Name: ....Index: ....

Stream: .... Adm. No.............................Date:...............................Sign:......................

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CHEMISTRY
Theory
Paper 3
July/August, 2018
Time: 2 Hours

FORM FOUR MID-YEAR EVALUATION EXAM-2018
Kenya Certificate of Secondary Education (KCSE)
Chemistry (Paper 3)

INSTRUCTIONS TO CANDIDATES

- Write your name and Index Number in the spaces provided above.
- Sign and write date of examination in the spaces provided above.
- Answer all questions in the spaces provided in the question paper.
- All workings must be clearly shown where necessary. Mathematical tables and silent electronic calculators may be used.

For Examiners use only.

Question	Maximum Score	Candidates Score
1	10	
2	12	
3	18	
Total		

This paper consists of 8 Printed pages. Candidates should check the question paper to ensure that all the Papers are printed as indicated and no questions are missing.

1. **You are provided with;**

   - 3.6g of solid Y which is a hydrated dibasic acid with a formula $H_2C_2O_4.nH_2O$

   - Solution X, a 0.2M sodium hydroxide solution.

   You are required to determine:

   The value of **n** in the formula $H_2C_2O_4.nH_2O$

   Procedure
   - (i)   Transfer all of solid P into a clean 250ml volumetric flask, add about $100cm^3$ of distilled water and shake.
   - (ii)   Top the solution up to the mark, and label the resulting solution as solution Q.
   - (iii)   Fill the burette with solution Q.
   - (iv)   Pipette $25cm^3$ of solution X into a clean conical flask and add 3 drops of phenolphthalein indicator. Titrate against solution X till the colour of the indicator just turns colourless.

   - **(v)**   Record your results in table II below.

Table II

	I	II	III
Final burette reading in cm^3			
Initial burette reading in cm^3			
Volume of solution Q used in cm^3			

(4marks)

Calculate;

a)   Average volume of Q used   (1 mark)

b)   i)   Moles of solution X used   (1 mark)

   (ii)   Moles of solution Q used   (1 mark)

2

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

c) Determine the value of n in the formula $H_2C_2O_4.nH_2O$ (2 marks)

2. You are provided with:
   - 1M Potassium iodide solution
   - 0.5M Lead (II) nitrate solution
   - Ethanol

You are required to determine the formulae of lead (II) iodide and the equation for the reaction between lead (II) nitrate and potassium iodide.

Procedure
Take **eight** test tubes and label them 1,2,3,4,5,6,7 and 8. Using a burette add, to separate test tube volumes of aqueous potassium iodide and aqueous lead (II) nitrate as shown in the table below. followed by 3 drops of ethanol. Shake and allow about 3 minutes for settling. Measure the height of the precipitate in each test tube in mm and record the measurements in the table below.

Test tube no	1	2	3	4	5	6	7	8
Volume of KI (cm^3)	2	3	4	5	6	7	8	9
Volume of Pb(NO$_3$)$_2$ cm^3	10	9	8	7	6	5	4	3
Height of the precipitate (mm)								

(4marks)

a) Plot a graph of height of the precipitate against the volume of lead (II) nitrate.   (3marks)
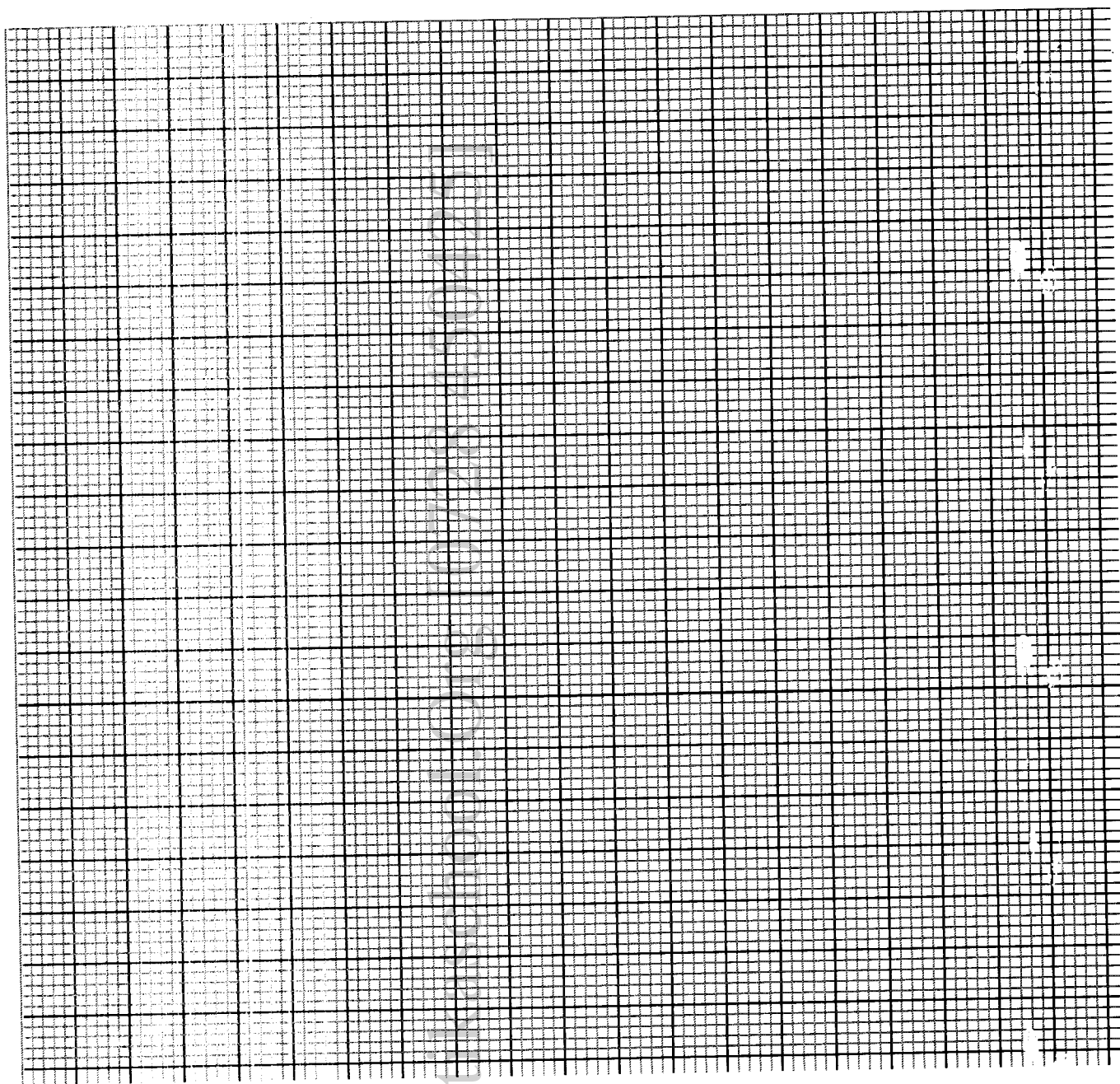
b) Use your graph to

i)   Find the maximum height of the precipitate formed.   (½ mark)

ii)   Determine the volume of the 0.5M $Pb(NO_3)_2$ used in b (i) above   (½ mark)

iii)   Determine the volume of 1M Potassium Iodide that completely reacts with 0.5M Lead
        (II) Nitrate solution.   (2marks)

iv)   Use your answer in b(ii) above to determine the number of moles of Iodide ions which
        reacts with one mole of Lead (II) ions hence determine the formulae of lead (II) iodide.

                                                                                        (2marks)

3. I) You are provided with
 - Substance W 0.5g
 - Sodium hydroxide solution
 - Aqueous ammonia
 - Solution F – Aqueous lead (II) Nitrate
 - Distilled water in wash bottle
 - Source of heat

a) Describe the appearance of substance W   (1mark)

b) Place all of Substance W in a boiling tube, and add 10cm^3 of distilled and shake.

Observation	Inference
($^1/_2$ mark)	($^1/_2$ mark)

c) **Substance W** is suspected to be **calcium chloride**. From the reagent provided and results in procedure (b) above select and describe four tests that could be carried out consecutively to confirm substance W is calcium chloride. Write the results and expected observation in the spaces provided.   (6marks)

Test 1	Expected observation
(1mark)	(1mark)
Test 2	Expected observation
(1mark)	(1mark
Test 3	Expected observation
(1mark)	(1mark)

d) Carry out the tests described in (c) above using substance W and record the observations and inferences in the spaces provided.

i)   Test 1

Observation	Inference
(1mark)	(1mk)

ii)   Test 2

Observation	Inference
(1mark)	(1mark)

iii)   Test 3

Observation	Inference
(1mark)	(1mark)

II) You are provided with substance P. Carry out the following test and record your observation and inferences in the spaces provided. Use about 2cm³ of portions of substance P in a test tube for each tests below.

a) Add about 2 or 3 drops of bromine water.

Observation	Inference
(½ mark)	(½ mark)

b) Add about 1cm³ of acidified potassium dichromate (VI) warm the mixture.

Observation	Inference
(½ mark)	(½ mark)

c) Add about 1cm³ of solution to E (aqueous sodium carbonate provided)

Observation	Inference
(½ mark)	(½ mar..)

d) Add the piece of magnesium ribbon provided

Observation	Inference
(½ mark)	(½ mark)