

CHEMISTRY PRACTICALS,

233/3,

TIME: $2\frac{1}{4}$ HOURS

NAME:..... SIGN:.....

CLASS..... ADM NO: DATE:.....

Instructions to candidates:

- (a) Answer all questions in the spaces provided in the question paper.
- (b) KNEC mathematical tables and electronic calculators may be used for calculations.
- (c) All working **MUST** be clearly shown where necessary.
- (d) Candidates should answer the questions in English.

FOR EXAMINERS USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE'S SCORE
1	21	
2	11	
3	08	
TOTAL	40	



1. You are provided with:

Solid P – 3.6 g of hydrated oxalic acid with the formula $\text{H}_2\text{C}_2\text{O}_4 \cdot X \text{H}_2\text{O}$.

Solution W – 0.2 M sodium hydroxide solution.

You are required to determine:

- (i) Solubility of solid P.
- (ii) The value of X in $\text{H}_2\text{C}_2\text{O}_4 \cdot X \text{H}_2\text{O}$.

Procedure I:

- (i) Fill the burette with distilled water.
- (ii) Transfer 4 cm^3 of distilled water from the burette in to a boiling tube containing solid P.
- (iii) Heat the mixture while stirring carefully with a thermometer until all the solid dissolves.
- (iv) Cool the mixture by dipping it in cold water contained in a beaker while stirring with the thermometer. Record the temperature at which crystals start to form in table 1 below.
- (v) Add a further 2 cm^3 of distilled water from a burette to the mixture. Repeat step (iii) and (iv) above and record the crystallization temperature. Complete table 1 below.

(RETAIN THE CONTENTS OF THE BOILING TUBE FOR USE IN PROCEDURE II)

(a) Table 1

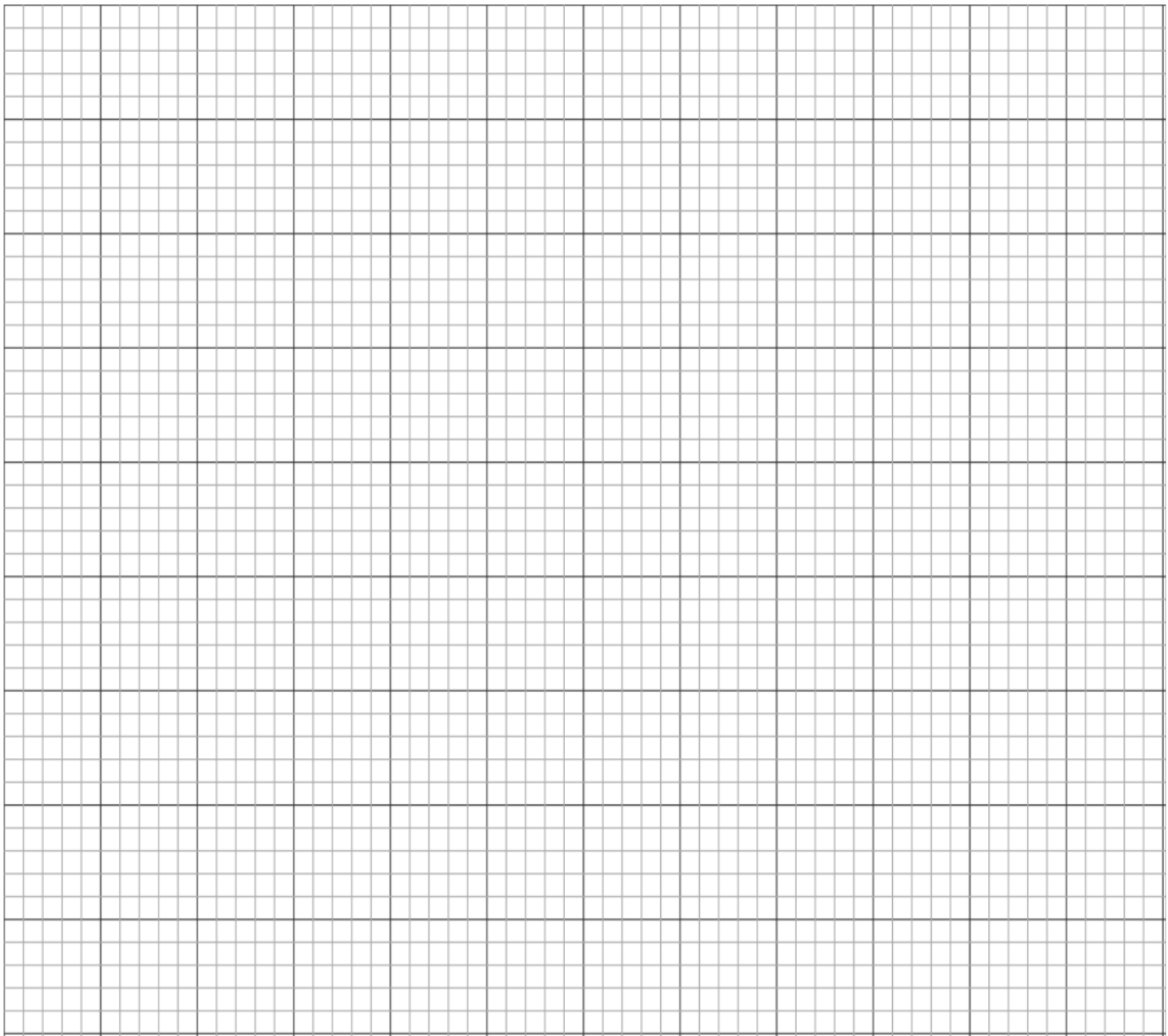
Volume of distilled water in boiling tube.	Crystallization temperature.	Solubility of solid A in g/100g of water.
4		
6		
8		

10		
12		

(5marks)

(b) On the grid provided, plot a graph of solubility of solid P against crystallization temperature.

(3marks)



(c) From the graph, determine:

(i) The solubility of solid P at 60°C . (1mark)

(ii) The temperature at which 40 g of solid P would dissolve in 50 g of water. (2marks)

Procedure II:

Transfer all the contents of the boiling tube in procedure I into a clean 250 ml volumetric flask. Rinse the boiling tube and the thermometer with distilled water and add the contents into the volumetric flask. Add 100 cm³ of distilled water to the volumetric flask; shake until all the solid dissolves. Add more distilled water to the mark. Label this as solution Q. Drain the burette of any distilled water and then fill it with solution Q. Pipette 25 cm³ of solution W into a clean conical flask, add 3 drops of phenolphthalein indicator. Titrate solution Q against solution W. Record your reading in table 2 below. Repeat the titration two more times and complete the table below.

Table 2

(a)

	I	II	III
Final burette reading (cm ³)			
Initial burette reading (cm ³)			
Volume of solution Q used (cm ³).			

(4marks)

(b) Calculate the average volume of solution Q used.

(1mark)

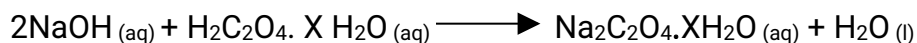
(c) Calculate the:

(i) Number of moles of solution W used.

(1mark)

(ii) Number of moles of solution Q used given the equation below.

(1mark)



(iii) Concentration of solution Q in moles per litre. (1mark)

(d) Determine the value of X in the formula $\text{H}_2\text{C}_2\text{O}_4 \cdot X \text{H}_2\text{O}$. (C = 12, H = 1, O = 16). (2mks)

2. You are provided with solid E. Carry out the tests below. Write your observations and inferences in the spaces provided. Place all solid E in a boiling tube. Add about 10 cm^3 of distilled water and shake until all the solid dissolves. Use about 2 cm^3 portions of the solution in a test tube for the tests below.

(a) To the first portion, add sodium hydroxide solution dropwise till in excess.

Observations	Inferences
(1mk)	(1mk)

(b) To the second portion, add aqueous ammonia dropwise till in excess.

Observations	Inferences
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(1mk)	(1mk)
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(c) To the third portion, add 3 drops of sodium chloride solution.

Observations	Inferences
(1mk)	(1mk)

(d) To the fourth portion, add 3 drops of barium nitrate solution.

Observations	Inferences
(1mk)	(2mks)

(e) To the fifth portion, add 3 drops of acidified lead (II) nitrate solution.

Observations	Inferences
(1mk)	(1mk)

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

(a) Place half of solid F on a metallic spatula and ignite it over a Bunsen burner.

Observations	Inferences
(1mk)	(1mk)

(b) Place the remaining portion of solid F in a boiling tube. Add 5 cm³ of distilled water and shake. Preserve the resulting mixture for test (i) and (ii) below.

Observations	Inferences
(1mk)	(1mk)

(i) To about 2 cm³ of the solution in a test tube, add 3 drops of acidified potassium manganate (VII) solution.

Observations	Inferences
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(1mk)	(1mk)

(ii) To another 2 cm³ portion of the solution, add 3 drops of acidified potassium dichromate (VI) solution.

Observations	Inferences
(1mk)	(1mk)

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