**NAME………………………………………………… INDEX NO……………….**

**SIGNATURE………………………………………… DATE……………………..**

**@*West practice papers- 2021***

***Kenya Certificate of Secondary Education (K.C.S.E)***

**CHEMISTRY**

**PAPER 233/3**

**(PRACTICAL)**

**Instructions to Candidates:**

1. *Write your name and index number in the spaces provided.*
2. *Sign and write the date of examination in the spaces provided above.*
3. *Answer* ***ALL*** *questions in the spaces provided.*
4. ***You are required to spend the first 15 minutes of the 2 1/4 hours allowed for this***

 ***Paper reading the whole paper carefully before commencing your work.***

1. *Additional pages must not be inserted.*
2. ***Candidates should check the question paper to ascertain that all the pages are***

***Printed as indicated and that no questions are missing****.*

***For the Examiner’s Use Only***

|  |  |  |
| --- | --- | --- |
| ***Question***  | ***Maximum score*** | ***Candidate’s Score*** |
| 1 | *21* |  |
| *2* | *13* |  |
| *3* | *06* |  |
| ***TOTAL SCORE*** | ***40*** |  |

**This paper consists of 7 printed pages**

1. You are provided with;
	* 3.6 g of solid P in a boiling tube. Solid P is a hydrated dibasic acid with the formula H2C2O4. nH2O
	* Solution L which is a 0.2 M sodium hydroxide solution. You are required to determine;
2. Solubility of solid P
3. The value of n in the formula H2C2O4. nH2O

## Procedure I

1. Using a burette, add 4cm3 of distilled water to solid P in the boiling tube. Heat the mixture while stirring with the thermometer to about 70 ⁰C. When all of solid has dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid P first appear. Record the temperature in **table 1** below.
2. 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 again. Allow the mixture to cool while stirring. Note the temperature at which crystals of solid P appears.
3. Repeat procedure (II) three more times and record the temperatures in **table 1**. **RETAIN the contents of the boiling tube for use in PROCEDURE II**

## TABLE 1

|  |  |  |
| --- | --- | --- |
| **Volume of water in the****boiling tube (cm3)** | **Crystallization****temperature (⁰C)** | **Solubility of solid P in g/100 g of****water** |
| 4 |  |  |
| 6 |  |  |
| 8 |  |  |
| 10 |  |  |
| 12 |  |  |

 (4marks)

* 1. Complete **table 1** above by working out the solubility. (1 mark)

Complete table 3 marks

Decimal place - 1mark

Accuracy – 1mark, and Trend – 1 mark

* 1. On the graph provided, plot a graph of solubility of solid P against crystallization temperature (3marks)

* 1. From the graph, determine;
1. The solubility of solid P at 50 ˚C (1 mark)

………………………………………………………………………………………………

1. The temperature at which 65 g of solid P would dissolve in 100 g of water

(1 mark)

………………………………………………………………………………………………**Procedure II**

1. Transfer the contents of the boiling tube from **PROCEDURE I** into a clean 250 ml volumetric flask.
2. Add distilled water up to the mark
3. Label the resulting solution as solution P
4. Fill the burette with solution P
5. Pipette 25cm3 of solution L into a conical flask. Add three drops of phenolphthalein indicator
6. Titrate solution P against solution L to an accurate end point. Record your results in **table 2** below.

|  |  |  |  |
| --- | --- | --- | --- |
| **TABLE 2** | 1 | 2 | 3 |
| Final burette reading |  |  |  |
| Initial burette reading |  |  |  |
| Volume of solution P used (cm3) |  |  |  |

(4 marks)

Complete table – 1, Decimal – 1, Accuracy – 1 PA – 1 and FA - 1

1. Calculate Average volume of solution P used. (1mark)

………………………………………………………………………………………………

1. **(i)** Moles of solution L used. (1 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

* 1. Moles of solution P used. (1 mark)

………………………………………………………………………………………………

……………………………………………………………………………………………...

* 1. Moles of solution P in 250 cm3 of solution P (1 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

(iv)The relative formula mass of P. (1 mark)

………………………………………………………………………………………………

………………………………………………………………………………………………

….……………………………………………………………………………………………

**(c)** Determine the value of n in the formula; H2C2O4. nH2O (H = 1, C = 12, O = 16)

(2marks)

………………………………………………………………………………………………

………………………………………………………………………………………………

….……………………………………………………………………………………………

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

Place all solid E into a boiling tube. Add about 20cm3 of distilled water and shake. Retain the content of the boiling tube.

 Observations inferences

Dissolves Soluble salt

 1 mark 1 mark

Use 2cm3 of solution E, in a test tube in each experiment I, ii,iii,1v

To experiment I, Add two drops of aqueous sulphuric vi acid

Observations inferences

White precipitate Ba2+,Ca2+, Pb2+ ions present (reject any other

 SO2-3, CO2-3 absent

No effervescence

1mark 1mark

To experiment ii, add NaOH solution drop wise till in excess.

Observations inferences

White ppt insoluble in excess Ba2+, Ca2+ present (penalize for any other cation introduced

1mark 1mark

To experiment iii, dip a stirring rod into the solution, place the rod in a non-luminous flame..

Observations inferences

1mark Ba2+ ions present 1mark

Green yellow flame

To experiment iv, add two drops of lead ii nitrate solution.

Observations inferences

No white ppt CI- absent

1mark 1mark

To experiment v, add a piece of aluminium foil followed by sodium hydroxide solution and warm . Test the gas given out with litmus papers.

Observations inferences

Colourless gas which turns pink NO2-3  confirmed

Litmus blue and blue remains

blue

2marks 1mark

3). you are provided with liquid Q. carry out the tests below. Write your observations and inferences in the spaces provided.

i). To 2 cm3 of liquid Q in a test tube, add universal indicator

Observations inferences

5.0 - 6.5 Weakly acidic

1 mark 1 mark

Accept any value within the

range

ii). Place 3 drops of liquid Q on a watch glass and ignite.

Observations inferences

Blue flame I l

 -C - C - present

 I I

1mark 1mark

ii). To 2 cm3 of liquid Q in a test tube , add two or three drops of acidified potassium dichromate VI and warm

Observations inferences

Cnc02-7 turns from orange to ROH present

green

1mark 1mark

## CONFIDENTIAL

**Each candidate requires:**

1. About 100 ml of solution L- 0.2 M NaOH
2. Distilled water in a wash bottle
3. Burette
4. Pipette and pipette filler
5. 2 conical flasks
6. 10 ml measuring cylinder
7. 250 ml volumetric flask
8. Exactly 3.6g of solid P- oxalic acid
9. Means of labelling- 1 piece
10. Test-tube holder
11. Thermometer(-10 to 110oC)
12. Boiling tube
13. 5 Test tubes
14. Glass rod
15. Aluminium Foil
16. Red and Blue litmus papers
17. Ethanol labelled Liguid Q
18. Universal indicator and universal chart paper
19. Watch glass
20. Wooden splint
21. Solid Barium Nitrate labelled solid E

**ACCESS TO**:

Source of heat.

Phenolpthalein indicator.

NaOH.

Dilute H2SO4.

Pb(NO3)2 Solution.

 Acidified K2Cr2O7.