Name _____ Index No. _____

Candidate's Signature _____

Date _____

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SERIES **10** EXAMS

233/3

CHEMISTRY

PAPER 3

PRACTICAL

2 ¼ HOURS

INSTRUCTIONS TO CANDIDATES

- Answer all the questions in the spaces provided in this question paper.
- You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2 ¼ 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 table may be used.
- Electrical calculators may be used.

FOR EXAMINER'SUSE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	22	
2	12	
3	6	
TOTAL SCORE	**40**	

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1. You are provided with:

- 4.5g of solid A in a boiling tube.

- Solution B, 0.06M acidified potassium manganate (VII)

You are required to determine:-

1) The solubility of solid A at different temperature.
2) The number of moles of water of crystallization in solid A.

Procedure

(a)   Using a burette, add 4cm^3 of distilled water to solid A in the boiling tube. Heat the mixture while stirring with the thermometer to about 70^{0}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 I.

(b)   Using the burette, add 2.0cm^3 of distilled water to the contents of the boiling tube. Warm the mixture while stirring with the thermometer until all 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 the table I. **Retain the contents of the boiling tube for use in procedure (e)**

(d)   (i) Complete table I by calculating the solubility of solid A at different temperatures. The solubility of a substance is the mass of that substance that dissolves in 100cm^3 (100g) of water at a particular temperature.

Table I

Volume of water in the boiling tube (cm^3)	Temperature at which crystals of solid A first appear	Solubility of solid A (g/100g water)
4		
6		
8		
10		

(6 marks)

(ii) On the grid provided, plot a graph of solubility of solid A against temperature (3 marks)

(iii) Using your graph

I) Determine the temperature at which 100g of solid A would dissolve in

100cm^3 of water.   (1 mark)

II) Calculate the mass of solid A that will crystallize out when a hot solution

at 60^{0}C cooled to 40^{0}C.   (1 mark)

(e)   (i) Transfer the contents of the boiling tube into 250ml 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 A. Fill burette with solution B. Using a pipette and pipette filler, place 25.0cm^3 of solution A into a conical flask. Warm the mixture to about 60^{0}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.

Table 2

	I	II	III
Final Burette reading			
Initial Burette reading			
Volume of solution B used (cm^3)			

(4 marks)

Calculations:-

I) Average volume of solution B used. (1 mark)

II) Number of moles of potassium manganate (VI)) used. (1 mark)

III) Number of moles of A in 25.0cm^3 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. (2 marks)

(ii)   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 and atomic mass of oxygen and hydrogen

are 16.0 and 1.0g respectively. (2 marks)

2. (a)   (i)   Place a spatula half-full of solid P in a clean dry test tube. Strongly heat the

test tube – together with its contents. Test for any gases produced.

Observation	Inferences
(1 mark)	(1 mark)

(ii)   Repeat the same procedure using solid R.

Observation	Inferences
(1 mark)	(1 mark)

(iii)   Place a little of solid G in a dry test tube and heat strongly. Record your

observations and inferences.

Observation	Inferences
(1 mark)	(1 mark)

(h)   (i)   Place all solid M in a boiling tube. Add distilled water while shaking until the boiling

tube is full.

Observation	Inferences
(1 mark)	(1 mark)

(ii)   Obtain two portions of about 2.0cm^3 of the resulting mixture above (h(i)

I)   To the first portion add 2-3 drops of barium nitrate solution.

Observation	Inferences
(1 mark)	(1 mark)

II)   To the second portion, add 2-3 drops of barium nitrate solution followed by a

few drops of 2M hydrochloric acid.

Observation	Inferences
(1 mark)	(1 mark)

3.   You are provided with liquid S. Carry out the following tests and record your observations

and inferences in the spaces provided.

(i)   Place four drops of liquid S on a clean dry watch glass and ignite it.

Observation	Inferences
(1 mark)	(1 mark)

(ii)   Place about 2.0cm^3 of liquid S in a clean dry test tube, add all sodium

hydrogen carbonate provided.

Observation	Inferences
(1 mark)	(1 mark)

(iii)   Place about 2.0cm^3 of liquid S in a test tube, add about 1cm^3 of acidified

potassium dichromate (VI) and warm the mixture.

Observation	Inferences
(1 mark)	(1 mark)