NAME:……..INDEX NO:…….

SCHOOL:……..CANDIDATE'S SIGNATURE:……...

DATE:……

233/3
CHEMISTRY
PAPER 3
(PRACTICAL)
JUNE-2016
TIME: 2 ¼ HOURS

CENTRAL YEARLY MEETING OF FRIENDS (CYMF) -2016

Kenya certificate of Secondary Education

233/3
CHEMISTRY
PAPER 3

INSTRUCTIONS TO CANDIDATES

-Write your name and index number in the spaces provided above.
-Answer all the questions in the spaces provided.
-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 apparatus and chemicals that you may need.
-All working must be clearly shown, mathematical and electronic calculators may be used.

FOR EXAMINER'S USE ONLY

QUESTIONS	MAXIMUM SCORE	CANDIDATE'S SCORE
1		
2		
3		
TOTAL	40	

This paper consists of 8 printed pages Check the Question paper to ensure that all pages are printed as indicated and no question are missing.

1. You are provided with:

-Solid A 2.0g of dibasic acid, H_2X.

-Solution B^1, 0.5M solution of dibasic acid, H_2X.

-Solution C, sodium hydroxide solution

-Solution D 0.02M acidified potassium manganate (vii) solution.

You are required to determine:

a) The heat of reaction of solid A, H_2X with sodium hydroxide.

b) The number of moles of solution E that reacts with 2 moles of acidified potassium manganate (vii) solution.

Procedure 1 (a)

Place $40cm^3$ of distilled water into 100ml beaker. Measure the initial temperature of water and record in the table 1 below. Add all the solid A provided at once. Stir the mixture carefully with the thermometer until ALL the solid dissolves. Measure the final temperature and record in table 1.

TABLE 1

Temperature^o C	
Initial temperature ^{0}C	

(1 ½ mks)

a) Determine the change in temperature Δ T. (1mk)

b) Calculate the

i) Heat change when H_2X dissolves in water. (Assume the heat capacity of solution is 4.2J/g/^{0}C and density of the solution is 1 g/cm^3). (1mk)

ii) The molar heat of solution, ΔH_1 solution of the acid H_2X. (Molar mass of acid H_2X is 126g) (2mks)

Procedure 1 (b)

Place 40cm^3 of solution B into 100ml beaker. Measure the initial temperature and record in table II below. Measure 40cm^3 of sodium hydroxide solution C. Add all the 40cm^3 of solution at once to solution. Stir the mixture carefully with thermometer. Measure the final temperature reached and record in table II. (Keep remaining solution n B to use in procedure II)

Table II

Temperature^{o}C	
Initial temperature ^{0}C	

a) Determine the change in temperature, ΔT. (1mk)

b) Calculate the

i) Heat change for the reaction. (Assuming the heat capacity of the solution is 4.2J/g/^{0}C and density of the solution is 1g/cm^3)

ii) Heat for the reaction of one mole of the acid H_2X with sodium hydroxide, ΔH_2. (2mks)

c) Given that $H_2X(s) + 2OH^-(aq) \longrightarrow 2H_2O(l) + X^{2-}(aq)$

Determine ΔH_3 using an energy circle diagram. (2mks)

Procedure II

Measure exactly 15cm^3 of solution B and put in 250ml volumetric flask. Add water as you shake up to the mark. Label as solution E. Using a pipette, pipette 25cm^3 of solution E and place in a conical flask. Warm solution E to boiling. Fill the burette with solution D and titrate with hot solution E. Stop just when a permanent change in colour. Record your results in table III below. Repeat the procedure to complete table III below.

	I	**II**	**III**
Final burette reading (cm^3)			
Initial burette reading (cm^3)			
Volume of solution D used			

a) Calculate the average volume of solution D used. (1mk)

b) Calculate the number moles of solution D reacting. (1mk)

c) Calculate the number of moles of solution E used . (1 ½ mks)

d) Calculate the number of moles of E which react with 2 moles potassium Manganate (vii). (2mks)

2. a) You are provided with solution F in a conical flask. Carry out the following test and record your observations and inferences in the spaces provided.

i) Add 20cm^3 of 2M sodium hydroxide solution to solution F in the flask; shake well filter the mixture in a clean boiling tube. Retain the filtrate and the residue.

Observation	**Inferences**
(½ mk)	(½ mk)

ii) Place about 2cm^3 of the filtrate in a test tube. Add 2M nitric (v) acid drop wise until in excess. Retain the mixture.

Observation	**Inferances**
(½ mk)	(½ mk)

iii) Divide the mixture in (ii) above into two portions. To one portion add 2M sodium hydroxide solution dropwise until in excess.

Observation	**Inferances**
(1mk)	(1mk)

iv) To portion two, add 2M ammonia solution drop wise until in excess.

Observation	**Inferances**
(1mk)	(1 mk)

v) Place about $2cm^3$ of filtrate in a test tube. Add 3 drops of acidified barium chloride.

Observation	**Inferances**
(1mk)	(1mk)

vi) To the residue add about $5cm^3$ of 2M nitric (v) acid and allow it to filter into a test tube. Place about $2cm^3$ of this filtrate in a test tube. Add 2M ammonia solution drop wise until in excess.

Observation	**Inferances**
(1 mk)	(1mk)

b) You are provided with solid G. Carry out the tests below and record your observations and inferences in the spaces provided.

i) Using a metallic spatula heat half spatula endful of solid G in a non-luminous flame. Remove it when it ignites.

Observation	**Inferances**
(1 mk)	(1mk)

ii) Put the remaining solid G in a boiling tube. Add about $5cm^3$ of distilled water and shake vigorously. (Keep the content for the next test)

Observation	**Inferances**
(1 mk)	(1 mk)

iii) Divide the resulting solution into two portions. To the first portion add two drops of acidified potassium manganate (vii) solution and shake vigorously.

Observation	**Inferances**
(1 mk)	(1 mk)

iv) Test pH of the second portion using pH indicator paper.

Observation	**Inferances**
(1 mk)	(1mk)