



## Project Report on

**"Preparation of phenol formaldehyde resin (bakelite) in laboratory"**

**Submitted By**

**M.Sc. SEM-III Students**

**(Roll No.01 to 07)**

**Guided By**

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**Submitted To**

**P. G. Department of Chemistry**

**Sir P.T.Science College, Modasa**

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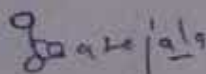
## Certificate

This is to certify that project report entitled "Preparation of Phenol Formaldehyde Resin (bakelite) in Laboratory" are carried out by students mentioned below. They have been satisfactorily completed their project work for academic year 2022-23. The project has been approved as it satisfies the academic requirement in respect of project work prescribed for the Master of Science. - II

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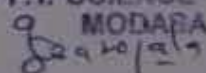
Signature of Guide



(Dr. M .P. Gongiwala)

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P.G. DEPARTMENT OF CHEMISTRY  
SIR. P.T. SCIENCE COLLEGE

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## Aim : Water analysis of given water sample

1) pH: 7.02

2) Conductivity:  $12.98 \times 10^{-3}$

3) Total dissolved solids: 0.19

### Process:

Take 250ml beaker and clean it by distilled Water and dry it with help of drien. Now weight it Actuality. Take 50 ml water sample in the beaker and Evaporate the near dryness. Now weight it and Calculate the total dissolved solids.

### Calculation :

1) Weight of empty beaker: 93.94

2) Weight of beaker + T.D.S: 94.13

3) Weight of T.D.S. = 0.19 gm  
= gm  
= + T.D.S in 50ml sample  
=  $0.19 \times 10$   
= 1.9 gm in 1000ml solution

Now, ppm of T.D.S =  $1.9 \times 1000$   
= 1900 mg/L

### (5) Determination of $Ca^{2+}$ :

- Requirements :
1. 0.01M EDTA
  2. 2N NaOH
  3. Murexide indicator

#### Process:

Take 25ml Water Sample And 25ml D.W. in Conical Flask and add 2-3ml NaOH. Murexide as an indicator Titrate at against 0.01M EDTA at the end point the colour will be red to purple.

#### Observation:

Burette : 0.01 M EDTA  
Conical flask : 25ml W.s + 25ml D.W + 2-3ml NaOH + indicator  
Indicator : Murexide  
Colour change : red to purple

#### Observation Table :

Burette Reading	I.	II.	III.	Constant
final	3.5	3.4	3.5	3.5
initial	0.0	0.0	0.0	
differences	3.5	3.4	3.5	

#### Calculation:

$$\begin{aligned} 1000\text{ml } 1\text{M EDTA} &= 40.08 \text{ gm/mol } Ca^{2+} \\ \text{ml } 0.01\text{M EDTA} &= (?) \\ &= \frac{3.5 \times 0.01 \times 40.08}{1000} \\ &= 0.0014028 \times 40 \\ &= 0.05611 \text{ gm in } 1000 \text{ ml w.s.} \\ \text{Ppm of } Ca^{2+} &= 0.05611 \times 1000 \\ &= 56.11 \text{ mg/L} \end{aligned}$$

### Calculation for $\text{CO}_3^{2-}$ :

$$\begin{aligned} 1000\text{ml } 1\text{N HCl} &= 60.009 \text{ gm/mol} \\ \text{ml } 0.05\text{N HCl} &= (?) \\ &= \frac{1.8 \times 0.05 \times 60.009}{1000} \\ &= 0.0054 \text{ gm } \text{CO}_3^{2-} \text{ in } 50 \text{ ml w.s} \\ &= 0.0054 \times 20 \\ &= 0.108 \text{ gm } \text{CO}_3^{2-} \text{ in } 1000 \text{ ml w.s} \end{aligned}$$

$$\begin{aligned} \text{Ppm of } \text{CO}_3^{2-} &= 0.108 \times 1000 \\ &= 108 \text{ mg/L} \end{aligned}$$

### Calculation for $\text{HCO}_3^{2-}$ :

$$\begin{aligned} 1000\text{ml } 1\text{N HCl} &= 61.0168 \text{ gm/mol } \text{HCO}_3^{2-} \\ \text{ml } 0.05\text{N HCl} &= (?) \\ &= \frac{17.9 \times 0.05 \times 61}{1000} \\ &= 0.05459 \text{ gm } \text{HCO}_3 \text{ in } 50 \text{ ml w.s} \\ &= 0.05459 \times 20 \\ &= 1.0918 \text{ gm } \text{HCO}_3 \text{ in } 1000 \text{ ml w.s} \end{aligned}$$

$$\begin{aligned} \text{Ppm of } \text{HCO}_3^{2-} &= 1.0918 \times 1000 \\ &= 1091.8 \text{ mg/L} \end{aligned}$$

(7) Determination of Cl<sup>-</sup> :

- Requirements :
1. 2 % K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution
  2. 0.01N AgNO<sub>3</sub>
  3. Conc. HNO<sub>3</sub>
  4. CaCO<sub>3</sub>

Process:

Take 25ml Water Sample in a conical flask add 1 drop conc. HNO<sub>3</sub>  
Now Heat it 3-4 min add 25 ml 2% K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution and add pinch of CaCO<sub>3</sub>  
so far turbidity as show now titrate it against 0.02N AgNO<sub>3</sub> Solution at the  
end point colour change will be yellow to pink.

Observation :

- Burette : 0.01 N AgNO<sub>3</sub>  
Conical flask : 25ml W.S +1 drops of conc. HNO<sub>3</sub>  
+25ml 2% K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution  
CaCO<sub>3</sub>  
Colour change : yellow to pink

Observation table:

Burette reading	I	II	III	Constant
Final	21.3	21.6	21.6	
Initial	0.0	0.0	0.0	
Differences	21.3	21.6	21.6	21.6

Calculation :

$$\begin{aligned} 1000\text{ml } 1\text{N AgNO}_3 &= 35.453 \text{ gm/mol} \\ \text{ml } 0.01\text{N AgNO}_3 &= (?) \\ &= \frac{21.6 \times 0.01 \times 35.5}{1000} \\ &= 0.007668 \text{ gm Cl in 25ml W.S} \end{aligned}$$

$$\begin{aligned} \text{Ppm of Cl} &= \frac{0.007668 \text{ gm}}{25\text{ml W.S.}} \\ &= 0.007668 \times 40 \text{ mg/L} \\ &= 0.30672 \text{ mg/L gm in 1000 ml W.S} \\ &= 0.30672 \times 1000 \\ &= 306.72 \text{ mg/L} \end{aligned}$$

### 9) Determination of dissolve oxygen :

- Requirements :
1. Orthophosphoric acid
  2. winkler 'A'
  3. winkler 'B'
  4. 0.01M  $\text{Na}_2\text{S}_2\text{O}_3$
  5. 10% KI

#### Process :

Take reagent bottle complitly filled with W.S. and 1ml winkler 'A' and Winkler 'B' shakewell the bottle when they settle down The ppt for 15min then add 2ml orthophosphoric acid till ppt is dissolved. Now take 50 ml solution in a conical flask add 10ml 10% KI and add starch solution as an indicator titrate it against 0.01M  $\text{Na}_2\text{S}_2\text{O}_3$  at the end point violet to colourless.

#### Observation :

Burette : 0.01M  $\text{Na}_2\text{S}_2\text{O}_3$  solution  
Conical flask : 50ml w.s. + 10ml 10% KI  
Indicator : starch  
Colour change: violet to colourless

#### Observation table :

Burette reading	I	II	III	Constant
Final	0.5	0.5	0.4	
Intial	0.0	0.0	0.0	0.5
Differences	0.5	0.5	0.4	

#### Calculation :

$$1000\text{ml } 1\text{N } \text{Na}_2\text{S}_2\text{O}_3 = 8.0 \text{ oxygen}$$

$$0.5 \text{ ml } .01\text{N } \text{Na}_2\text{S}_2\text{O}_3 = (?)$$

$$= \frac{0.5 \times 0.01 \times 8.0}{1000}$$

$$\text{Ppm of D.O} = 0.004 \text{ in } 50 \text{ ml w.s.}$$

$$= 0.004 \times 20$$

$$= 0.008 \text{ in } 1000 \text{ ml w.s.}$$

$$= 0.008 \times 1000$$

$$= 8 \text{ mg/L}$$

## 10) Determination of Chemical Oxygen Demand :

- Requirements :**
1. 0.05N  $K_2Cr_2O_7$  solution
  2. 0.25N  $FeSO_4(NH_4)_2SO_4$
  3. orthophosphoric acid
  4. Aencuric acid
  5. 0.25N Ferrous Ammonium sulphate
  6. Ferroin

**Process:** Transfer 10ml of sample in  $HgCl_2$  of reflux unit this add 10 ml 0.25N potassium di-chromate solution pinch of each silver sulphate and aencuric sulphate and 30ml of sulphuric acid. After attaching labing condencer to the mounth of flaric heat the flask an a hot water bath on heating for at nearly to 2 hour to refluxe the contents Cool the flask deficient at form units and dilute it contants of nearly 150ml by adding D.W. and take 10ml solution. Then add 2-3 drops of ferroin indicator solution Now titrate the solution against 0.25N Ferrous Ammonium sulphate solution at the end point blue green colour of constant gets changed the reddish blue run to in nearly a distilled water blank in similar manner

### Observation:

#### **Sample reading:**

Burette : 0.25N ferrous Ammonium sulphate  
Conical flask : 10 ml 0.25N  $K_2Cr_2O_7$  solution +  
Silver sulphate + mencuric sulphate  
+ 30ml  $H_2SO_4$  + 150ml D.W.  
Indicator : Ferroin  
Colour change : Blue green to Readdish brown



Observation table

Burette reading	I	II	III	Constant
Final	0.5	0.5	0.5	↖ 0.5 ↗
Initial	0.0	0.0	0.0	
Differences	0.5	0.5	0.5	

**Blank reading :**

Burette : 0.25 N ferrous Ammonium sulphate  
 Conical flask : 10ml 0.25N K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> + silversulphate + mercuric sulphate + 150ml D.W  
 Indicator : Ferroin  
 Colourchange : blue green to reddish blue

Observation table:

Burette reading	I	II	III	Constant
Final	1.5	2.0	1.5	↖ 1.5 ↗
Initial	0.0	0.0	0.0	
Differences	1.5	2.0	1.5	

**Calculation:**

$$\begin{aligned}
 \text{C.O.D. (mg/L)} &= \frac{(B-T) \times N \times 1000 \times 8}{10} \\
 &= \frac{1.0 \times 0.25 \times 1000 \times 8}{10} \\
 &= 200 \text{ mg/L}
 \end{aligned}$$