<u>Utkalmani Gopabandhu Institute Of Engineering,</u> <u>Rourkela</u>



LESSON PLAN

Department of Chemical Engineering

| LESSON PLAN | | | | | | | | |
|------------------|---|--|--|--|--|--|--|--|
| | Aret gas abst. Rel | | | | | | | |
| SUBJECT CODE | : TH-1 | | | | | | | |
| NAME | : PHYSICAL CHEMISTRY | | | | | | | |
| BRANCH | : CHEMICAL ENGINEERING | | | | | | | |
| SEMESTER | :Diploma-III | | | | | | | |
| CREDIT POINTS | : 4 | | | | | | | |
| NUMBER OF MODULE | NUMBER OF MODULES : 6 | | | | | | | |
| CLASSES REQUIRED | : 60 | | | | | | | |
| PRE-REQUISITE | : Basic idea about solution,osmosis,osmotic pressure,adsorption | | | | | | | |

MODULE-I

PHYSICAL PROPERTIES OF LIQUIDS 1.1 Intermolecular forces in liquid. 1.2 Vapour pressure and its effect on temperature and boiling point. 1.3 Surface tension. 1.4 Viscosity and measurement of viscosity by Ostwald method. 1.5 Refractive index, specific refraction, determination of refractive index 1.6 Optical activity and measurement of optical activity. 1.7 Solve simple problems based on physical properties of liquid.

Objective

The students will understand the basic idea on Surface tension, viscosity, refractive index

| Session no | Topics to be covered | PRIMARY REFERENCE (BOOKS/NOTES) |
|---------------|--|---------------------------------------|
| 1 | Intermolecular forces in liquid. | T1,R1 |
| 2 | Vapour pressure and its effect on temperature and boiling point. | T1 |
| 3 | Surface tension. | T1 |
| 4 | Viscosity and measurement of viscosity by Ostwald method. | T1 |
| 5 | Viscosity and measurement of viscosity by Ostwald method. | T1 |
| 6 | Refractive index, specific refraction, determination of refractive index | T1 |
| 7 | Refractive index, specific refraction, determination of refractive index | T1 |
| 8 | Optical activity and measurement of optical activity | T1 |
| 9 | Optical activity and measurement of optical activity | T1 |
| 10 | Solve simple problems based on physical properties of liquid. | T1 |

MODULE-II

SOLUTIONS 2.1 Solution and Types of solutions. 2.2 Ways of expressing concentration. 2.3 Solve numerical related to concentration. 2.4 The solution of gases in gases. 2.5 Henry's law and solve numerical related to it. 2.6 Solutions of liquid in liquids. 2.7 Solubility of partially miscible liquids 2.8 Solubility of solid in liquid and equilibrium concept, solubility curve. 2.9 Raoult's Law, ideal solution and explain the lowering of vapour pressure and its measurement. 2.10 Concept of elevation of boiling point and depression of freezing point

Objectives:

To understand solution, types of solution and miscibility properties of liquid

| Session no | Topics to be covered | PRIMARY REFERENCE (BOOKS/NOTES) |
|---------------|---|---------------------------------------|
| 11 | Solution and Types of solutions | T1,R1 |
| 12 | Ways of expressing concentration. | T1R1 |
| 13 | Solve numerical related to concentration | T1R1 |
| 14 | The solution of gases in gases | T1R1 |
| 15 | Henry's law and solve numerical related to it | T1R1 |
| 16 | Solutions of liquid in liquids. | T1R1 |
| 17 | Solubility of partially miscible liquids | T1R1 |
| 18 | Solubility of solid in liquid and equilibrium concept, solubility curve. | T1R1 |
| 19 | Raoult's Law, ideal solution and explain the lowering of vapour pressure and its measurement. | T1R1 |
| 20 | Raoult's Law, ideal solution and explain the lowering of vapour pressure and its measurement. | T1R1 |
| 21 | Concept of elevation of boiling point and depression of freezing point | T1,R1 |
| 22 | Concept of elevation of boiling point and depression of freezing point | T1,R1 |

MODULE-III

OSMOSIS AND OSMOTIC PRESSURE. 3.1 Osmosis and osmotic pressure with example. 3.2 Function of semi permeable membrane. 3.3 Osmotic pressure and isotonic solutions. 3.4 The theories of Osmosis. 3.5 Reverse osmosis. 3.6 The laws of osmotic pressure. 3.7 Solve the Simple Problems. 3.8 Relation between Vapour Pressure & Osmatic Pressure.

Objectives:

To study osmosis and theories of osmosis.

| Session | Topics to be covered | PRIMARY | | |
|---------|---|---------------|--|--|
| no | | (BOOKS/NOTES) | | |
| 23 | Osmosis and osmotic pressure with example | T1,R1 | | |
| 24 | Function of semi permeable membrane | T1,R1 | | |
| 25 | Osmotic pressure and isotonic solutions | T1,R1 | | |
| | Osmotic pressure and isotonic solutions | T1,R1 | | |
| 26 | | | | |
| 27 | The theories of Osmosis | T1,R1 | | |

| 28 | The theories of Osmosis | T1,R1 |
|----|--|-------|
| 29 | Reverse osmosis | T1,R1 |
| | The laws of osmotic pressure. | T1,R1 |
| 30 | | |
| 31 | The laws of osmotic pressure. | T1,R1 |
| 32 | Relation between Vapour Pressure & Osmatic Pressure. | T1,R1 |
| 33 | Solve the Simple Problems. | T1,R1 |
| 34 | Solve the Simple Problems. | T1,R1 |

MODULE-IV

DISTRIBUTION LAW. 4.1 Nernst's distribution law. 4.2 Equilibrium constant from distribution coefficient. 4.3 Extraction with a solvent, multiple extraction 4.4 Concept of liquid-liquid chromatography. 4.5 Applications of distribution law. 4.6 Numerical based on distribution law.

Objectives:

To study the extraction, Nernst distribution law

| Session | Topics to be covered | PRIMARY REFERENCE |
|---------|--|----------------------|
| по | | (BOOKS/NOTES) |
| 35 | Nernst's distribution law | T1,R1 |
| 36 | Nernst's distribution law | T1,R1 |
| 37 | Equilibrium constant from distribution coefficient | T1,R1 |
| | Extraction with a solvent, multiple extraction | T1,R1 |
| 38 | | |
| 39 | Extraction with a solvent, multiple extraction | T1,R1 |
| 40 | Concept of liquid-liquid chromatography. | T1,R1 |
| 41 | Applications of distribution law | T1,R1 |
| | Numerical based on distribution law. | T1,R1 |
| 42 | | |

\MODULE-V

COLLOIDS. 5.1 Colloids & types of colloidal systems. 5.2 Characteristics of sols. 5.3 The application of colloids. 5.4 Methods of preparation of sols & purification of sols. 5.5 The optical, kinetic and electrical properties of sols. 5.6 Emulsion and types of emulsion. 5.7 The role of Emulsifier. 5.8 The preparation of Emulsions and their properties. 5.9 Gel, type of gel, properties and application.

OBJECTIVE

To study colloids and colloidal system.

| Session no | Topics to be covered | PRIMARY REFERENCE (BOOKS/NOTES) |
|---------------|---|---------------------------------------|
| 43 | Colloids & types of colloidal systems. | T1,R1 |
| 44 | Characteristics of sols. | T1,R1 |
| 45 | The application of colloids. | T1,R1 |
| 46 | Methods of preparation of sols & purification of sols. | T1,R1 |
| 47 | The optical, kinetic and electrical properties of sols. | T1,R1 |
| 48 | The optical, kinetic and electrical properties of sols. | T1,R1 |
| 49 | Emulsion and types of emulsion. | T1,R1 |
| | The role of Emulsifier. | T1,R1 |
| 50 | | |
| 51 | The preparation of Emulsions and their properties. | T1,R1 |
| 52 | Gel, type of gel, properties and application. | T1,R1 |

MODULE-V

ADSORPTION. 6.1 Adsorption 6.2 Compare absorption and adsorption 6.3 Types of adsorption. 6.4 Physical adsorption and Chemisorption. 6.5 The application of adsorption 6.6 The Ion- exchange adsorption and discuss its application.

OBJECTIVE

To study adsorption and different between physical and chemical adsorption

| Session no | Topics to be covered | PRIMARY REFERENCE (BOOKS/NOTES) |
|---------------|-----------------------------------|---------------------------------------|
| 53 | Adsorption | T1,R1 |
| 54 | Compare absorption and adsorption | T1,R1 |
| 55 | Types of adsorption | T1,R1 |

| | Types of adsorption | T1,R1 |
|----|--|-------|
| 56 | | |
| 57 | Physical adsorption and Chemisorption | T1,R1 |
| 58 | The application of adsorption | T1,R1 |
| 59 | The application of adsorption | T1,R1 |
| | The Ion- exchange adsorption and discuss its application | T1,R1 |
| 60 | | |

Course Delivery Plan

| We ek | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|----------------|---|---|-----|---|---|-----|---|---|-----|----|-----|----|----|----|----|
| | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| MO DU LE | 1 | 1 | 1,2 | 2 | 2 | 2,3 | 3 | 3 | 3,4 | 4 | 4,5 | 5 | 5 | 6 | 6 |

BOOKS FOR REFERENCE: TEXT BOOKS

T1: Essentials of Physical Chemistry BY B.S. Bahl, H.D. Tuli, A. Bahl, S. Chand & Co

REFERENCE

R1: A Text Book Of Physical Chemistry BY K.K. Sharma, L.K. Sharma, Vikash Publication

| | Prepared by | Approved by |
|-------------|-------------------|----------------|
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| Name | RAGHUNATH MARANDI | |
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| Date | | |