**NAME……INDEX NO……**

**CANDIDATE'S SIGNATURE……DATE……**

**SCHOOL……**



**233/3**
**CHEMISTRY**
**PAPER 3**
**PRACTICALS**
**TIME: 1 ¼ HOURS**

## INSTRUCTIONS TO CANDIDATES.

a) Write your name and index number in the spaces provided above.
b) Sign and write the date of examination in the spaces provided above.
c) Answer **ALL** questions in the spaces provided above.
d) All workings **MUST** be clearly shown where necessary.
e) You are not allowed to work with the apparatus for the first 15minutes of the 2 ¼ Hours allowed for this paper.This time is to enable you read the question paper and make sure you have all the chemicals and the apparatus that you may need.
f) Mathematical tables and silent electronic calculators may be used.

***FOR EXAMINERS' USE ONLY.***

| Question | Maximum Score | Candidates' Score |
|---|---|---|
| 1 | 12 | |
| 2 | 40 | |
| 3 | 14 | |
| | 40 | |

***This paper consists of 4 printed pages.***
***Candidates should check the questions paper to ascertain that all pages are printed as indicated and no questions are missing.***

1 You are provided with:

Solution M 0.2M hydrochloric acid,

Solution F containing 15.3g per litre of basic compound $G_2X.H_2O$.

You are required to determine the relative atomic mass of G.

**PRECEDURE**:

Place solution M in a burette ,pipette 25$cm^3$ of solution F into a 250$cm^3$ conical flask. Add two drops of methyl orange indicator and titrate. Record your results in the table below. Repeat the procedure two more times and complete table I.

Table I

a) i)

| | I | II | III |
|---|---|---|---|
| Final burette reading | | | |
| Initial burette reading | | | |
| Volume of solution M used ($cm^3$) | | | |

(4mks)

ii) What is the average volume of solution M.? (1mk)

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b) Given that one mole of F reacts with 2moles of M. Calculate the;

i) number of moles the basic compound,$G_2X$, $10H_2O$ in the volume of solution F used. (2mks)

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ii) Concentration of solution F in mole per litre. (2mks)

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iii) Relative formula mass of the basic compound, $G_2X.10H_2O$. (1 ½ mks)

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iv) relative atomic mass of G (Relative formula Mass of X=60 , atomic mass of H=1.0 , O=16.0). (1 ½ mks)

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2 You are provided with:

1 1.899g of solid P, solid P is adiabatic acid $H_2X$.

2 0.5M Solution of the dibasic acid , $H_2X$ , Solution V.

3 Sodium hydroxide, Solution K.

You are required to determine:

a) i) the molar heat of solid P.

ii) the heat of reaction of one mole of the dibasic acid with sodium hydroxide.

b) Calculate the heat of reaction of solid $H_2X$ with aqueous sodium hydroxide.

**PROCEDURE I.**

Place $30cm^3$ of distilled water into a 100ml beaker. Measure the initial temperature of the water and record it in the table II below. Add all the solid P at once; stir the mixture carefully with the thermometer until all the solid dissolves. Measure the final temperature reached and records it in the table II

**Table II**

| | |
|---|---|
| Final temperature ($^oc$) | |
| Initial temperature ($^oc$) | |

a) Determine the change in temperature $\Delta T_1$ (1½mks)

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b) Calculate the:

i) heat change when $H_2X$ dissolves in water, (Assuming the heat capacity of the solution is $4.2Jg^oK^{-1}$ and density is $1g/cm^3$) (2mks)

ii) number of moles of the acid that were used. (Relative formula mass of $H_2X$ is 126) (1mk)

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iii) molar heat of solution $\Delta H_1$ solution of the acid $H_2X$. (1mk)

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**PROCEDURE II.**

Place $30cm^3$ of solution V into a $100cm^3$ beaker. Measure the initial temperature and record it in table III below. Measure $30cm^3$ of sodium hydroxide, solution K.Add all of the $30cm^3$ of t of solution K at once to V in the beaker. Stir the mixture with the thermometer. Measure the final temperature reached and record it in table III.

**Table III.**

a)

| | |
|---|---|
| Final temperature ($^oC$) | |
| Initial temperature ($^oC$) | |

( 1 ½ mks)

b) Determine the change in temperature, $\Delta T_2$. ( ½ mk)

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c) Determine the:

i) heat change for the reaction (Assume the heat capacity of the solution is $4.2Jg\text{-}1^{-1}{}_k{}^{+1}$ and density is $1g/cm^3$ (2mks)

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ii) Number of moles of the acid used ($H_2X$). (1mk)

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iii) Heat of reaction , $\Delta H_2$ of one mole of the acid $H_2X$ with sodium hydroxide (1mk)

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d) Given that,

$\Delta H_1$ is the heat for reaction $H_2X_{(s)} \xrightarrow{\text{water}} 2H^+_{(aq)} + X^{2-}_{(aq)}$

$\Delta H_2$ is the heat for the reaction $H^+_{(aq)}+OH^-_{(aq)} \longrightarrow H_2O_{(l)}$

Calculate $\Delta H_3$ for the reaction $H_2X_{(s)} + 2OH^-1_{(aq)} \longrightarrow 2H_2O_{(l)} + X^{2-}_{(aq)}$(2mks)

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

a) Place about one third of solid S in a dry test tube. Heat the solid gently and the strongly. Test any gases produced with blue and red litmus papers.

| Observations | Inferences |
|---|---|
| (2mks) | (1mk) |

b) Dissolve the remaining portion of solid S in $8cm^3$ of distilled water.

i) Divide the solution into the first portions, to the first portion, add aqueous sodium hydroxide drop wise until in excess.

| Observations | Inferences |
|---|---|
| (1mk) | (2mks) |

ii) To the second portion , add aqueous ammonia dropwise in excess.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

iii) To the third portion , add $10cm^3$ of barium chloride solution.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

iv) To the forth portion , add about 1$cm^3$ of Lead (II) nitrate solution.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |

v) To the fifth portion, add about 2ml of hydrogen peroxide then about 1$cm^3$ of sodium hydroxide solution.

| Observations | Inferences |
|---|---|
| (1mk) | (1mk) |