1- Analytical chemistry is generally classified into ……. And …… . (Ans: qualitative and quantitative)

2- Always the amount of …….. more than the amount of ……. in solution. (Ans: solvent, solute)

3- …….. is the number of moles of solute on one liter of solution. (Ans: Molarity)

4- A titration curve is a plot of ……. vs. the amount of ……. added. (Ans: pH vs. titrant)

5- For substances that …….. in solution, such as NaCl, molarity and formality are …… . (Ans: ionize, different)

6- …….. deals with the development of new methods and techniques for the separation and determination of the analyte qualitatively and quantitatively. (Ans: Analytical chemistry)

7- …… attempting to identify what materials are present in sample. (Ans: Qualitative analysis)

8- Sugar dissolves in water by ……. process . (Ans: Dispersion)

9- The most ……. indicators are colorless in acidic solutions and shows different color in basic solution. (Ans: phthalein)

10- Many of …….. indicator exhibit two useful color change ranges. One occurs in acidic solutions (pH 1.5 – 3) and the other in neutral or moderately basic media (pH 6.4 - 8). (Ans: Sulfonphthaleins)

11- Titration curves are useful for determining …….. and …….. of weak acids or bases. (Ans: *end-points* and *dissociation constants*)

12- Volumetric analysis involves using volumes of liquids of ……. concentration to determine a concentration of an …….. . (Ans: known, analyte)

13- What is the range of pH for indicator if you now that the dissociation constant Ka equal to 1×10^{-5}.
(Ans: Ka = 1x10-5 pKa = -log10-5 pH = 5 ± 1 pH = 6-4 the pH range)

14- Describe the most critical conditions for sampling.
(Ans:
a) The sample must be representative (reflect entire body from which it came).

b) The sample must be homogeneous (having the composition everywhere)

c) Transportation, from the field (sample place) to the laboratory without altering sample.)

15- Describe the methods for the preparation of anhydrous ethanol:

1) 500 ml of 6% (w/v) 2) 500 ml of 6% (w/w) 3) 500 ml of 6% (v/v)

(Ans: 1) 6% (w/v) meaning dissolving 6 g of ethanol in 100 ml of water this is meaning (6×5)= 30 g of ethanol in 500 ml of water.

2) 6% (w/w) meaning dissolving 6 g of ethanol in 100 g of water this is meaning (6×5)=30 g of ethanol in 500 g of water.

3) 6% (v/v) meaning mixing 6 ml of ethanol in 94 ml of water this is meaning (6×5)=30ml of ethanol in (94 × 5) = 470 ml of water

16- Prepare solution 0.1N of $Ca(OH)_2$ in 1L volumetric flask. (M.wt = 74.093 g/mol)

(Ans: Wt=N*eq.wt*V(L)

M.wt= 74.093 g/mol

Eq.wt\= M.wt/2= 37.0465

Wt=3.70465g)

17- Explain the ionic theory of acid-base indicator only by chemical reaction.

(Ans: A) $H_2O + HIn \rightleftarrows H_3O^+ + In^-$ …….. (1)

(Acid color) (Base color)

or: $In + H_2O \rightleftarrows InH + OH^-$ …… (2)

(Base color) (Acid color))

18- What are the Important requirements for primary standard materials?

(Ans:

1. High purity.

2. Atmospheric stability.

3. Absence of hydrate water so that the composition of the solid does not change with variations in humidity.

4. Modest cost.

5. Reasonable solubility in the titration medium.

6. Reasonably large molar mass (M.wt) so that the relative error associated with weighing the standard is minimized.)

19- Concentration of diclofenac-sodium in a voltaren ointment equal to 1%. How many milligrams of diclofenac-sodium is containing in 60g ointment? (Ans:

Ex2:
Concentration of diclofenac-sodium in a voltaren ointment equal to 1%.
How many milligrams of diclofenac-sodium is contain in 60g ointment?

$$\%w/w = \frac{Wt.of\ solute_{(g)}}{Wt\ of\ solution_{(g)}} * 100$$

$$Wt.of\ solute_{(g)}\ x\ 100\ = \%w/w\ x\ Wt.of\ solution)g)$$

Milligrams in ointment = ?

$$Wt.of\ solute_{(g)} = \frac{\%w/w\ x\ Wt.of\ solution_{(g)}}{100}$$

$$Wt.of\ solute_{(g)} = \frac{1\ x\ 60}{100} = 0.6g = 600mg\ diclofenac - sodium$$

20- Calculate the molar concentration of the solute species in:

a) An aqueous solution that contain 2.30 g of ethanol (C_2H_5OH) (M.Wt.= 46.1 g/mol), in 3.50L.

b) An aqueous solution that contains 285 mg of trichloroacetic acid (Cl_3CCOOH) (M.Wt.=163 g/mol), in 10 ml (the acid is 73% ionized in water).

(Ans:

A) $no.\ of\ moles$ = wt. (g) /M.Wt. (g/ mol) = 2.30 (g) /46.1 (g/ mol) = 0.0498 mole $Molarity$ = no.of mole (mole) /Volume (L) = 0.0498 (mole)/ 3.5 (L) = 0.0143 mol/L (M)

B) $no.\ of\ moles$ = wt. (g)/ M.Wt. (g /mol) = 285 (mg) /163 (g mol) = 1.7484 mmole $Molarity$ = no.of mole (mole) /Volume (L) = 1.7484 (mole) / 10 (mL) = 0.17484 mol/L (M)

But 27% of the Cl_3CCOOH is undissociated as H_3O^+ and Cl_3CCOO^- , the species concentration of Cl_3CCOOH is given by: M Cl_3CCOOH × (27 / 100) = 0.17484 × 0.27 = 0.047 mol/L (M))

21- Calculate the weight in gram of $AgNO_3$ required to convert 2.33g of Na_2CO_3 to Ag_2CO_3 . (M.Wt $AgNO_3$ = 170 g/mol) , (M.Wt Na_2CO_3 = 106 g/mol)

(Ans:

$2AgNO_3 + Na_2CO_3 \longrightarrow Ag_2CO_3\,(s) + 2NaNO_3$

$moles\ Na_2CO_3 = Wt. / M.Wt. = 2.33 / 106 = 0.02\ mol$

$2AgNO_3 + Na_2CO_3 \longrightarrow Ag_2CO_3\,(s) + 2NaNO_3$

Mole = 2 1

Mole = X 0.02

X = (2 * 0.02) / 1 = 0.04 mol $AgNO_3$

$Wt.\ AgNO_3 = No.\ of\ moles\ X\ M.Wt. = 0.04\ X\ 170 = 6.8\ g\ AgNO_3$)

22- Prepare 500mL (6M) from the concentrated H_3PO_4 . Sp.gr. = 1.696 , percentage = %85 , At.Wt: P=31 , O=16.

(Ans:

$$M = \frac{\%\ x\ Sp.g\ x\ 1000}{M.wt}$$

$$M = \frac{Sp.Gr. * \% * 10}{M.Wt.} = \frac{1.696 * 85 * 10}{98} = 14.7\ mol/L$$

$(M_1V_1)_{concentrated} = (M_2V_2)_{diluted}$

$(14.7 \times V_1) = (6 \times 500)$

$V_1 = (6x500)/14.7 = 204.1$ mL

This is meaning we take 204.1 mL from the concentrated solution (bottle) and diluted to 500 mL with distilled water to obtain 6M H_3PO_4.

23- Drive a curve for the titration of 50.0 mL of 0.05 M HCl (Titrand) with 0.10 M NaOH (Titrant).

(Ans:

$NaOH + HCl \rightarrow NaCl + H_2O$

no. of moles HCl = no. of moles NaOH

$(M \times V)_{HCl} = (M \times V)_{NaOH}$

The volume of NaOH needed to reach the equivalence point is:

$$V_{NaOH\ at\ equivalence\ point} = \frac{(M \times V)_{HCl}}{M_{NaOH}} = \frac{50 \times 0.05}{0.1} = 25\ ml$$

1- Initial pH: The solution is 0.05 M HCl: Since HCl is completely dissociated:

$HCl + H_2O \rightarrow H_3O^+ + Cl^-$

$[H_3O^+]$= 0.05 M

pH= – Log $[H^+]$ = – Log (0.05)= 1.30

2- Before Equivalence point

pH after addition of 10ml NaOH. The volume of the solution is now 60ml and part of the HCl has been neutralized. Thus:

$$[H_3O^+] = \frac{(M \times V)_{HCl} - (M \times V)_{NaOH}}{V_{Total}}$$

$$= \frac{(0.05 \times 50)_{HCl} - (0.1 \times 10)_{NaOH}}{(50 + 10)} = 0.025M$$

pH= – Log $[H^+]$ = – Log (0.025)= 1.60

3- At Equivalence point

pH after addition of 25ml of NaOH. Here the solution contains neither an excess of HCl nor of NaOH; thus, the pH is obtained from the dissociation of water:

$$[H_3O^+] = [OH^-] = \sqrt{K_w} = \sqrt{1 \times 10^{-14}} = 1 \times 10^{-7}M$$

pH= – Log $[H^+]$ = – Log (1×10^{-7})= 7.00

4- After Equivalence point

pH after addition of 25.1ml NaOH. Here there are an excess of the base after equivalence point, thus:

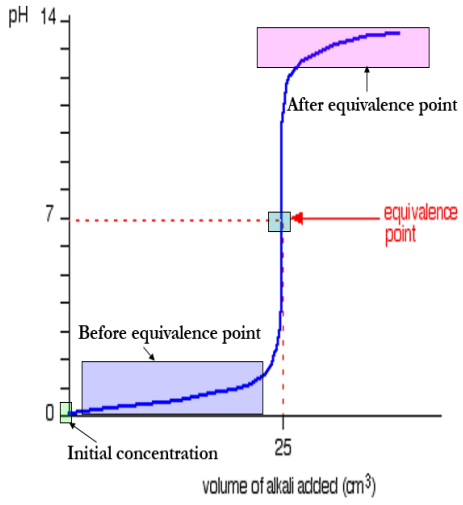
$$[OH^-] = \frac{(M \times V)_{NaOH} - (M \times V)_{HCl}}{V_{Total}}$$

$$[OH^-] = \frac{(0.1 \times 25.1)_{NaOH} - (0.05 \times 50)_{HCl}}{(25.1 + 50)} = 1.33 \times 10^{-4}M$$

pOH= – Log $[OH^-]$ = – Log (1.33×10^{-4})= 3.88

pH + pOH = 14

pH= 14 – 3.88 = 10.12



Strong Acid-Strong Base Titration Curve

24- Describe the method for preparation of 500 ml of 0.03M K^+ from the 0.7M $K_4Fe(CN)_6$

(Ans:

$K_4Fe(CN)_6 \rightarrow 4K^+ + Fe(CN)_6^{4-}$

$K_4Fe(CN)_6$ contain 4K+ M $K_4Fe(CN)_6$ = (1/4) M K+ = (1/4) x 0.03 = 0.0075M

(M1V1) concentrated = (M2V2) diluted

(0.7 x V1) = (0.0075 x 500) ⇒ V1 = (0.0075x500) / 0.7 =5.357 mL

Taking 5.357 ml from the 0.7M $K_4Fe(CN)_6$ then diluted to 500 ml with water to prepare 0.03M K^+)

25- What is the volume of 0.1N HCl which is prepared from dilution of 150ml of 1.24N HCl.

(Ans: No. milleq. for acid before dilution = No. milleq for acid after dilution

(N1V1) before dilution = (N2V2) after dilution

(1.24 x 150) = (0.1 x V2) ⇒ V2 = 1860 ml

i.e, we can prepare 0.1N HCl by diluting 150ml of 1.24N of HCl to final volume of 1860ml.