Inferences
(1 mark)	(1 mark)

(iv)   To the fourth portion, add dilute sodium hydroxide **dropwise** until in **excess**.

Observations	Inferences
(1 mark)	(1 mark)

3   You are provided with solid **F**.
Carry out the following tests and record your observations and inferences in the spaces
provided.

(a)   Using a **metallic** spatula, take one-third of solid **F** and ignite it using a **Bunsen** burner

Observations	Inferences
(1 mark)	(1 mark)

(b)   Place the remaining solid **F** in a boiling tube. Add about 10 cm³ of distilled water.
Shake the mixture until all the solid dissolves.

(i)   To about 4 cm³ of the solution, add 2 to 3 drops of acidified potassium
manganate (VII), solution **B**.

Observations	Inferences
(1 mark)	(1 mark)

(ii)   To about 4 cm³ of the solution, add 2 to 3 drops of bromine water. Warm the
mixture.

Observations	Inferences
(1 mark)	(1 mark)