Analatical chemistry

Chemical analysis

1-Qualitative analysis: knowing type of substance present in solution and identification of chemical component

2-Quantitative analysis: knowing the quantity of chemical substance present in the solution

Examples :

A-Volumetric analysis

B-Instrumental analysis

C-Spectrophotometric analysis

Concentration: - it's the quantity of solute per unit volume o off the solution.

Concentration

-Gram per liter
-Milligram per liter
-Molarity
-Normality

Determination of acidity

-Standard solution as sodium hydroxide

-Sample solution is sulfuric acid

-Indicator is phenolphthalein and methyl orange Indicators

-*Color change* :

In case of methyl orange the color change from red to orange

In case of phenolphthalein the color change from colorless to faint pink

(N x v) acid = N x v) base

Procedure

-Take 10 ml of sulfuric acid using pipette and into conical flask

-Add two drops of phenolphthalein Indicator

-Fill the burette with0.05 standards sodium hydroxide solution then titrate against sulfuric acid solution till the color of indicator has been changed.

-repeat these steps three times

-calculate the average value of the three volumes

Reading	V1	V2	V3
Volume			

Average volume= v1 + v2 + v3 / 3

Determination of alkalinity

-Standard solution is sulfuric acid

-Sample solution is sodium hydroxide.

-*Color change* :

In case of methyl orange the color change from yellow to orange

In case of phenolphthalein the color change from pink to colorless

(N x v) acid = N x v) base

procedure

-Take 10 ml of sodium hydroxide using pipette and into conical flask

-Add two drops of Indicator

-Fill the burette with0.05 standards sodium hydroxide solution then Titrate against 0.01 N sulfuric acid solution till the color of indicator has been change

-repeat these steps three times

-calculate the average value of the three volumes

Reading	V1	V2	V3
Volume			

Average volume= v1 + v2 + v3 / 3

Water analysis

Water hardness

Temporary hardness: due to presence of calcium and magnesium salt as carbonates or bicarbonates

Permanent hardness: due to presence of calcium and magnesium salt as chlorides or sulfates.

Determination of calcium and magnesium salt hardness (total hardness)

-Standard solution is EDTA (ethylene diamine tetra acetic acid disodium salt).

- Sample solution is tap water.

-Indicator is manganese ver indicator

-Color change from red to blue

Procedure

-Fill the burette with standard solution of EDTA

-Take 10 ml of tap water using pipette to the conical flask

-Add 1ml hardness one solution

-Add two drops of indicator

-Titrate the solution against the EDTA solution.

-repeat these steps three times

-calculate the average value of the three volumes

Reading	V1	V2	V3
Volume			

Average volume= v1 + v2 + v3 / 3

Concentration of (Ca + Mg) = Ve.p x 100 =……..mg/l

Determination of calcium salt hardness

-Standard solution is EDTA (ethylene diamine tetra acetic acid disodium salt).

- Sample solution is tap water.

-Indicator is calcium ver indicator

-Color change from red to blue

Procedure

-Fill the burette with standard solution of EDTA

-Take 10 ml of tap water using pipette to the conical flask

-Add 1ml KOH solution

-Add two drops of indicator

-Titrate the solution against the EDTA solution.

-repeat these steps three times

-calculate the average value of the three volumes

Reading	V1	V2	V3
Volume			

Average volume= v1 + v2 + v3 / 3

Concentration of (Ca) = Ve.p x 100 =……..mg/l

Determination of the dissolved oxygen in the tap water

Procedure:

-Fill the bottle with over flow water

-Put the stopper and remove the excess water

-Add dissolved oxygen 1,2 reagent s to the water then check the bottle several times and allow to stand, it is observed that suspension is formed which has yellow color and two zones are formed clear and turbid zone

-Add dissolved oxygen 3 reagent to the solution which clearing the
-turbid solution and clear yellow solution is formed

-Take 5.8ml of the solution then titrate against phenyl arsine oxide solution till the color changed from yellow to colorless

Calculation:

Each one drop of PAO = 1 mg/l of D.O

Protection against corrosion using cathodic protection

Procedure:

1-wheight two sheets of steel (dry and clean from oxide).

2-Immerse one sheet of steel in 200mL solution containing saturated ammonium chloride solution for 45minutes.

3- In the same time couple the other sheet with (dry clean from oxide) zinc sheet of the same dimension then immerse them in 200mL solution containing saturated ammonium chloride solution for 45minutes.

4-wash each sheet using distilled water then dry with filter paper.

5- Reweight the two sheets of steel.

Calculation:

Rate of corrosion= weight loss/ area.time (gm/cm2.min)

R1= (gm/cm2.min)

Rp= (gm/cm2.min)

Degree of protection= (R – Rp / R) . 100

Where:

R is rate of corrosion of unprotected sheet.

Rp is rate of corrosion of protected sheet.

Determination of the inhibition efficiency for corrosion inhibitors

Procedure:

1-wheight two sheets of steel (dry and clean from oxide).

2-Immerse one sheet of steel in 200mL solution containing (1 molar ferric chloride and 0.25 molar hydrochloric acid) for 30 minutes.

3-Immerse the other sheet of steel in 200mL solution containing (1 molar ferric chloride and 0.25 molar hydrochloric acid and 1% glycerol) for 30 minutes.

4-wash both sheets with distilled water then dry with filter paper.

5-reweight the two sheets of steel.

Calculation:

Rate of corrosion= weight loss/ area.time (gm/cm^2.min)

R_1= (gm/cm^2.min)

Rp= (gm/cm^2.min)

Degree of protection= (R – Rp / R) . 100

Where:

R is rate of corrosion of uninhibited sheet (solution not contain inhibitor).

Rp is rate of corrosion of inhibited sheet (solution not contain inhibitor).

Protection against corrosion using passivation

Procedure:

1-wheight two sheets of steel (dry and clean from oxide).

2-passivate only one of them in 200ml of solution containing (20 g/L sodium hydroxide and 50 g/L potassium dichromate) for 15minutes at room temperature.

3-Immerse each sheet of steel in 200mL solution containing saturated ammonium chloride solution for 45minutes.

4-wash both sheets with distilled water then dry with filter paper.

5-reweight the two sheets of steel.

Calculation:

Rate of corrosion= weight loss/ area x time (gm/cm2.min)

R_1= (gm/cm2.min)

Rp= (gm/cm2.min)

Degree of protection= (R – Rp / R). 100

Where:

R is rate of corrosion of unpassivated sheet.

Rp is rate of corrosion of passivated sheet.

s***pectrophotometer***

Procedure:

-clean the cell with distilled water

-put in the cell distilled water till reach the mark

-switch the spectrometer on

-enter the program number of the element to be determined

-adjust the wave length of the selected element

-put the cell inside spectrophotometer then close the door and press zeroing

-put the sample solution in the cell then add the packet of the reagent (reagent ver.)then press alt +shift and observe the timer appearance then start quite checking.

-after the time out put the sample cell inside the spectrophotometer

-know press read

-observe your result

Note:

Concentration in PPm