

Enable | Enlighten | Enrich (Deemed to be University) (Under Section 3 of UGC Act 1956) **KARPAGAM ACADEMY OF HIGHER EDUCATION** 

(Deemed to be University Established Under Section 3 of UGC Act 1956) Coimbatore – 641 021.

# LECTURE PLAN DEPARTMENT OF CHEMISTRY B.Sc CHEMISTRY

# STAFF NAME: Dr.M.MAKESWARI AND Dr.M.R.EZHILARASISUBJECT NAME: CHEMISTRY PRACTICAL -VISUB.CODE:15CHU611SEMESTER: VICLASS: III B.Sc (CHEMISTRY)

O M	<b>T</b> 4		
<b>S.No.</b>	Lecture	Name of the Experiment	Support
	Hour		Materials
1	5	Introduction and Procedure writing	
2	5	Determination of partition coefficient of iodine between carbon tetrachloride and water	<b>R1 :</b> 190-192
3	5	Determination of partition coefficient of iodine between benzene and water	<b>R1 :</b> 192
4	5	Determination of equilibrium constant for the reaction between potassium iodide and iodine	<b>R1 :</b> 192-195
5	5	Determination of rate constant of acid- catalyzed hydrolysis of an ester	<b>R1 :</b> 210-213
6	5	Viva -Voce	
7	5	Determination of K <sub>f</sub> molecular weight by Rast method	<b>R1 :</b> 205-207
8	5	Determination of critical solution temperature of phenol- water system	<b>R1 :</b> 197-200
9	5	Determination of effect of added electrolyte on critical solution temperature of phenol-water system	<b>R1 :</b> 200-202
10	5	Determination of concentration of an electrolyte NaCl/ KCl/ Succinic acid	<b>R1 :</b> 203-204
11	5	Determination of transition temperature of sodium acetate, sodium thiosulphate and SrCl <sub>2.6</sub> H <sub>2</sub> O	<b>R1</b> : 187-190
12	5	Phase diagram – simple eutectic system	<b>R1</b> : 208-209

13	1	Revision	
14	1	Viva -Voce	
15	1	Model practical examination	

### Support Material:

**R1:** V. Venkateswaran, R. Veerasamy and A.R. Kulandaivelu, (2003) Basic Principles of Practical Chemistry, Sultan Chand & Sons, Daryagani, New Delhi-110 002.



Enable | Enlighten | Enrich (Deemed to be University) (Under Section 3 of UGC Act 1956) **KARPAGAM ACADEMY OF HIGHER EDUCATION** 

(Deemed to be University Established Under Section 3 of UGC Act 1956) Coimbatore – 641 021.

# LECTURE PLAN DEPARTMENT OF CHEMISTRY B.Sc CHEMISTRY

# STAFF NAME: Dr.M.MAKESWARI AND Dr.M.R.EZHILARASISUBJECT NAME: CHEMISTRY PRACTICAL -VISUB.CODE:15CHU611SEMESTER: VICLASS: III B.Sc (CHEMISTRY)

O M	<b>T</b> 4		
<b>S.No.</b>	Lecture	Name of the Experiment	Support
	Hour		Materials
1	5	Introduction and Procedure writing	
2	5	Determination of partition coefficient of iodine between carbon tetrachloride and water	<b>R1 :</b> 190-192
3	5	Determination of partition coefficient of iodine between benzene and water	<b>R1 :</b> 192
4	5	Determination of equilibrium constant for the reaction between potassium iodide and iodine	<b>R1 :</b> 192-195
5	5	Determination of rate constant of acid- catalyzed hydrolysis of an ester	<b>R1 :</b> 210-213
6	5	Viva -Voce	
7	5	Determination of K <sub>f</sub> molecular weight by Rast method	<b>R1 :</b> 205-207
8	5	Determination of critical solution temperature of phenol- water system	<b>R1 :</b> 197-200
9	5	Determination of effect of added electrolyte on critical solution temperature of phenol-water system	<b>R1 :</b> 200-202
10	5	Determination of concentration of an electrolyte NaCl/ KCl/ Succinic acid	<b>R1 :</b> 203-204
11	5	Determination of transition temperature of sodium acetate, sodium thiosulphate and SrCl <sub>2.6</sub> H <sub>2</sub> O	<b>R1</b> : 187-190
12	5	Phase diagram – simple eutectic system	<b>R1</b> : 208-209

13	1	Revision	
14	1	Viva -Voce	
15	1	Model practical examination	

### Support Material:

**R1:** V. Venkateswaran, R. Veerasamy and A.R. Kulandaivelu, (2003) Basic Principles of Practical Chemistry, Sultan Chand & Sons, Daryagani, New Delhi-110 002.

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

# LAB MANUAL DEPARTMENT OF CHEMISTRY B.Sc CHEMISTRY

# **CONTENTS**

S.No	NAME OF THE EXPERIMENT	PAGE NO
	PARTITION EXPERIMENTS	
1	Determination of Partition Coefficient of Iodine Between Carbon Tetra chloride and water	2
2	Determination of Partition Coefficient of Iodine Between Benzene and water	5
3	Determination of Equilibrium constant By Distribution method	8
	<u>KINETIC EXPERIMENTS</u>	
4	Determination of Rate constant of Acid catalysed Hydrolysis of an Ester	12
	<u>THERMAL EXPERIMENTS</u>	
5	Determination of Molecular weight - Rast 's Method	16
6	Determination of Critical Solution Temperature of Phenol-water System	20
7	Determination of effect of added electrolyte on CST of Phenol- water system	23
8	Determination of concentration of an electrolyte Using CST of Phenol- Water System	25
9	Determination of transition temperature of sodium acetate, sodium thiosulphate and SrCl <sub>2.6</sub> H <sub>2</sub> O	27
10	Phase Diagram- Simple Eutectic system	30

### **Support Material:**

**R1:** V. Venkateswaran, R. Veerasamy and A.R. Kulandaivelu, (2003) Basic Principles of Practical Chemistry, Sultan Chand & Sons, Daryagani, New Delhi-110 002.

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

# PARTITION EXPERIMENTS

### **Experiment No 1**

# DETERMINATION OF PARTITION COEFFICIENT OF IODINE BETWEEN CARBON TETRA CHLORIDE AND WATER

### Aim

To determine the partition or distribution coefficient of iodine between the organic liquid, carbon tetra chloride (CCl<sub>4</sub>) and water.

### Principle

When a solute like  $I_2$  is added to a mixture of two immiscible liquids, iodine distributes itself between the liquids. The ratio of the concentration of iodine in the two layers is constant. The ratio of the concentrations is called partition or distribution coefficient. It is independent of the amount of the substance added to the liquid pair.

The partition coefficient of iodine (K<sub>D</sub>)

Concetrtion of iodine in organic layer

Concetrtion of iodine in aqueous layer

$$K_D = \frac{[I_2] \ org}{[I_2] \ aqu} = constant$$

### **Materials required**

- (i) Carbon tetra chloride (CCl<sub>4</sub>)
- (ii) Iodine solid
- (iii) N/10 Thio
- (iv) N/500 Thio solution
- (v) Starch indicator solution
- (vi) Burette -50ml-2 Nos
- (vii) Pipette 10 ml
- (viii) Reaction bottle 250 ml 2 No s

### **Procedure:**

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 2/32

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

### BATCH-2015-2018

Exactly 50 ml of iodine in carbon tetra chloride (CCl<sub>4</sub>) and exactly 50 ml of water are taken in a clean 250 ml reaction bottle and stoppered well. The mixture is mechanically shaken well for about an hour. If mechanical shaking machine is not available, the bottle containing the mixture must be throughlyshaken nearly an hour. The bottle is kept in a trough containing water to attain thermal equilibrium. Exactly 10 ml of the organic layer (lower layer) is pipetted out into aclean conical flask and is then titrated against N/10 thio solution using starch indicator. The end point is the disappearance of blue colour. Similarly, 10 ml of the aqueous layer (upper layer) is taken and titrated against N/500 thio solution starch indicator. The titrations are repeated for concordant values. From the titre values, the value of partition coefficient can be calculated.

In another bottle, exactly 40 ml of I<sub>2</sub> in CCl<sub>4</sub> and exactly 60 ml of water aretaken and the experiment is repeated as described above.

S.No	Type of	Volume	Burette read	dings	Volume of	Normality
	layer	pipetted out	Initial	Final	thio	of thio
Bottle I	Organic	10 ml	0			
50 ml of $I_2$	layer	10 ml	0			
$\begin{array}{rrrr} In & CCl_4 & + \\ 50 & ml & of \end{array}$	Aqueous	10 ml	0			
water	layer	10 ml	0			
Bottle II	Organic	10 ml	0			
40 ml of $I_2$	layer	10 ml	0			
$\begin{array}{ccc} In & CCl_4 & + \\ 60 & ml & of \end{array}$	Aqueous	10 ml	0			
water	layer	10 ml	0			

### **Observations and calculations**

### **Calculations:**

 $[I_2]$  aqueous layer  $K_D =$  $[I_2]$  Organic layer

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 3/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

	Volume of thio solution X Normality of $\left(\frac{N}{10}\right)$ Thio
[I <sub>2</sub> ] Organic layer	$r = \frac{10 X 2}{10 X 2}$
[I <sub>2</sub> ] aqueous layer	$= \frac{Volume \ of \ thio \ solution \ X \ Normality \ of \ \left(\frac{N}{500}\right) Thio}{10 \ X \ 2} \ moles/lit$
[I <sub>2</sub> ] Organic layer	V of thio X Normality of $\left(\frac{N}{10}\right)$ Thio
$[I_2]$ aqueous layer =	V of thio X Normality of $\left(\frac{N}{10}\right)$ Thio
$[I_2]$ Organic layer	Volume of thio in organic layer
$[I_2]$ aqueous layer =	Volume of thio in aqueous layer
$K_D =$	

### **Result:**

The Partition or Distribution co-efficient of iodine between  $CCl_4$  and water  $K_D =$ 

### Note

- (i) To prepare iodine in carbon tetra chloride, dissolve 3 g of iodine I every 100 ml of CCl<sub>4</sub>.
- (ii) Care should be taken to pipette out only organic layer or aqueous layer as the case may be.
   Mixing up of layers at any stage will lead to error in the determination.
- (iii) While titrating the organic layer, 2 ml of 10% KI solution can be added so that iodine associated with the organic liquid is readily liberated.

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### **Experiment No 2**

### DETERMINATION OF PARTITION COEFFICIENT OF IODINE BETWEEN BENZENE AND WATER

### Aim

To determine the partition or distribution coefficient of iodine between Benzene and water.

### Principle

When a solute like  $I_2$  is added to a mixture of two immiscible liquids, iodine distributes itself between the liquids. The ratio of the concentration of iodine in the two layers is constant. The ratio of the concentrations is called partition or distribution coefficient. It is independent of the amount of the substance added to the liquid pair.

The partition coefficient of iodine (K<sub>D</sub>)

= Concetrtion of iodine in organic layer Concetrtion of iodine in aqueous layer

$$K_D = \frac{[I_2]_{org}}{[I_2]_{aq}} = constant$$

### **Materials required**

- (i) Benzene
- (ii) Iodine solid
- (iii) N/10 Thio
- (iv) N/500 Thio solution
- (v) Starch indicator solution
- (vi) Burette -50ml-2 Nos
- (vii) Pipette 10 ml
- (viii) Reaction bottle 250 ml 2 No s

### **Procedure:**

Exactly 50 ml of iodine in benzene and exactly 50 ml of water are taken in a clean 250 ml

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 5/32

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

### BATCH-2015-2018

reaction bottle and stoppered well. The mixture is mechanically shaken well for about an hour. If mechanical shaking machine is not available, the bottle containing the mixture must be throughlyshaken nearly an hour. The bottle is kept in a trough containing water to attain thermal equilibrium. Exactly 10 ml of the organic layer (upper layer) is pipetted out into aclean conical flask and is then titrated against N/10 thio solution using starch indicator. The end point is the disappearance of blue colour. Similarly, 10 ml of the aqueous layer (lower layer) is taken and titrated against N/500 thio solution starch indicator. The titrations are repeated for concordant values. From the titre values, the value of partition coefficient can be calculated.

In another bottle, exactly 40 ml of  $I_2$  in benzene and exactly 60 ml of water are taken and the experiment is repeated as described above.

S.No	Type of	Volume	Burette read	ding	Volume of	Normality
	layer	pipette out	Initial	Final	thio	of thio
Bottle I	Organic	10 ml	0			
50 ml of	layer	10 ml	0			
I2inbenzene	Aqueous	10 ml	0			
+ 50 ml of	layer	10 ml	0			
water						
Bottle II	Organic	10 ml	0			
$40 \ ml \ of \ I_2$	layer	10 ml	0			
In benzene	Aqueous	10 ml	0			
+ 60 ml of	layer	10 ml	0			
water						
		T.	[I <sub>2</sub> ] <sub>aqueous</sub>	layer	l	<u> </u>
$K_{\rm D} = \frac{1}{[I_2]_{\rm organic  layer}}$						
[1] 0mm	amia lawan	Volume of th	nio solution 2	X Normalit	$xy of \left(\frac{N}{10}\right) Th$	iio molog (lit
[1 <sub>2</sub> ] Organic layer		$= - \frac{10 \times 2}{10 \times 2} moles/lit$				
[r] r		Volume of thio solution X Normality of $\left(\frac{N}{500}\right)$ Thio				
[I <sub>2</sub> ] aqueous layer			10	) X 2		— motes/l

### **Observations and calculation**

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 6/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

$[I_2]$ Organic layer	V of thio X Normality of $\left(\frac{N}{10}\right)$ Thio
[I <sub>2</sub> ] aqueous layer	V of thio X Normality of $\left(\frac{N}{10}\right)$ Thio
$[I_2]$ Organic layer	Volume of thio in organic layer
[I <sub>2</sub> ] aqueous layer	Volume of thio in aqueous layer
$K_D =$	-

### **Result:**

The Partition or Distribution co-efficient of iodine between Benzene and water  $K_D =$ 

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 7/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### **Experiment No 3**

### DETERMINATION OF EQUILIBRIUM CONSTANT BY DISTRIBUTION METHOD

### Aim

To determine the equilibrium constant of the reaction between potassium iodine and iodine and to find out the concentration of the given potassium iodide solution by distribution method.

### Principle

The partition law is obeyed well for the distribution of iodine between  $CCL_4$  andwater. At constant temperature the partition co-efficient is given by

 $K_D = \frac{\text{concentration of iodine in organic layer in gm moles /lit}}{\text{concentration of iodine in aqueous layer gm moles /lit}}$ 

The law doesn't hold good in the distribution of iodine between organic and aqueous layer of KI because in aqueous layer the complex is formed. The facture of distribution law is only apparent and it is expected to hold good provided the concentration of iodine in aqueous layer is taken into a consideration of iodine is distributed between CCl<sub>4</sub> and aqueous solution of KI, the total concentration of iodine in aqueous layer is given by[concentration of iodine in free+ concentration of I<sub>3</sub>] which can be determined by titration with standard thio solution. The concentration of iodine in organic layer can also be determined by titration with standard thio solution. Then the concentration of free iodine in aqueous layer can be determined by dividing the concentration of iodine in organic layer by partition co-efficient. It is used to calculate the vales of  $Cl_3^-$  and  $Cl^-$  If the initial concentration of KI is known and its  $Cl_3^-$ ,  $Cl_2$ ,  $Cl^-$  Are unknown the equilibrium constant for the reaction.

$$KI + I_2 \longrightarrow KI_3$$

The equilibrium constant, 
$$K = \frac{[KI_3]}{[KI][I_2]}$$
]

The equilibrium constant can be calculated by knowing the concentration of free iodine and potassium iodide. If the equilibrium constant is known, the concentration of the unknown solution can

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 8/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### be calculated.

### Materials required

- (i) Iodine in CCl<sub>4</sub> solution
- (ii) M/10 KI solution
- (iii) N/50 Thio solution
- (iv) Starch indicator solution
- (v) Burette
- (vi) Pipette 10 ml
- (vii) Conical flask
- (viii) Reaction bottle 250 ml 2 No s

### Procedure

Exactly 50 ml of M/10 KI solution taken in a clean stoppered reaction bottle is mixed with exactly benzene and exactly 50 ml of a standard solution of iodine in carbon tetra chloride. The mixture is mechanically shaken well for about an hour. If mechanical shaking machine is not available, the bottle containing the mixture must be thoroughlyshaken nearly an hour. It is then set aside for about 20 minutes in a water trough so that equilibrium is attained. Exactly 5 ml of the aqueous layer is pipette out into a clean conical flask. A little of KI salt is addedto it. The liberated iodine is titrated against standard sodium thio sulphate solution taken in a clean burette, using starch as indicator. The end point is the disappearance of blue colour. Another titration is performed to determine the concordant values. From the titre value the concentration of iodine in aqueous layer is calculated. In a similar manner, the concentration of iodine in organic layer is calculated. Using these values, the equilibrium constant is calculated.

The given KI solution is made upto 100 ml in a standard flask. After thorough shaking to make the solution uniform, exactly 50 ml of the solution is taken in a reaction bottle. It is then mixed with exactly 50ml of iodine in CCl<sub>4</sub> solution. The bottle is shaken well for about an hour and set aside for about 20 minutes to attain the equilibrium. The concentration of iodine in aqueous layer is found out as described above. From the concentration of iodine and knowing the equilibrium constant, the concentration of given KI solution is calculated.

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### **Observations and calculations**

SI.No.	Type of	Volume	Burette read	ling	Volume of	Normality
	layer	pipette out			thio	of thio
			Initial	Final		
Bottle I	Organic layer	10 ml	0			
50 ml of $I_2$	•	10 ml	0			
in CCl <sub>4</sub> + 50 ml of M/10 KI	Aqueous layer	10 ml	0			
Bottle II 50 ml of J2	Organic layer	10 ml	0			
in CCl <sub>4</sub> $\pm$ 50		10 111	0			
ml of M/10 KL solution	Aqueous laver	10 ml	0			
(Unknown)		10 ml	0			

### Calculations

The equilibrium constant of the reaction, (K)

 $KI + I_2 \rightarrow KI_3$ 

The equilibrium constant 
$$K = \frac{[KI_3]}{[KI][I_2]}$$

Where,

 $[KI_3]$  = Concentration of  $I_3^-$  at equilibrium

[KI] = Concentration of KI at equilibrium or unreacted

 $[I_2]$  = concentration of free iodine in aqueous layer,

Suppose the concentration of free I<sub>2</sub> in organic layer is C<sub>1</sub>moles /lit and in aqueous layer is C<sub>2</sub> moles / lit. Let the initial concentration of KI be C<sub>3</sub> moles / lit. The partition coefficient of iodine between CCl<sub>4</sub> and water is 80. ( $K_D = 80$ )

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 10/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

=

### **Bottle I organic layer:**

Volume of sodium thio sulphate  $(V_1)$ = Normality of sodium this sulphate( $N_1$ ) = Volume of organic layer pipetted  $out(V_2) =$  $=1 \times \frac{N1}{N2}$ Normality of iodine in organic layer (N<sub>2</sub>) Concentration of iodine in organic layer  $C_1 =$ **Aqueous layer:** Volume of sodium thio sulphate (V<sub>1</sub>) Normality of sodium this sulphate( $N_1$ ) = Volume of organic layer pipetted  $out(V_2)$ Normality of iodine in organic layer (N<sub>2</sub>) =  $V_1 \times \frac{N_1}{N_2}$ Concentration of iodine in aqueous layer  $C_2 =$ Concentration of iodine in aqueous layer  $C_3 = \frac{C_3}{K_D}$ Concentration of  $KI_3 (C_2-C_3) = C_4---gm.mol/lit$ Concentration of KI used 0.1 mol/lit Concentration of KI at equilibrium =0.1 - C<sub>4</sub>-----gm.mol/lit Equilibrium constant  $[KI_3]$ = [KI] [I<sub>2</sub>]

### Result

- (i) The equilibrium constant for the tri iodide formation was found to be =
- (ii) The concentration of the given potassium iodide solution

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

# KINETIC EXPERIMENTS

### **Experiment 4**

# DETERMINATION OF RATE CONSTANT OF ACID CATALYSED HYDROLYSIS OF AN ESTER

### Aim

To determine the rate constant for the acid catalysed hydrolysis of ethyl acetate at room temperature using hydrochloric acid

### Principle

The hydrolysis of ethyl acetate, the presence of acid may be represented as

$$CH_3COOC_2H_5 + H_2O \xrightarrow{H^+} CH_3COOH + C_2H_5OH$$

The reaction is an example of a pseudo unimolecular reaction. The concentration of water practically remains constant in the reaction and thus the rate of reaction is determined by one concentration term that is of ethyl acetate. Therefore the rate equation may be written as

$$\frac{dx}{dt} = k \left[ CH_3 COOC_2 H_5 \right]$$

And the formula for first order rate constant.

$$k = \frac{2.303}{t} \log \left[ \frac{V_{\infty} - V_0}{V_{\infty} - V_t} \right]$$

k = Rate constant of reaction

 $V_{\infty} - V_0$  is proportional to the amount of acid produced when the hydrolysis is complete and is proportional to the amount of ester hydrolysed in 5 ml of reaction mixture.  $(V_{\infty} - V_t)$  Can be given as  $(V_{\infty} - V_0) - (V_t - V_0)(V_t - V_0)$  is proportional to the acetic acid from up to time 't' or the amount of

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 12/32

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

ester hydrolysed up to time 't'.

Since acetic acid is produced during the reaction. The progress of the reaction may be studied by titrating non-volume of the reaction.

The velocity of the chemical reaction is greatly increased with rise in temperature

$$k = \frac{\Delta_{2.5}}{\Delta_{40}}$$

the ratio of velocity constant at different temperature at are known as the temperature coefficient of the reaction. Arrhenius suggested that the velocity constant with temperature't' is given by

$$\frac{d \ln k}{dt} = \frac{E_a}{RT^2}$$

Ea is the activation energy, t' is the temperature; 'R' is rate constant. Assuming that Ea is independent on temperature, the above equation on integration gives

$$\ln k_2 / k_1 = \frac{-Ea}{2.303 R} \left[ \frac{t_2 - t_1}{t_1 t_2} \right]$$

Where  $k_1$  and  $k_2$  are rate constant at temperature 'T' and R=2 cal/degmol<sup>-1</sup>. From this equation, Ea can be calculated.

$$K = Ae^{-Ea/RT}$$

By knowing the value of rate constant and activation energy E, the frequency factor A can be determined. Thus Arrhenius equation can be verified.

### Materials required

- (i) Conical flask with cork
- (ii) Beaker
- (iii) Burette
- (iv) Pipette
- (v) Thermostat and water bath
- (vi) 0.5 N HCl, 0.1 N NaOH, ethyl acetate and
- (vii) Stop watch.

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 13/32

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### Procedure

100 ml of 0.5 N HCl is taken in clean 100 ml conical flask and about 20 ml of pure ethyl acetate is taken in a stoppered bottle. Both of them are placed in a thermostat to attain room temperature. Then 10 ml of ester is added into a conical flask containing HCl. When the pipette is half drained, the time is noted. At the time 5 ml of the reaction mixture is pipetted out into a conical flask containing 25 ml of ice cold water. This is then titrated against NaOH taken in the burette. This gives the value of V<sub>o</sub>, at regular time interval of 5, 10, 25, 20, 25 etc. the 5 ml of reaction mixture is pipetted out into a conical flask against NaOH taken in the burette. This gives the value of V<sub>t</sub>. Mean while 20 ml of the reaction mixture is taken and heated on a water bath. From this 5 ml of reaction mixture is pipetted out and titrated against NaOH taken in the burette. This gives the value of V<sub>∞</sub>. Phenolphthalein is used as the indicator.

From the values of  $V_o$ ,  $V_\infty$  and  $V_t$ , we can calculate the rate constant using the formula.

$$k = \frac{2.303}{t} \log \left[ \frac{V_{\infty} - V_0}{V_{\infty} - V_t} \right]$$

The above procedure is repeated at different temperature higher than the room temperature. Then the strength of unknown acid and rate constant can also be graphically calculated

### **Observations and calculations**

 $\mathbf{V}_0 = \textbf{------} \mathbf{ml} \qquad \mathbf{V}_\infty = \textbf{------} \mathbf{ml} \qquad \mathbf{V}_\infty - \mathbf{V}_0 = \textbf{-------} \mathbf{ml}$ 

sec-1	Time in sec	$\begin{array}{c c} \text{sec} & V_t (\mathbf{ml}) & V_{\infty} & - & V_{\infty} \\ \hline & & (\mathbf{ml}) \end{array}$	$ \begin{array}{c cccc} V_t & \log & (V_\infty & - & V_t) \\ (ml) & \end{array} $	$k = \frac{2.303}{t} \log \left[ \frac{V_{\infty} - V_0}{V_{\infty} - V_t} \right]$
				sec <sup>-1</sup>

Mean =

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 14/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### From graph

slope =  $\frac{d_y}{d_x}$  = ----

 $K = slope \times 2.303$ 

= ----- sec<sup>-1</sup>

### Result

Velocity constant for the hydrolysis of given ester catalyst by acid A

(a) Calculated value = -----  $\sec^{-1}$ 

(b) Graphical value =----- sec<sup>-1</sup>

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 15/32

## CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### THERMAL EXPERIMENTS

**Experiment No 5** 

# DETERMINATION OF CRITICAL SOLUTION TEMPERATURE OF PHENOL – WATER SYSTEM

Aim

To determine the critical solution temperature of phenol – water system.

### Principle

The temperature at which two partially miscible liquids become completely miscible is called critical solution temperature. Mixtures of phenol and water of varying compositions are taken and their miscibility temperatures are plotted against their compositions. The maximum temperature point on the curve obtained is the critical solution temperature.

### **Materials Required**

- (i) Flat bottom test tube
- (ii) Thermometer
- (iii) Burette
- (iv) Water Bath
- (v) Phenol

### Procedure

An accurately weighted amount of phenol (about 2g) is taken in a flat bottomed test tube. It is fitted with a cork carrying a thermometer and a stirrer.2ml of water is added to it from burette. The test tube is fixed in a bigger tube by a cork and the whole is heated at which the two liquids become completely miscible is noted. the mixture is then cooled by cooling the water bath, and the temperature at which the turbidity appears is noted .the average value is taken as the miscibility temperature.

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

The experiment is repeated by adding 2, 4, 6, 8, 10, 12, 14,16ml of water and their corresponding miscibility temperature are noted. The results are tabulated. The results obtained by such an experiment are given below. These miscibility temperatures are plotted against their respective compositions .the maximum temperatures on the curve is taken as the critical solution temperature. According to the above data the critical solution temperature of phenol –water system is found to be 68.5°C.



Diag. experimental arrangement for cst determination of phenol water system

### **Observations and calculations**

SI.No.	Volume of	Volume of	percentage of	Miscibility temperature (°C)
	Phenol	water	phenol	
1.	2ml	2ml		
2.	2ml	4ml		
3.	2ml	6ml		
4.	2ml	8ml		
5.	2ml	10ml		
6.	2ml	12ml		
7.	4ml	2ml		
8.	6ml	2ml		
9.	8ml	2ml		
10	10ml	2ml		
11.	12ml	2ml		

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 17/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### **Calculation:**

# Weight percentage composition of phenol

(i) Weight of P	henol _	Volume of phen	ol $  imes  { m Density}  { m of}  { m phenol}$
$\frac{(1)}{\text{Weight of phenol}} + V$	Veight of water	(Volume of pheno	(Density of Phenol)
		+ (Volume of wa	ter) $\times$ (Densityof water)
(ii) $\frac{2 \times 1.071}{2 \times 1.071 + 2 \times 1} = 0$ (iii) $\frac{2 \times 1.071}{4 \times 1 + 2 \times 1.071}$	% = %		
Graph			
	% Phenol	Miscibility Temperature	

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 18/32

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018



### Result

The critical solution temperature of phenol water system is =

### Note

Note in the case of certain systems the mutual solubility of the two components decreases with the rise of temperature .this shows that they have a lower critical solution temperature. The critical solution temperature is markedly influenced by the presence of impurities.

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 19/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### **Experiment No 6**

### DETERMINATION OF EFFECT OF ADDED ELECTROLYTE ON CST OF PHENOL-WATER SYSTEM

### Aim

To study the effect of addition of an electrolyte such as NaCl or KCl on the critical solution temperature of phenol-water system.

### Principle

Whenever an electrolyte such as NaCl or KCl is added to a system like phenol- water, the mutual solubility of the two layers isaffected. It has been found that if the electrolyte is capable of dissolving in one of the layers, then the CST of phenol- water is enhanced. These can be verified by taking a 1 % solution of NaCl or KCl instead of water in the previous experiment and the same procedure is repeated.

### **Meterials Required:**

(i) NaCl (AR) or KCl (AR)(ii) Phenol(iii)Distilled water

(iv)Flat bottomed tubes

(v)  $110^{\circ}$ C- (1/10°C) ive Sensitive thermo meter.

(vi)Beaker (corning)500ml

### Procedure

A 1% NaCl solution is prepared by accurately weighing out 1g of NaCl (AR) crystals and dissolving it in 100ml standard flask and the solution is made up to the mark.Exactly 2ml of this solution is pipetted out (using a graduated pipette) in to a flat bottomed testtube fitted with stirrer and a sensitive thermometer.2ml of freshly distilled phenol is added to the flat bottomed tube it is then placed in a beaker containing water and the temperature is slowly raised. The temperature at which the two layers becomes homogeneous forming a clear liquid is noted .The flat bottomed test tube is taken out of the water bath and cooled slowly. Again the temperature is noted when there is an appearance of

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 20/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

### BATCH-2015-2018

turbidity resulting in the separation of two layers. The experiment is repeated by taking 4ml,6ml,8ml,10ml,12ml,etc., of this solution with phenol and the miscibility temperature is determined in each case. A graph is drawn between the miscibility temperature and composition of the phenol. The graph indicates an increase in the CST of phenol –water system.

### **Observations and Calculations**

S.No	Volume	Volume	% of	Miscibility temper		ature(°C)	
	of phenol	of NaCl solution	phenol	Heating	cooling	Average	
1	2ml	2ml					
2	2ml	4ml					
3	2ml	6ml					
4	2ml	8ml					
5	2ml	10ml					
6	2ml	12ml					
7	3ml	2ml			-		
8	4ml	2ml					
9	5ml	2ml					
10	6ml	2ml					

Effect of added electrolyte (NaCl) on CST of phenol -H2O System

### Graph

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 21/32

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018



### Result

CST of phenol –water system in the presence of NaCl= ----- ° C

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 22/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### **Experiment No 7**

# DETERMINATION OF THE CONCENTRATION OF AN ELECTROLYTE USING CST OF PHENOL-WATER SYSTEM

### Aim

To study the effect of added electrolyte and CSTof phenol-water system and to determine the concentration of the given electrolyte solution.

### Principle

The CST of phenol-water system is greatly influenced by the addition of an electrolyte. The mutual solubility of phenol and water areaffected in the presence of an electrolyte. If a substance is capable of dissolving in only one liquid (or layer)it results the enhancement of miscibility temperature and hence alters the CST of the system. A substance dissolving in both the layers totally decreases the CST of the system. This has been verified by taking various electrolytes in the phenol-water system.

### **Materials Required**

- (i) Phenol(Analar)
- (ii) NaCl(AR), KCl(AR), Succinic acid(AR)
- (iii) Distilled water
- (iv) Flat bottomed tubes
- (v)  $110^{\circ}C (1/10^{\circ}C) Sensitive thermometer$
- (vi) Beaker (corning) 500ml

### Procedure

A 2% of solution of the given electrolyte is prepared in a 250ml standard flask. It is then diluted to various concentrations such as 1.6%, 1.2%, 1%, 0.6%, 0.4% etc., in different 100 ml standard flasks. The solutions are thoroughly shaken to get uniformly concentrated solutions. A 3ml /5ml of the made up solution is pipetted out into a clan flat bottomed tube. It is mixed with 3ml/5ml of pure distilled phenol. The tube is fitted with a stirrer and sensitive thermometer. The mixture is stirred well. The miscibility temperature is determined for the mixture as in the case of CST of phenol – water system. The experiment is repeated with various concentration suchthat the total volume of the mixture remains constant in each experiment. The graph is drawn between the miscibility temperature and percentage

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 23/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

composition of the electrolyte. A straight line is obtained.

The given unknown electrolyte solution is made up to 100ml in a standard flask. 3ml/5ml of this solution is mixed with 3ml/5ml of phenol and the miscibility temperature is noted. From the miscibility temperature of the unknown solution, the corresponding composition is found out using the graph.

### **Observations and Calculations**

S.No	Concentration of NaCl	Volume of NaCl Solution	Volume of phenol	Miscibility temperature (°C		ature (°C)
		(in ml)	(in ml)	Heating	cooling	Average
1.	2%	3	3			
2.	1.8%	3	3			
3.	1.6%	3	3			
4.	1.4%	3	3			
5.	1.2%	3	3			
6.	1%	3	3			
7.	0.8%	3	3			
8.	0.6%	3	3			
9.	0.4%	3	3			
10.	Unknown solution	3	3			

### Result

Concentration of the given electrolyte solution = -----

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 24/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### **Experiment No 8**

### **DETERMINATION OF MOLECULAR MASS - RAST'S METHOD**

### Aim

To determine the Molecular mass by Rast's method

### Principle

Presence of dissolved non-volatile substances depress the melting point of camphor. The depression in melting point.

$$\Delta T = K \times \frac{1000 \times W_2}{M_2 \times W_1}$$

Where K= molal depression constant

 $W_1 = mass of solvent$ 

W<sub>2</sub>= mass of solute

M<sub>2</sub>= molecular mass of solute

The molal depression constant is the depression of the freezing point of a solvent when one gram molecular mass of a solute is dissolved in 100g of the solvent. This method can be used only for non-volatile solutes which dissolve in molten camphor without reaction with it.

### **Materials Required**

- (i) Camphor
- (ii) Acetanilide
- (iii)Glycerine bath
- (iv)Thermometer
- (v) Flat bottom test tube

### Procedure

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 25/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

### **Determination of K for camphor using reference solute**

An ignition tube is weighed accurately. About one gram of pure camphor is taken and again weighed. About 0.1g of acetanilide is introduced and gram weighed.

= ag

 $=T_0$ 

=T

= (b-a)= W1 g

= (c-b) = W2 g

 $=T_0-T=\Delta T$ 

The tube is corked and heated on a glycerin bath. When it is melted to become a homogeneous solution, it is poured on a clean porcelain dish. When it is solidified, it is powdered and its melting point is determined by capillary method. Similarly the melting of pure camphor is also determined. The difference between the two values gives the depression in the melting point,  $\Delta T$ .

### **Observations and calculations**

Mass of empty tube

Mass of empty tube + camphor = bg

Mass of camphor

Mass of tube+ camphor+ acetanilide= cg

Mass of acetanilide

Melting point of champhor

Melting point of mixture

Depression in melting point

 $\Delta T = \frac{1000 \times KXW_2}{M_2 \times W_1}$ 

The same experiment is repeated with the given soluteand the depression in melting point is noted. Knowing the values of K and  $\Delta T$ , molecular mass of solute is calculated from the following equation.

$$M_2 = \frac{1000 \ XKXW_2}{W_1 \times \Delta T}$$

### Result

The molecular weight of the given solute = g

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 26/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

### **Experiment No 9**

### DETERMINATION OF TRANSITION TEMPERATURE OF A HYDRATED SALT

### Aim

To determine the Transition temperature of a hydrated salt by Thermometric method.

### Principle

The crystalline solids on heating lose their water of crystalisation at a particular temperature to change into an anhydrous form or less hydrated form. This transition takes place at constant temperature and is accompanied by absorption or evolution of heat. The temperature at which such a transition takes place is called the transition temperature.

The thermometric method depends on the fact that the temperature rises normally until the hydrate begins to change from one form to another form. Then at a particular point the temperature remains practically steady until the transformation is complete. On cooling, the temperature will fall at a definite rate until the transition point is reached. At transition point once again the temperature will remain practically constant for some time. The transition temperature can be determined by plotting a graph taking on the x-axis and temperature on the y-axis.

### **Materials Required**

- (i) A hydrated salt:  $Na_2S_2O_3.5H_2O$ ,  $SrCl_2$ .  $6H_2O$ ,  $NaBr.3H_2O$ ,  $CH_3COONa$ .  $3H_2O$ ,  $MnCl_2$ .  $6H_2O$ .
- (ii) Transition temperature apparatus
- (iii) A sensitive thermometer
- (iv) Stirrer
- (v) Water Bath
- (vi) Stop watch.

### Procedure

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 27/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

### BATCH-2015-2018

The given salt along with a few ml of a non-polar solvent such as paraffin liquid or toluene is placed in the inner tube of the transition temperature apparatus, fitted with a stirrer and thermometer. The bulb of the thermometer should be kept immersed in the sample. The inner tube is then placed inside the outer jacket and this arrangement is immersed into a water bath. The temperature of the bath is slowly raised by using a small flame. The rate of increase in temperature is recorded for every minute. The temperature increases gradually, remains constant for some time and again increases.



**Transition Temperature apparatus** 

The transition temperature apparatus is taken out of the water bath. It is allowed to cool slowly with constant stirring. The temperature is recorded for every minute. At one point, the temperature will remain constant. Cooling is continued further for some more time.

A graph is plotted taking time in the abscissa and temperature in the ordinate. Two curves will be obtained, one for heating and the other for cooling. The curve has an approximately horizontal portion. The temperature corresponding to the horizontal portion in the graph is noted. This gives the transition temperature of the given salt hydrate.

### **Observations and calculations**

Time	Temperature (°C)		
seconds	Heating	Cooling	
60			
120			
180			
240			
300			

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 28/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018



Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 29/32

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

**Experiment No 10** 

# PHASE DIAGRAM-SIMPLE EUTECTIC SYSTEM

### Aim

To determine the eutectic temperature and eutectic composition of a given systems.

### Principle

When the liquid mixture of two substances A and B which do not form a compound is cooled, solid begins to separate at a definite temperature. This temperature is called the freezing point of the mixture. Adding of anyone of the component say B to A lowers the melting point of substance A.

The depression in melting point of the pure substance is proportional to the amount of the other substance added. At a particular temperature composition of the mixture of two components A and B have the lowest possible freezing point is known as eutectic temperature is eutectic composition > below the eutectic temperature liquid doesn't exist. Mixture of substance A and B in varying composition are latter the corresponding freezing point of the melts and determined.

Melting point of pure A and B are also found out a graph is drawn with composition of the mixture against freezing temperature are read from the graph.

### **Materials Required**

- (i) Glass specimen tube
- (ii) sensitive thermometer
- (iii) air jacket
- (iv) biphenyl amine
- (v) naphthalene

CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

### Procedure

The glass specimen tube was cleaned well and dried. It is fitted with two holed rubber cork through which a sensitive thermometer and a stirrer was passed. This was fitted into an outer tube called an air jacket.

4g of the solid was weighed accurate and introduced into the specimentube fitted with a cork carrying a thermometer and stirrer. It was then fixed into the air jacket and immersed in a waterbath and heated. The melting point of pure 'A' was noted. It was further heated till it melts completely. Then the apparatus was taken out of the hot water bath and allow cooling with constant stirring. The temperature at which first solid appeared was noted. The mean value of two temperature readings were taken at the freezing point of pure 'A'

0.4g of the substance 'B' was accurately weighed and carefully transferred into the specimen tube. It was heated in the hot liquid bath till it become a homogenous liquid. The freezing point of the mixture was noted. The experiments was repeated several times by adding known amount of 'B' to 'A' and recorded. The experiments was repeated by taking 4g of pure 'B' and addition of 1g of portion 'A' to this several times. The melting point of pure 'B' and the freezing point of the mixture of various composition of A and B were the determined.

A graph was plotted by taking composition along x axis and the freezing point of mixture along y axis, two curves were obtained. One showing the change in freezing point at 'A' due to the addition of 'B' and the other showing the change in freezing point of 'B' due to addition of 'A', the point at which two curves meet gives the eutectic temperature of the binary system 'A' and 'B'. The eutectic composition was obtained by dropping perpendicular as line to the composition axis and the eutectic temperature by dropping a perpendicular line to the temperature axis from eutectic point.

### **Observations and calculations**

Weightof A	Weight of	% of A	% of B	Melting	Freezing	Mean
in gms	Bin gms	A/(A+B)	B/(A+B)	point <sup>0</sup> C	Point <sup>0</sup> C	temp <sup>0</sup> C

Prepared by Dr.M.Makeswari & Dr.M.R.Ezhilarasi, Asst Prof, Dept. of Chemistry, KAHE Page 31/32

### CLASS : III B.Sc CHEMISTRY COURSE NAME : CHEMISTRY PRACTICAL -VI -PHYSICAL CHEMISYRY COURSE CODE : 15CHU611 SEMESTER : VI

BATCH-2015-2018

