**Name:**....................................................................................**Index No.:** ........................................

 **Candidate’s Signature**: .................

 **Date**: ................................................

**233/3**

**CHEMISTRY**

**Paper 3**

**PRACTICAL**

**JUNE/AUGUST 2016**

**Time: 2 hours**

MARKING SCHEME

Kenya Certificate of Secondary Education

CHEMISTRY

Paper 3

**Instructions to Candidates**

* *Write your name and index number in the spaces provided above.*
* *Sign and write the date of the examination paper.*
* *Answer* ***ALL*** *the questions in the spaces provided in the question paper.*
* *ALL working* ***MUST*** *be clearly shown where necessary.*
* *Mathematical tables and silent electronic calculators may be used.*
* *Candidates should check the paper to ascertain that all the pages are printed as indicated and that no questions are missing.*
1. You are provided with:-

Solution A, 0.07M hydrochloric acid

1g solid B, Calcium hydroxide

You are required to determine the solubility of Ca (OH)2

Procedure:

Transfer all solid B into a 250cm3 volumetric flask. Measure accurately using a clean measuring cylinder 50 cm3 of water and transfer this carefully into the volumetric flask. Shake gently and measure a second portion of 40cm3 water and add this to the resulting solution in the volumetric flask. Filter the solution into a beaker and label this solution D.

Place solution A in the burette, pipette 25.0 cm3 of solution D into a 250 cm3 conical flask and titrate using methyl orange indicator. Record your result in table below and repeat the titration carefully to obtain consistent results.

|  |  |  |  |
| --- | --- | --- | --- |
| Table | 1 | 2 | 3 |
| Final burette reading (cm3) | 19.50 | 19.50 | 19.50 |
| Initial burette reading (cm3) | 0.00 | 0.00 | 0.00 |
| Volume of A used (cm3) | 19.50 | 19.50 | 19.50 |

 (4 mks)

1. **Volume of solution A used. ( 1mk)**

 Average = 19.5 cm3

1. **Number of moles of the solution A reacted. ( 1mk)**

 $\frac{MV}{1000}= \frac{0.07×19.5}{1000}=1.365 ×10^{-3}$ $Moles$

1. **Number of moles of solution D in the 25cm3 (2mks)**

Ca (OH)2 (aq) + 2HCl(aq)+ CaCl2 (aq) CaCl2 (aq) $+ $2H2 (l)

Ratio 1: 2

Moles = $\frac{1.365 × 10^{-3} }{2}$ = $6.825 ×10^{-3}$

1. **Calculate mole of solution D in the 90 cm3 of the solution D. (1mk)**

 $6.825 ×10^{-3}$= 25 cm3

 = 90 cm3

 $6.825 ×10^{-3}× \frac{90 cm}{25}$

 = 2.457 x 10-3 moles

1. **Calculate the mass of calcium hydroxide that dissolved in 90cm3 of water. (2 mks)**

Mass = 2.457 x 10-3 x 74

 = 1.81 x 10-1 = 0.181g

1. **Determine the solubility of calcium hydroxide at the room temperature. (2 mks)**

0.181 = 90 cm3

 100 cm3‑ = 0.181 x 100 = 0.2 g 1100g of H2O

 90

1. You are provided with:-
* Solution Y contained 0.2M copper (II) sulphate per litre of solution
* Solid Z

You are required to determine the heat evolved when one mole of solution Y react with solid Z.

Procedure

Measure 40cm3 of solution y and place it into insulated 50 cm3 plastic beaker, stir the solution with the help of the thermometer and record its temperature after every half minute for 1 ½ minutes.

After exactly 2 minutes add all the solid Z provided and continue stirring the mixture while recording the temperature of solution and complete the table below.

Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time (min) | ½  | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 | 5.5 | 6 | 6.5 | 7 |
| Temp 0c | 21.0 | 21.0 | 21.0 | X | 24.0 | 26.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | 26.5 | 26.5 |

**(b) (i) On the graph paper provided. Plot a graph of temperature against time.**

**(4mks)**

1st reading ±2/last reading ±2

Trend

Decimals

Graph-draw to scale

**(ii) From your graph, determine the maximum temperature change. (1mk)**

Change t=27-21=6.0

 **(c) Given that density of the solution is 1 g/cm3, determine the quantity of heat evolved**

**when the 40cm3 of solution Y is reacted completely with solid Z. Specific heat capacity of solution = 4.2 Jg-1K-1. (2mks)**

∆H=MC∆T

∆H=40x4.2x6

∆H=-10085J

**(d) (i) Given that solid Z is zinc powder. Write an ionic equation of the reaction**

**which occurs (1mk)**

 Zn(s) + Cu2+(aq) Zn2+(aq) + Cu(s)

 (**ii) Determine the moles of copper (II) ions used up in the reaction. (1 mk)**

 0.2 miles ≡ 1000 cm3

 x ≡ 40 cm3

 x= 0.2 x 46 = 0.008 miles

 1000

**(iii) Determine the amount of heat that would be evolved of one mole of copper (II) ions were used up. (1 mk)**

0.008 miles = 10085

 1 miles ≡ ?

 = 1 x 1008 = -126000 J/mile

 0.008

 = -126 ks/mil

1. **You are provided with substance K. carry out the test below and record your observations and deductions in the table below.**
2. **Scoop a little of solid K with a clean metallic spatula and place it at the hottest part of a non-luminius flame.**

|  |  |
| --- | --- |
| Observation  | Deductions |
| Burns with a luminous flame or sooty smoky flame (1 mk) | Saturated hydrocarbon  \ / C = C or –C ≡ C- / \ |

1. **Add about 10 cm3 of distilled water to the remaining solid K. divide the resulting mixture into 4 portions.**
2. **To the 1st portion add 3 drops of acidified K2Cr2O7**

|  |  |
| --- | --- |
| Observation  | Deductions |
| Acidified K2Cr2O7 turns from orange to green. (1 mk) | R – OH \ / C = C or –C ≡ C- / \ |

1. **To the 2nd portion add 3 drops of bromine water and warm.**

|  |  |
| --- | --- |
| Observation  | Deductions |
| Bromine water decolorized from red-brown to colourless. (1 mk) | K unsaturated \ / C = C or –C ≡ C- / \ (1 mk) |

1. **Add 2-3 drops of universal indicator to the 3rd portion and determine the pH of the solution**

|  |  |
| --- | --- |
| Observation  | Deductions |
| PH = 4 (1 mk) | R- CooH, weka acid |

1. **To the 4th portion add a spatula of sodium carbonate.**

|  |  |
| --- | --- |
| Observation  | Deductions |
| Effervescence of a colourless gas. (1 mk) | R – CooH or H+ confirmed (1 mk) |

1. **Dissolve one spatula endful of solid L in about 10cm3 of distilled water. Divide the solution in 6 portions.**
2. **To the 1st portion add Naoh(aq) dropwise until in excess.**

|  |  |
| --- | --- |
| Observation  | Deductions |
| White precipitate soluble in excess. ( ½ mk) | Al3+, 2u2+, Pb 2+ ions |

1. **To the 2nd portion add dilute ammonia solution dropwise until in excess.**

|  |  |
| --- | --- |
| Observation  | Deductions |
| White precipitate insoluble in excess ( ½ mk) | Al3+, Pb2+ |

1. **To the 3rd portion add 2-3 drops of lead (II) nitrate solution and warm.**

|  |  |
| --- | --- |
| Observation  | Deductions |
| White precipitate dissolves onehating  ( ½ mk) | Cl ion confirmed |