

**ST. JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM**  
**V SEMESTER CHEMISTRY 3 Hrs/ Week**  
**CH 5208 (3) PHYSICAL & INORGANIC CHEMISTRY Max. Marks: 60**  
**w.e.f 2017-2018 ('15AC' Batch) SYLLABUS**

**OBJECTIVES:** To enable the students to apply physical laws to chemical phenomena  
To understand principles of electricity, most essential commodity of man, and further it to prosperity. Similarly dry cells are centre of attention and usefulness presently.  
Correlate characteristic chemical behaviour of metals, organometallic compounds as well as the nature of bonding present in them.

**COURSE:**

**UNIT I :**

**1. SOLUTIONS**

Liquid-liquid - ideal solutions, Raoult's law, ideally dilute solutions, Henry's law. Non-ideal solutions. Vapour pressure - composition and vapour pressure - temperature curves. Azeotropes- HCl-H<sub>2</sub>O, ethanol-water systems and fractional distillation. Partially miscible liquids- phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consolute temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

**2. COLLIGATIVE PROPERTIES**

Raoult's law, relative lowering of vapour pressure, its relation to molecular weight of non-volatile solute. Elevation of boiling point and depression of freezing point. Derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods of determination. Osmosis, osmotic pressure, experimental determination. Theory of dilute solutions. Determination of molecular weight of non-volatile solute from osmotic pressure. Abnormal Colligative properties- Van't Hoff factor.

**UNIT II**

**3. ELECTRO CHEMISTRY-I**

Electrical transport- Conductors – electronic conductors and electrolytic conductors  
Conduction in metals and in electrolyte solutions, Specific conductance, equivalent conductance. Variation of equivalent conductance with dilution. Migration of ions, Kohlrausch's law. Arrhenius theory of electrolyte dissociation and its limitations. Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Definition of transport number, determination by Hittorf's method. Application of conductivity measurements- conductometric titrations. method and explanation of strong acid Vs strong base and mixture of acids (strong and weak) Vs strong base titrations.

**4. ELECTRO CHEMISTRY -I I**

Electrochemical cell, cell notation, cell reactions, reversible cells, , irreversible cells – differences between electrolytic and electro chemical cells. . Single electrodes: Types of single electrodes like metal-metal ion single electrode, calomel electrode, standard hydrogen electrodes. Construction and working of calomel electrode and normal hydrogen electrode. Standard electrode potentials Single electrode potential,-- Determination of EMF of cell, Nernst equation and calculation of electrode potentials at different concentrations. Applications of EMF measurements - Potentiometric titrations.

**UNIT III:**

5. A. THEORIES OF BONDING IN METALS: Metallic properties and its limitations, Valence bond theory, Free electron theory, Explanation of thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

B. METAL CARBONYLS : EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni.

6. ORGANOMETALLIC COMPOUNDS: Definition - classification of Organometallic compounds - nomenclature, preparation, properties and applications of alkyls of Li and Mg.

**REFERENCES:**

1. Text Book of physical chemistry – P.L.Soni and O.P. Dharmarha, 20<sup>th</sup> Edition, Sultan Chand and Sons, New Delhi .
2. Elements of Physical Chemistry – B.R. Puri, L.R. Sharma & Madan S. Pathania, 43<sup>rd</sup> Edition, 2008, Vishal Publishing Co., Jalandhar.
3. Essentials of physical chemistry – B.S.Bahl and G.D. Tuli, 25<sup>th</sup> Edition, Sultan Chand and Sons, New Delhi.
4. Physical Chemistry , Part – II – R.K.Prasad, Bharati Bhawan, Patna.
5. Unified Chemistry (Vol.2) (B.Sc. I) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhiana. Sixth Revised Edition, 2010.
6. Unified Chemistry (Vol.2) (B.Sc. II) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhiana. Sixth Revised Edition, 2010.
7. Unified Chemistry (Vol.2) (B.Sc. III) – Y.R.Sharma & Dr. K.Rama Rao - Kalyani Publishers, Ludhiana. Sixth Revised Edition, 2010.
8. Basic Inorganic Chemistry by Cotton and Wilkinson
9. Concise Inorganic Chemistry by J.D.Lee

