Examples with its solution

Q-1- (0.2) g of saline solution consisting of mixing (potassium chloride and potassium nitrate) was passed through a cationic exchanger and the collected solution from the column was calibrated against the potassium hydroxide base ,If the flow volume of the burette was(20) ml , calculate :

1 . The weight of potassium chloride in the sample ?

2. The weight of potassium nitrate in the sample ?

3. The Normality concentration of the potassium hydroxide ?

4. PPM for potassium nitrate in the solution (5ml) ?

5. Write the equations for this question ?

If you know the percentage of potassium chloride in the sample is 80 %

And the Atomic weight for (K = 39 , N =14 , O = 16 , Cl = 35.5)

(1) $\% KCl = \frac{wt(KCl)}{wt\ Sample} \times 100 \Rightarrow \frac{80}{100} = \frac{wt(KCl)}{0.2} \Rightarrow 0.16$

(2) $\% KNO_3 = \frac{wt(KNO_3)}{wt\ Sample} \times 100 \Rightarrow \frac{20}{100} = \frac{wt(KNO_3)}{0.2} \Rightarrow 0.04$

(3) No. of Meq KCl + No. of Meq KNO_3 = No. of Meq KOH

$$\frac{wt}{eq.wt} + \frac{wt}{eq.wt} = \frac{N \times V}{1000}$$

$$\frac{0.16}{74.5} + \frac{0.04}{101} = \frac{N \times 20}{1000} \Rightarrow N = 0.12$$

(4) PPM for KNO_3 $= N \times eq.wt \times 1000$

$$= \frac{wt}{eq.wt} \times \frac{1000}{V(ml)} \times eq.wt \times 1000$$

$$= \frac{0.04 \times 10^6}{5} = 8000$$

(5) $R\text{-}H^+ + KCl \rightleftharpoons R\text{-}K^+ + HCl$

$R\text{-}H^+ + KNO_3 \rightleftharpoons R\text{-}K^+ + HNO_3$

Q-1- A sample of sodium bromide weighing (0.1) g was dissolved in (50) ml of the distilled water,The saline solution was then passed on a cationic column (H^+_Form), Then solution was collected from the column and calibrated with sodium hydroxide ,If the volume of the sodium hydroxide was (50)ml,

Calculate :

1- The resin capacity if the resin weight is (0.5) g
2- The concentration of the sodium hydroxide in ppm .
3- Write the equation for this question $\Rightarrow R\text{-}H^+ + NaBr \rightleftharpoons R\text{-}Na^+ + HBr$

If you know the atomic weight of Na = 23 , O = 16 , H = 1 , Br = 80

(1) $T.C = \frac{\text{No. of Meq of } (H^+)}{\text{g of Resin}}$ → كان إلكتروليت أو كاتيون

No. of Meq H^+ = No. of Meq of NaBr

$N \times V = N \times V$

$? = \frac{wt}{eq.wt} \times \frac{1000}{V} \times V$

$= \frac{0.1}{103} \times 1000 \Rightarrow 0.97$ This No. of Meq H^+

$T.C = \frac{0.97}{0.5} = 1.94$

(2) No. of Meq of H^+ = No. of Meq NaoH

No. of Meq of NaBr = No. of Meq NaoH

$0.97 = N \times 50$

$N = 0.019$

$$ppm = N \times eq.wt \times 1000$$

$$= 0.019 \times 40 \times 1000$$

$$= 776$$

Q-1- (0.2) g of saline solution consisting of mixing (sodium chloride and sodium nitrate) was passed through a cationic exchanger and the collected solution from the column was calibrated against the sodium hydroxide base ,If the flow volume of the burette was

(20) ml , calculate :

1 . The weight of sodium chloride in the sample ?

2. The weight of sodium nitrate in the sample ?

3. The Normality concentration of the sodium hydroxide ?

4. PPM for sodium nitrate in the solution (5ml) ?

5. Write the equations for this question ?

If you know the percentage of sodium chloride in the sample is 80 %

And the Atomic weight for (K = 39 , N =14 , O = 16 , Cl = 35.5)

eq.wt (NaCl) $= \frac{23+35.5}{1} = 58.5$

eq.wt $NaNO_3 = \frac{23+14+3\times16}{1} = 85$

(1) $\% NaCl = \frac{wt(NaCl)}{wt\ of\ Sample} \times 100$

$\frac{80}{100} = \frac{wt(NaCl)}{0.2\ gm} \Rightarrow 0.16\ gm$ wt of NaCl

wt of $NaNO_3 \Rightarrow \%100 - \%80 = 20\%$

(2) $\% NaNO_3 = \frac{wt(NaNO_3)}{wt\ of\ sample} \times 100 \Rightarrow \frac{20}{100} = \frac{wt(NaNO_3)}{0.2}$

$\Rightarrow 0.04\ gm$

(3) No. of Meq(NaCl) + No. of Meq($NaNO_3$) = No. of Meq(NaOH)

$\frac{wt}{eq.wt} \times 1000 + \frac{wt}{eq.wt} \times 1000 = N \times V$

$\frac{0.16}{58.5} + \frac{0.04}{85} = \frac{N \times 20}{1000} \Rightarrow N = 0.15$ for NaOH

(4) PPM for $NaNO_3$ = N x eq.wt x 1000

$$= \frac{wt}{eq.wt} \times eq.wt \times \frac{1000}{V} \times 1000$$

$$= \frac{0.04 \times 10^{6}}{5\,(ml)} \Rightarrow 8000$$

(5) $R-H^+ + NaCl \rightleftharpoons R-Na^+ + HCl$

مبادل كاتيوني

$R-H^+ + NaNO_3 \rightleftharpoons R-Na^+ + HNO_3$

Q-1- (0.5) g of the potassium chloride solution was transferred to the cationic exchanger (H+ _Form),if The volume of the come down solution from the cationic exchanger was (10)ml ,which was calibrated with the sodium hydroxide, The volum of the sodium hydroxide was (12) ml,

Calculate :

1- The concentration of sodium hydroxide in ppm
2- The pH of the acid that come down from Ion exchange column
3- Write the equation for this question $\Rightarrow R\text{-}H^+ + KCl \rightleftharpoons R\text{-}K^+ + HCl$

If you know the atomic weight for K = 39 , Cl = 35.5 , Na = 23 ,O =16 , H=1

(1) No. of M eq KCl = No. of Meq NaOH

$$\frac{wt}{eq.wt} \times \frac{1000}{V} \times V = N \times V$$

$$\frac{0.5}{74.5} = \frac{N \times 12}{1000} \Rightarrow N = 0.55$$

$$PPM = N \times eq.wt \times 1000 \Rightarrow 0.55 \times 40 \times 1000 \Rightarrow 22{,}371.3$$

(2) No. of Meq for acid = No. of Meq NaOH

$$N \times V = N \times V$$

$$N \times 10 = 0.55 \times 12 \Rightarrow N = 0.66$$

$$\therefore pH = -\log [H]$$

$$= -\log [0.66] \Rightarrow$$

Q-1- Answer the following questions :

1- $2R^-\_H^+ + Na_2CO_3^{2-} \rightleftharpoons 2R\text{-}Na + H_2CO_3$ (مبادل كاتيوني)

2- $R^+\_OH^- + NaCl \rightleftharpoons R\text{-}Cl^- + NaOH$ (مبادل أنيوني)

3- $R^-\_K^+ + NaOH \rightleftharpoons R\text{-}Na^+ + KOH$ (مبادل كاتيوني)

Q-2- Sort the ions according to the speed of replacement:

$R^-\_H^+ + (K^{+1}, Ca^{+2}, Al^{+3}) \rightleftharpoons$

إن سرعة الاستبدال تعتمد إما على زيادة الشحنة في حالة اختلاف الشحنات

أو

زيادة الوزن الذري في حالة تشابه الشحنات.

(1) $3R\text{-}H^+ + Al^{+3} \rightleftharpoons (R\text{-})_3\text{-}Al^{+3} + 3H^+$

(2) $2R\text{-}H^+ + Ca^{+2} \rightleftharpoons (R\text{-})_2 Ca^{+2} + 2H^+$

(3) $R\text{-}H^+ + K^+ \rightleftharpoons R\text{-}K^+ + H^+$