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**CEKENAS END OF TERM 2 EXAM-2022**

**FORM FOUR**

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

***CHEMISTRY PP3***

***MARKING SCHEME***

You are provided with the following

Sodium hydroxide solution A

0.1M HCl labelled B

An alkanoic acid labelled C

You are required to

i) Standardize solution A

ii) Determine the mole ratio of reaction between sodium hydroxide and the alkanoic acid

iii) Calculate the molarity of solution C

iv) Determine the molar enthalpy of neutralisation of the alkanoic acid and sodium hydroxide

PROCEDURE 1

Using the pipette, place 25cm3 of solution A into a 250ml volumetric flask .Add distilled water as you shake up to the 250ml mark .Label the solution formed as D.

Fill the burette with solution B .Rinse the pipette and use it to transfer 25cm3 of solution D into a conical flask. Add 3 drops of phenolphthalein indicator and carry out titration .Repeat the procedure twice to obtain concordant values .Record the results below

CT 1

 DP 1

ACC 1

PA 1

FA 1

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

a) Determine the average titre volume (1mk)

b) Calculate the number of moles of

i) HCl that reacted (1mk)

 *= correct answer A*

ii) NaOH in the 25cm3 of solution D ( 1/2MK)

 *Correct answer (i) above*

iii) Molarity of NaOH solution A (1MK)



 **PROCEDURE 2**

Rinse the burette and fill it with solution C .Run 16cm3 of solution C into a 100ml plastic beaker .Using a thermometer measure its temperature and record it in the table 2 below as initial .Add 4cm3 of solution A using a syringe .Stir with the thermometer immediately and note the highest temperature reached .Record it in the table as final temperature .Repeat the procedure with other volumes of A and C as shown in the table and complete it . Rinse the beaker and the thermometer after each experiment

CT 2

DP 1

ACC 1 tied to the initial

Trend 2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Volume of solution (cm3) | 16 | 12 | 8 | 6 | 4 | 2 |
| Volume of solution A (cm3) | 4 | 8 | 12 | 14 | 16 | 18 |
| Final temperature (C ) |  |  |  |  |  |  |
| Initial temperature (0C) |  |  |  |  |  |  |
| Change in temperature |  |  |  |  |  |  |

d) On the grid below, plot the graph of change in temperature against volume of sodium hydroxide solution A (3mks)

LA =1/2

Scale =1/2

P=1

Line=1

e) From your graph determine

i) The volume of sodium hydroxide solution A required t neutralize the alkanoic acid (1/2mks)

 **(To be read from the correct graph)**

ii) Highest change in temperature ΔT (1mk)

 **(To be read from a correct graph)**

f) Determine the volume of the alkanoic acid solution C, used in the neutralization (1mk)

 **20 –Ans in (i) above**

g) Calculate the;

i) Concentration of the alkanoic acid solution C, given that the ratio of volume of alkalis to the volume of acids is also the mole ratio (2mks)

 vol of NaOH ;Acid

 2 :1

 **Moles of sodium hydroxide**

**=ans in c**

**Moles of acid = Ans C /2**

**=Correct answer**

ii) Molar enthalpy of neutralization of the acid by sodium hydroxide (2mks)

 (C=4.2J/g/k, density of solution =1g/cm3)

 **Heat change for reaction 20 x 4.2 x Ans in e (ii) above**

 **= Correct answer (K) in joules**

 **Moles of acid = Ans in (F) above /1000 x correct Ans in g (i) above**

 **= Ans M**

 **=Correct Ans K /Ans M = - Correct Ans J/mole**

2. You are provided with solid P .Carry out the following tests and write your observations and inferences in the spaces provided

a)Place all the solid P in a boiling tube .Add about 10cm3 of distilled water and shake the mixture thoroughly .Filter the mixture into another boiling tube .Retain the filtrate for use in the test 2 (b) below .Dry the residue using a filter paper

i) Transfer about half of the residue into a dry test tube .Heat the residue strongly and test any gas produced using a burning splint

Observations Inferences

|  |  |
| --- | --- |
| Effervescence ,burning splint extinguished | CO3²- |
| Residue, yellow hot white when cold | Zn²+ 1mk |

ii) Place the rest of the residue in a dry test tube .Add 2cm3 of 2M hydrochloric acid .Retain the mixture for test (iii) below

|  |  |
| --- | --- |
| Observations | Inferences |
| Effervescence/ bubbles of a  | CO3 2- |
| Colourless gas | 1mk |

iii) To the solution formed in (ii) above, add aqueous ammonia drop wise till in excess

|  |  |
| --- | --- |
| Observations | Inferences |
| White precipitate soluble in excess | Zn2+ |
| 1mk | 1mk |

b) i) To about 2cm3 of the filtrate obtained in (a) above add aqueous ammonia drop wise until in excess

|  |  |
| --- | --- |
| Observations | Inferences |
| White precipitate soluble in excess | Zn2+ |
| 1/2mk | 1/2mk |

ii) To about 2cm3 of the filtrate, add about 2cm3 of 2M hydrochloric acid

|  |  |
| --- | --- |
| Observations | Inferences |
| No effervescence | CO3 2-, SO32- absent |
| No white precipitate (1mk) | Pb2+Ag+ absent 1MK |

iii) To 2cm3 of filtrate add two drops of barium nitrate solution

|  |  |
| --- | --- |
| Observations | Inferences |
| White precipitate  | SO4 2- |
| 1/2mk | 1/2mk |

3. You are provided with solid E. Carry out the following test and record your observations and inferences in the spaces provided

a) Pace about one half of solid E in a dry test tube .Retain the other half for use in b.Add all of the absolute ethanol provided to solid E in a test tube shake the mixture

|  |  |
| --- | --- |
| Observations | Inferences |
| Soluble  | polar |
| 1/2mk | 1/2mk |

Divide the mixture formed into two portions

i) Determine the pH of the first portions

|  |  |
| --- | --- |
| Observations | Inferences |
| pH7 | neutral |
| 1/2mk | 1/2mk |

ii) To the second portion, add about one half of sodium hydrogen carbonate provided

|  |  |
| --- | --- |
| Observations | Inferences |
| No effervescence/bubbles | RCOOH/ /H3O+/H+ Absent |
| 1mk | 1mk |

b) Place the remaining solid E in a boiling tube 10cm3 of distilled water and shake. Boil the mixture and divide it into 3 portions while still warm

i) To the first portion add the remaining sodium hydrogen carbonate

|  |  |
| --- | --- |
| Observations | Inferences |
| Effervescence  | RCOOH/H3O+ |
| 1/2MKS | ½ MKS |

ii) The second portion add three drops of acidified K2Cr2O7

|  |  |
| --- | --- |
| Observations | Inferences |
| Orange colours of H+/ K2Cr2O7 changes to green( ½ mks) | R-OH (1/2mk) |

iii) To the third portion add 5 drops of Bromine water

|  |  |
| --- | --- |
| Observations | Inferences |
| Yellow bromine water decolourises/ changes to colourless (1/2mk) |  or |