



## *Manual Chemical analysis*

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# Manual Chemical Analysis



✚ Determination of “ Total , Free Chlorine “ , Total Iron , Sulphate , Potassium , Manganese , Silica by Using **device DR3900** ?

## ✚ Determination of Total , Free Chlorine:-

- Take 10 mL of The sample and put it in Cuvette .
- Push Zero The device DR3900 .
- Start a time for 3 minutes .
- Remove Cuvette and Put **PDP Reagent** for ( Total or Free Chlorine ) ,  
DPD = N,N-Diethyl-P-Phenylenediamine .
- Push Read , Record the results of ( Total or Free Chlorine ) .

We have Two Reagent ( DPD Free Chlorine , DPD Total Chlorine ) .

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## ✚ Determination of Total Iron:-

- Take 10 mL of The sample and put it in Cuvette .
  - Push Zero The device DR3900 .
  - Start a time for 3 minutes .
  - Remove Cuvette and Put **Ferover Iron Reagent** for ( Total Iron ) .
  - Push Read , Record the results of ( Total Iron ) .
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## ✚ Determination of Sulphate:-

- Take 10 mL of The sample and put it in Cuvette .
  - Push Zero The device DR3900 .
  - Start a time for 5 minutes .
  - Remove Cuvette and Put **Sulfaver 4 sulfate Reagent** for ( Sulphate ) .
  - Push Read , Record the results of ( Sulphate ) .
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 Determination of Potassium:-

- Take 25 mL of The sample and put it in Cylinder .
  - Put Potassium 1 Reagent ( Powder )
  - Put potassium 2 Reagent ( Solution )
  - Put Potassium 3 Reagent ( Powder )
  - Take 10 mL from Mixing and put it in Cuvette.
  - Push Zero The device DR3900 By another Cuvette But this cuvette contain 10 mL of pure sample .
  - Start a time for 10 minutes.
  - Put the cuvette which contain 10 ML from Mixing.
  - Push Read , Record the Results of ( Potassium ) .
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 Determination of Silica:-

In this experience we have Two range ( **High range** it happens on **Feed water** but **Low range** it happens on **Product water** ) .

**HIGH RANGE :-**

- Take 10 mL of The sample and put it in Cuvette .
  - Push Zero The device DR3900 .
  - Start a time for 2 minutes .
  - Remove Cuvette and Put **Molybdate Reagent ( Powder )** for ( Silica \_HR ).
  - Start a time for 10 minutes
  - Remove Cuvette and Put **Acid Reagent ( Powder )** And **Citric Acid Reagent ( Powder )** for ( Silica \_HR ).
  - Push Read , Record the Results of ( Silica \_HR ) .
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**LOW RANGE :-**

- Take 10 mL of The sample and put it in Cuvette .
  - Push Zero The device DR3900 .
  - Start a time for 2 minutes
  - Remove Cuvette and Put **14 Point Molybdate Reagent ( Solution )** for ( Silica \_LR ).
  - Start a time for 4 minutes
  - Remove Cuvette and Put **Citric Acid Reagent ( Powder )** for ( Silica \_LR ).
  - Start a time for 1 minutes
  - Remove Cuvette and Put **Amino Acid Reagent ( Powder )** for ( Silica \_LR ).
  - Push Read , Record the Results of ( Silica \_LR ) .
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### Determination of Manganese:-

In this experience we have Two range ( **High range** it happens on **Feed water** but **Low range** it happens on **Product water** ) .

We Push Zero The device DR3900 by distilled Water means

We take 10 ml of the distilled water and put in Cuvette.

Remove Cuvette and Put **Powder** for ( Manganese \_HR ) . or Powder for (Manganese \_LR ) .

Now; We Push Zero The device DR3900 , I can make the experience

#### **HIGH RANGE :-**

- Start a time for 2 minutes .
  - Take 10 mL of The sample and put it in Cuvette .
  - Remove Cuvette and Put **Buffer Powder Citrate** and Put **Sodium Periodate ( Powder )** for ( Manganese \_HR ) .
  - Push Read , Record the Results of ( Manganese \_HR ) .
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#### **LOW RANGE :-**

- Start a time for 2 minutes.
  - Take 10 mL of The sample and put it in Cuvette .
  - Remove Cuvette and Put **Ascorbic acid Reagent ( Powder )**
  - **Put 12 point Alkaline Cyanide Reagent ( Solution )**
  - **Put 12 point Di-solution Reagent ( Solution )** for ( Manganese \_LR ) .
  - Push Read , Record the Results of ( Manganese \_LR ) .
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## **Titration Methods**

 Determination of “ Total Hardness , Total Alkalinity , Calcium , Magnesium , Chloride by Using **Titration Methods** ?

### Determination of Total Hardness:-

- ❖ Take 50 mL of the sample to Conical Flask .
- ❖ Add 2 drop from **EBT Indicator**. EBT = Eriochrom Black T
- ❖ Add 5 drop from **ammonical Buffer** until Violet color .
- ❖ Titrate against **EDTA ( 0.01 M )** until till Blue color.
- ❖ Record the Volume of EDTA ( V )

- ❖ Calculate Total Hardness from equation :-

$$\text{Total Hardness (ppm)} = 20 * v$$

#### Determination of Total Alkalinity:-

- ❖ Take 50 mL of the sample to Conical Flask .
- ❖ Add 2 drop from **Methyl orange Indicator** until bill orange
- ❖ Titrate against **H<sub>2</sub>SO<sub>4</sub> ( 0.02 N )** until till Red orange.
- ❖ Record the Volume of **H<sub>2</sub>SO<sub>4</sub> ( V )**
- ❖ Calculate Total Hardness from equation :-

$$\text{Total Alkalinity (ppm)} = 20 * v$$

#### Determination of Calcium:-

- ❖ Take 50 mL of the sample to Conical Flask .
- ❖ Add 2 drop from **Muroxide Indicator**.
- ❖ Add 1 drop from **NaOH ( 4M )** Until pink color.
- ❖ Titrate against **EDTA ( 0.01 M )** until till Violet color.
- ❖ Record the Volume of EDTA ( V )
- ❖ Calculate Total Hardness from equation :-

$$\text{Calcium(ppm)} = 8.016 * v$$

#### **WE CAN CALCULATED MAGNESIUM BY USING THIS IS EQUATION :-**

$$\text{Magnesium (ppm)} = 0.243 * \{ \text{Total Hardness} - ( 2.5 * \text{Calcium} ) \}$$

#### Determination of Chloride:-

In This experience we want to know the Normality of Sliver Nitrat

- ❖ Take 50 mL of NaCl ( 0.028 N ) to Conical Flask .
- ❖ Add 10 drop from **Potassium Chromate Indicator** the color become yellow.
- ❖ Titrate against **AgNO<sub>3</sub> ( 0.1 M )** until till Red brown.
- ❖ Record the Volume of AgNO<sub>3</sub> ( V<sub>1</sub> )
- ❖ Calculate:-

$$\text{Normality of AgNo3} = \frac{1.4}{v_1 - 0.2}$$

- ❖ Take 50 mL of the sample to Conical Flask.
- ❖ Add 10 drop from **Potassium Chromate Indicator** the color become yellow.
- ❖ Titrat against **AgNO<sub>3</sub>** until till Red brown.

- ❖ Record the Volume of  $\text{AgNO}_3$  (  $V_2$  )
- ❖ Calculate:-

$$\text{Chloride (ppm)} = \text{Norm.} * (V_2 - 0.2) * 710$$

### Notes:-

- ❖ **IN CASE OF PRODUCT WATER** we make all test as it as.
- ❖ **IN CASE OF FEED WATER:-**

The sample is diluted 40 times in case of Total Hardness, Chloride and Calcium.

But in case of Total Alkalinity we make test as it as.

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## Molality

 How to prepare ( 1.0 M ) from NaOH in 250 mL ?

### In case of Solid Substance:-

$$gm = M * M.wt * V(L)$$

Which:-

gm = the weight of Substance in grams.

M = Molality required.

M.wt = Molecular weight of Substance.

V(L) = Volume per Liter.

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### In case of Liquid Substance:-

 How to prepare ( 1.0 M ) from HCL in 250 mL ?

$$V = \frac{M.wt * M * v(L) * 100}{D * c}$$

Which:-

V = the Volume of Liquid Substance.

M = Molality required.

M.wt = Molecular weight of Substance.

V(L) = Volume per Liter.

D = Density of Liquid substance.

C = Concentration of Liquid substance.

# Normality

How to prepare ( 1.0 N ) from HCL in 250 mL ?

**In case of Liquid Substance:-**

$$\text{Normality} = \frac{C * D * 10}{eq. wt}$$

Which

D = Density of Liquid substance.

C = Concentration of Liquid substance.

❖ How to Calculate Equivalent weight ?

In Case of Acid

$$eq. wt = \frac{M. wt \text{ of substance}}{\text{number of Hydrogen replaced}}$$

In case of Basic

$$eq. wt = \frac{M. wt \text{ of substance}}{\text{number of Hydroxide replaced}}$$

In case of Salt

$$eq. wt = \frac{M. wt \text{ of salt}}{\text{valence one of salt} * \text{Number of repetitions}}$$

Then we used this equation

$$(N * V) \text{ berfor} = (N * V) \text{ after}$$

**In case of Solid Substance:-**

$$gm = \frac{N * eq. wt * V(L)}{1000}$$