**BUNYORE – MARANDA JOINT PRE-MOCK EXAMINATIONS 2014**

**BUMA (II) 2014**

**233/3**

**CHEMISTRY PRACTICAL**

**CONFIDENTIAL**

**CHEMISTRY PAPER 3 INSTRUCTIONS**

**Requirements per candidate**

- 4.5g of solid A (oxalic acid) weighed accurately and placed in a boiling tube.
- About 100$cm^3$ of solution B, 0.06M acidified KMno4
- Thermometer (-10 – 110$^0$C)
- 50ml burette
- 25ml pipette
- Pipette filler
- 250ml volumetric flask
- 2 lables
- 20$cm^3$ of 2m nitric acid
- 10$cm^3$ of solution P
- 2 filter papers
- 3 conical flasks
- 1 filter funnel
- About 1g of $NaHCO^3$
- About 500$cm^3$ of distilled water in a wash bottle
- 30$cm^3$ of 2M NaOH
- 10ml or 50ml measuring cylinder
- 6 test tubes

Access to:

- 2M NaOH
- 2M NH4OH
- 2M nitric acid
- 0.1M potassium iodide solution
- Acidified Barium nitrate
- 10% bromine water

Notes

- Solid A is Oxalic acid
- Solid G is Maleic acid
- Solution P is a mixture of copper II sulphate and aluminium sulphate
  It is prepared by mixing two grams of each in water to make 20$cm^3$ of solution. (Prepare as per the number of candidates)
- Solution B is prepared by dissolving 9.48 grams of potassium manganate VII in 200$cm^3$ of 2M sulphuric acid and diluting to 1L of solution with distilled water.

NAME: ……INDEX NO:……..

SCHOOL: …….STREAM:……

233/3
CHEMISTRY
THEORY
PAPER 3
MAY – JUNE 2014
TIME: 2 HOURS

**BUNYORE – MARANDA (BUMA) JOINT EXAMINATIONS**
**CHEMISTRY PAPER 1 2014**

**INSTRUCTIONS TO CANDIDATES**

- Write your name and index number in the spaces provided above.
- Answer ALL the questions in the spaces provided in the question paper.
- You are NOT allowed to start working with the apparatus for the first 15 minutes of the 2 ½ hours allowed for this paper. This time it to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
- All working MUST be clearly shown where necessary
- Mathematical tables and electronic calculators may be used.

FOR EXAMINER'S USE ONLY

| QUESTION | MAX. SCORE | SCORE--------- |
|---|---|---|
| 1 | 20 | |
| 2 | 14 | |
| 3 | 6 | |
| TOTAL SCORE | 40 | |

1. You are provided with: -
   - 4.5g of solid A in a boiling tube.
   - Solution B, 0.06M acidified Potassium manganate (VII)

You are required to determine
   (1) The solubility of solid A at different temperatures.
   (2) The number of moles of water of crystallization in solid A.

PROCEDURE
   (a) Using a burette, add 4cm3 of distilled water to solid A in the boiling tube. Heat the mixture while stirring with the thermometer to about $70^0$C. When the entire solid has dissolved, allow the solution to cool while stirring with the thermometer. Note the temperature at which crystals of solid A firs appear. Record this temperature in table 1.
   (b) Using the burette, add $2cm^3$ of distilled water to the contents of the boiling tube. Warm the mixture while stirring with the thermometer until all the solid dissolves. Allow the mixture to cool while stirring. Note and record the temperature at which crystals of solid A firs appear.
   (c) Repeat procedure (b) two more times and record the temperatures in table I. Retain the contents of the boiling tube for use in procedure (e)
   (d) (i) Complete table 1 by calculating the solubility of solid A at the different temperatures. The solubility of a substance is the mass of the substance that dissolves in $100cm^3$ (100g) of water at a particular temperature. (6 marks)

Table 1

| Volume of water in the boiling tube ($cm^3$) | Temperature at which crystals of solid A first appear ($^0$C) | Solubility of solid A (g/100g water) |
|---|---|---|
| 4 | | |
| 6 | | |
| 8 | | |
| 10 | | |

(ii) On the grid provided, plot a graph of the solubility of solid A (vertical axis against temperature). (3 marks)

(iii) Using your graph, determine the temperature at which 100g of solid A would dissolve in $100cm^3$ of water. (1 mark)

……
……..

(e) (i) Transfer the contents of the boiling tube into a 250ml volumetric flask. Rinse both the boiling tube and the thermometer with distilled water and add to the volumetric flask. Add more distilled water to make up to the mark. Label this solution A. Fill a burette with solution B. Using a pipette and a pipette filler, place $25.0cm^3$ of solution A into a conical flaks. Warm the mixture to about $70^0$C. Titrate the hot solution A with solution B until a permanent pink colour persists. Record your readings in table 2. Repeat the titration two more times and complete table 2. (Retain the remaining solution B for use in question 3).

Table 2

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

(3 marks)

(ii) Calculate the:

I. Average volume of solution B used. (1 mark)

……

……..

……

……..

II. Number of moles of potassium manganate (VII) used. (1 mark)

……

……..

……

……..

III. Number of moles of A 25$cm^3$ of solution A given that 2 moles of potassium manganate (VII) react completely with 5 moles of A. (1 mark)

……

……..

……

……..

VI. Relative formula mass of A. (2 marks)

……

……..

……

……..

(iii) The formula of A has the form D. $xH_2O$. Determine the value of x in the formula given that the relative formula mass of D is 90.0 and atomic masses of oxygen and hydrogen are 16.0 and 1.0 respectively.

……

……..

……

……..

2. You are provided with $10cm^3$ P. Solution P contains two cations and one anion. Carry out the tests below and record your observations and inferences in the spaces provided.

(a) Add $20cm^3$ of 2M aqueous sodium hydroxide to all of solution P provided. Shake well filter the mixture into conical flask. Retain both and the residue.

(b)

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

(b) (i) To about $2cm^3$ of the filtrate, add 2m nitric acid dropwise until in excess (i.e. about $1cm^3$ of the acid). Retain the mixture.

| Observations |
|---|
| (1 mark) |

Divide the mixture in b(i) above into two portions.
(ii) To the first portion, add aqueous sodium hydroxide dropwise until in excess.

| Observations | Inferences |
|---|---|
| (1 mark) | (2 marks) |

(iii) To the second portion, add aqueous ammonia drowise until in excess.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

(c) To $2cm^3$ of the filtrate, add 3 drop of potassium iodide solution.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

(d) To $2cm^3$ of filtrate, add 3 drops of acidified barium nitrate solution.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

(e) To the residue in (a) add $8cm^3$ of dilute nitric acid and allow it to filter into a boiling tube.
(i) To $2cm^3$ of this filtrate, add aqueous ammonia dropwise until in excess.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

3. Dissolve all of solid G in about $10cm^3$ of distilled water in a boiling tube. Use the solution for tests (a) to (c) below.

(a) Place $2cm^3$ of the solution in a test tube and add 2 drops of acidified potassium manganate (VII), solution B from the burette.

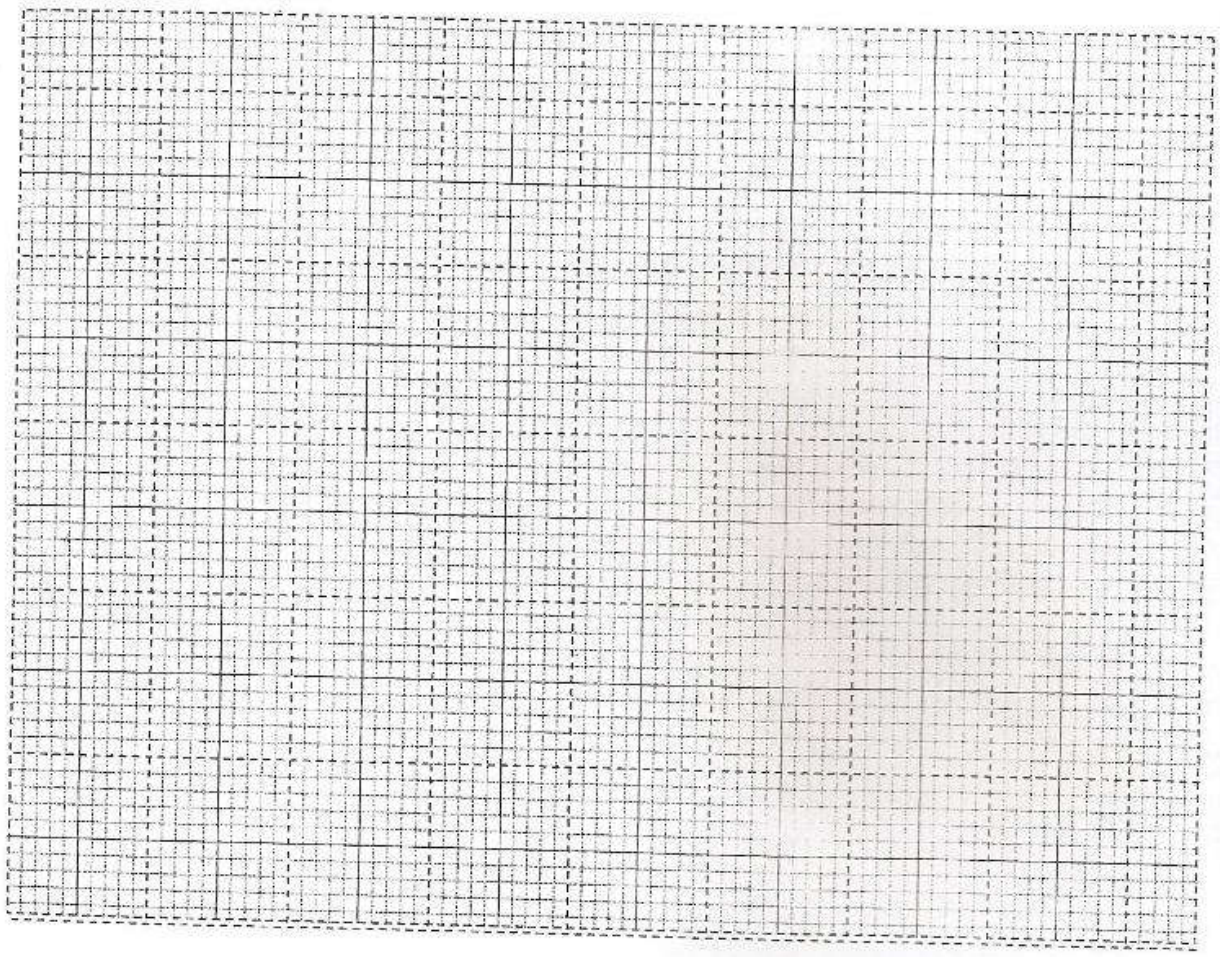
| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

(b) To $2cm^3$ of the solution in another test-tube, add 2-3 drops of bromine water.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |

(c) To $2cm^3$ of the solution in a third test-tube add a spatula full of the sodium hydrogen powder provided.

| Observations | Inferences |
|---|---|
| (1 mark) | (1 mark) |



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You are required to determine
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   (b) Using the burette, add $2cm^3$ of distilled water to the contents of the boiling tube. Warm the mixture while stirring with the thermometer until all the solid dissolves. Allow the mixture to cool while stirring. Note and record the temperature at which crystals of solid A firs appear.
   (c) Repeat procedure (b) two more times and record the temperatures in table I. Retain the contents of the boiling tube for use in procedure (e)
   (d) (i) Complete table 1 by calculating the solubility of solid A at the different temperatures. The solubility of a substance is the mass of the substance that dissolves in $100cm^3$ (100g) of water at a particular temperature. (6 marks)

Table 1

| Volume of water in the boiling tube ($cm^3$) | Temperature at which crystals of solid A first appear ($^0$C) | Solubility of solid A (g/100g water) |
|---|---|---|
| 4 | 70 | 112.5 |
| 6 | 59 | 75 |
| 8 | 51 | 56.25 |
| 10 | 46 | 45 |

(ii) On the grid provided, plot a graph of the solubility of solid A (vertical axis against temperature). (3 marks)

(iii) Using your graph, determine the temperature at which 100g of solid A would dissolve in $100cm^3$ of water. (1 mark)

*$67^0C \pm 5$*

(e) (i) Transfer the contents of the boiling tube into a 250ml volumetric flask. Rinse both the boiling tube and the thermometer with distilled water and add to the volumetric flask. Add more distilled water to make up to the mark. Label this solution A. Fill a burette with solution B. Using a pipette and a pipette filler, place $25.0cm^3$ of solution A into a conical flaks. Warm the mixture to about $70^0$C. Titrate the hot solution A with solution B until a permanent pink colour persists. Record your readings in table 2. Repeat the titration two more times and complete table 2. (Retain the remaining solution B for use in question 3).

Table 2

| | I | II | III |
|---|---|---|---|
| Final burette reading | | | |
| Initial burette reading | | | |
| Volume of solution B used ($cm^3$) | 20.8 | 20.6 | 20.7 |

(3 marks)

(ii) Calculate the:

I. Average volume of solution B used. (1 mark)

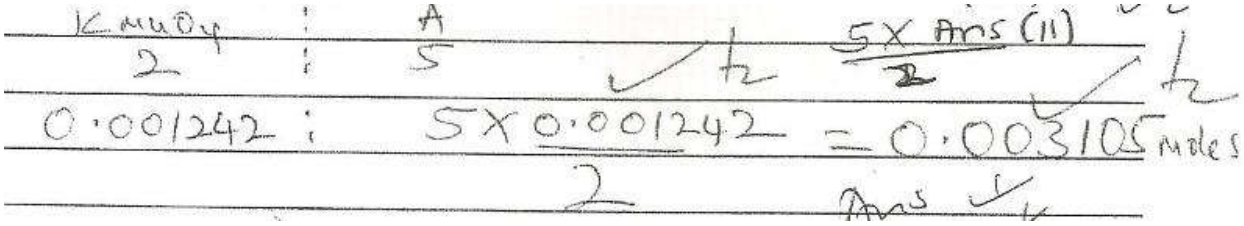
*AV = 20.7*

II. Number of moles of potassium manganate (VII) used. (1 mark)

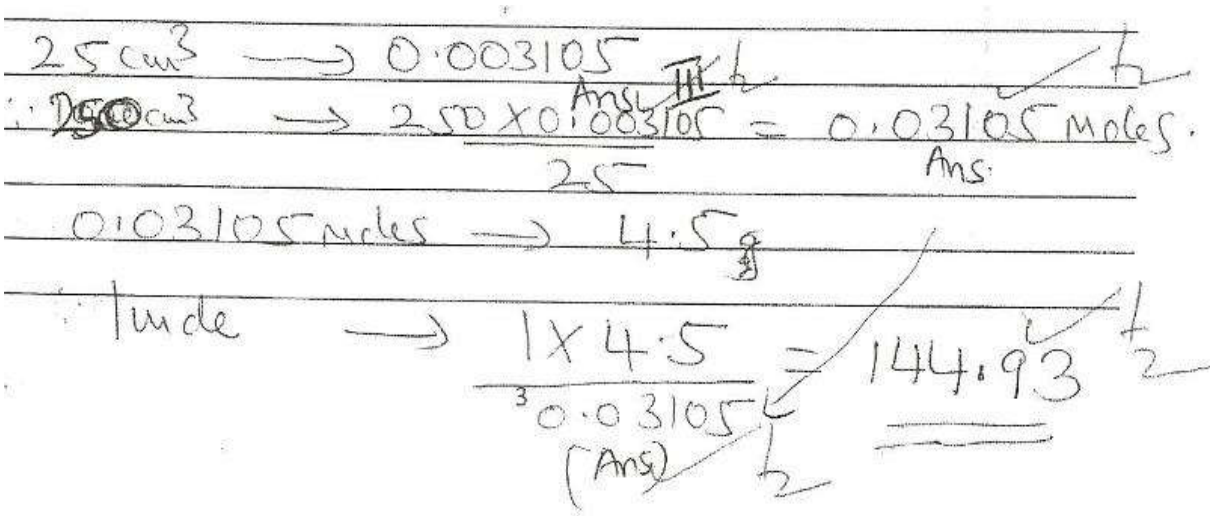
*$\frac{20.7}{100}$ x 0.06 =0.001242 moles*

*Ans (ii) $\frac{I \times 0.06}{100}$*

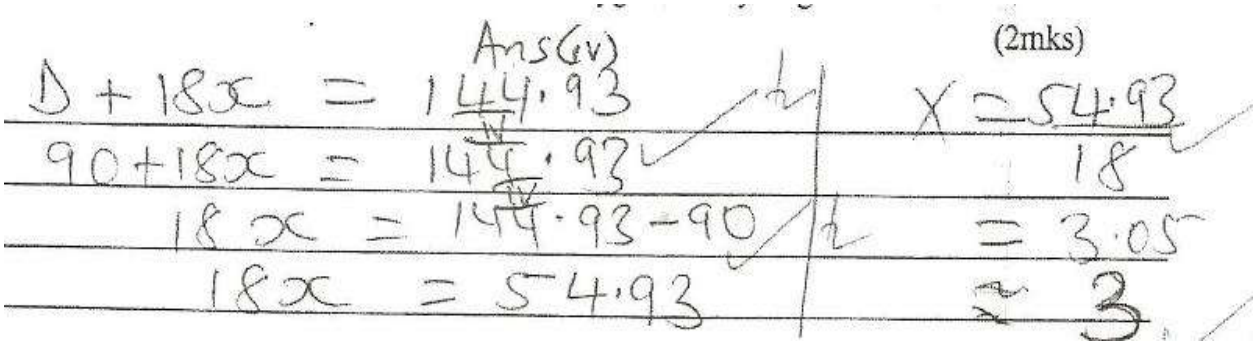
III. Number of moles of A 25$cm^3$ of solution A given that 2 moles of potassium manganate (VII) react completely with 5 moles of A. (1 mark)




VI. Relative formula mass of A. (2 marks)



(iii) The formula of A has the form D. $xH_2O$. Determine the value of x in the formula given that the relative formula mass of D is 90.0 and atomic masses of oxygen and hydrogen are 16.0 and 1.0 respectively.




2. You are provided with $10cm^3$ P. Solution P contains two cations and one anion. Carry out the tests below and record your observations and inferences in the spaces provided.

(a) Add $20cm^3$ of 2M aqueous sodium hydroxide to all of solution P provided. Shake well filter the mixture into conical flask. Retain both and the residue.

(b)

| Observations | Inferences |
|---|---|
| - Blue ppt/residue<br>- Coloureless filtrate<br>(1 mark) | - Cu2+ present<br>(1 mark) |

(b) (i) To about $2cm^3$ of the filtrate, add 2m nitric acid dropwise until in excess (i.e. about $1cm^3$ of the acid). Retain the mixture.

| Observations |
|---|
| - White ppt formed<br>- Soluble in excess acid<br>(1 mark) |

Divide the mixture in b(i) above into two portions.
(ii) To the first portion, add aqueous sodium hydroxide dropwise until in excess.

| Observations | Inferences |
|---|---|
| - White ppt formed<br>- Soluble in excess<br><br>(1 mark) | Pb2+ or $Ab_r^{3+}$, Zn2+ present<br><br>(2 marks) |

(iii) To the second portion, add aqueous ammonia drowise until in excess.

| Observations | Inferences |
|---|---|
| White ppt formed<br>insoluble in excess<br><br>(1 mark) | Al3+ or pb2+ present<br><br>(1 mark) |

(c) To $2cm^3$ of the filtrate, add 3 drop of potassium iodide solution.

| Observations | Inferences |
|---|---|
| No yellow ppt formed<br><br>(1 mark) | Al3+ present<br>pb2+ Absent<br><br>(1 mark) |

(d) To $2cm^3$ of filtrate, add 3 drops of acidified barium nitrate solution.

| Observations | Inferences |
|---|---|
| White ppt formed<br><br>(1 mark) | $SO_4^{2-}$ present<br><br>(1 mark) |

(e) To the residue in (a) add $8cm^3$ of dilute nitric acid and allow it to filter into a boiling tube.
(i) To $2cm^3$ of this filtrate, add aqueous ammonia dropwise until in excess.

| Observations | Inferences |
|---|---|
| blue ppt formed<br>soluble to form a deep blue solutin<br><br>(1 mark) | Ccl 2+ present /confirmed<br><br>(1 mark) |

3. Dissolve all of solid G in about $10cm^3$ of distilled water in a boiling tube. Use the solution for tests (a) to (c) below.

(a) Place $2cm^3$ of the solution in a test tube and add 2 drops of acidified potassium manganate (VII), solution B from the burette.

| Observations | Inferences |
|---|---|
| Purple acidified Kmn04 decolorized<br>OR<br>purple solution is decolorized<br><br>(1 mark) | C = c- or –c = c- or<br>R – OH present<br><br>(1 mark) |

(a) To $2cm^3$ of the solution in another test-tube, add 2-3 drops of bromine water.

| Observations | Inferences |
|---|---|
| - Orange/yellow bloune water not decolourized<br><br>(1 mark) | C = C- or C = Absent<br>R – OH present<br><br>(1 mark) |

(b) To $2cm^3$ of the solution in a third test-tube add a spatula full of the sodium hydrogen powder provided.

| Observations | Inferences |
|---|---|
| ettervescene/fizzing/gas bubbles produced<br><br>(1 mark) | H+/H3O+/<br>R-C-OH/R-CooH present<br><br>(1 mark) |