CHE 123(T+P): Inorganic and Physical Chemistry

Credit – (2T+2P), Theory Hours – 30, Practical Hours – 60

Course Outcomes:

After the completion of this course, student will be able to-

CO-1. Gain the basic knowledge of types of chemical bonds and compounds, electric conductance and reactions of organic functional group.

CO-2. Understand the basic concepts of formation of chemical bond**,** Conductivity, hydrolysis and principles of different test for the organic qualitative analysis.

CO-3. Solve the problems related to geometry and structure ofcompounds, hybridization, different types of conductance, hydrolysis of salts, buffer solution.

CO-4. Correlate the facts regarding the solutions of problems related with industriesand efficiency to work in industries.

CO-5. Evaluate the interpretation, analysis, investigation and solution problems regarding bonding and structure, ionic equilibrium.

CO-6. Synthesise, create, modify and judge the facts of chemical bonds and compounds,electric conductance.

CO-PSO mapping (connecting COs with PSOs)

CO	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5	PSO-6
CO-1	3	3	2	2	2	3
CO-2	3	3	2	2	2	3
CO-3	2	2	3	2	3	2
CO-4	3	2	3	3	2	3
CO-5	3	2	3	2	3	3
CO-6	3	3	2	2	3	3

UNIT – I – Bonding and Structure **[25 Marks]**
[15 Hours]

Chemical bond, Types of Bond (Ionic, Covalent, Coordinate and Metallic Bond), Ionic Bond, Conditions and factors governing the formation of Ionic Bond, Properties of Ionic Compounds, Covalent Bond, Covalency, Conditions for the formation of Covalent Bond, Properties of Covalent Compounds, Failure of octet rule (Lewis Concept) in Covalent Compounds, Covalent Bond having partial Ionic character, Co-ordinate Bond, Condition for the formation of Co-ordinate Bond, , Properties of Co-ordinate Compounds, Metallic Bond, Conditions for the formation of Metallic Bond, Hydrogen Bond, Properties of Hydrogen Bond, Types of Hydrogen Bond, Sidgwick Powel theory, VSEPR theory and its application for CH_4, NH_3, H_2O, CIF_3, SF_4, SF_6, I_3^-, IF_7, Hybridization of atomic orbitals, Rules for Hybridization, Types of hybridization and shape of molecules with sp, sp^2, sp^3, sp^3d, sp^3d^2 hybridization.

UNIT II - Ionic Equilibrium **[25 Marks]**
[15 Hours]

Definition of basic terms: Electrical conductance, Specific conductance, Equivalent conductance, Molar conductance, Cell constant and its determination, Incomplete dissociation, Degree of dissociation, Oswald's dilution law and its limitations, Kohlraush law and its application, Debye – Huckel theory, Self ionization of water and Ionic product of water K_w, pH Scale, Hydrolysis of different salts (strong acid and weak base, strong base and weak acid, weak acid and weak base) including relation between K_a , K_b , K_h , h, K_w and their pH equation, Buffer Solutions, Henderson – Hasselbalch equation, Indicator theory, useful pH range of indicator for acid and base titration.

REFERENCE BOOKS

1 'Concise Inorganic Chemistry' by J. D. Lee, 5th Ed., 2013, Wiley India.

2 'Basic Inorganic Chemistry' by F. A. Cotton, Geoffrey Wilkinson, CarlosA Murilloand Manfred Bochmann, 6th Ed., Wiley publication.

3.'Inorganic Chemistry' by Shriver & Atkins, 5th Ed., 2013, Oxford University Press.

4 'Satya Prakash's Modern Inorganic Chemistry' by Dr. R. D. Madan, 1987, S. Chand, New Delhi.

5 'Principles of Inorganic Chemistry' by Puri, Sharma and Kalia, 2018, Vishal Publishing Co., Jallandhar – Delhi.

6.'Elements of Physical Chemistry' by Peter Atkins & Julio De Paula, 5/E, Indian Edition, OxfordUniversity Press.

7. 'Physical Chemistry' by P. W. Atkins, 7/E, 2002, Indian Edition Oxford University Press.

8. Physical Chemistry' by W. J. Moore, 6/E, 1996, MacGraw Hill Publication.

9. 'Principle of Physical Chemistry' by Puri, Sharma & Pathania, 41/E, Vishal Publishers.

10. 'Essentials of Physical Chemistry' by Bahl & Tuli, 22/E, S. Chand publication, New Delhi.

11. 'Advanced Physical Chemistry' by Gurdeep Raj, 19/E, Goel Publishing House Meerut

CHE 123(P): Chemistry Practical

Chemistry Lab- I (2 credit)

Credit – 2, Hours – 60, Marks – 50

ORGANIC QUALITATIVE ANALYSIS

Concept of types of organic compound, lassaigne's elements, Organic functional groups, water soluble/ insoluble compounds, Aromatic character, MP/ BP and their measurement, Chemical properties of different organic compounds.

Organic spotting

Acids:

Solid: Benzoic acid, Salicylic acid**,** Succinic acid, Oxalic acid

Phenol:

Solid: alpha-naphthol & beta-naphthol

Base:

Solid: p-nitroaniline

Liquid: Aniline

Neutral:

Solid: Urea, Thiourea, Naphthalene
Liquid: Acetone, Ethanol, Ethyl acetate, Benzaldehyde, Nitrobenzene, Chloroform

DEMONSTRATION

Purification of organic compounds

1. Simple distillation

Introduction to distillation, Types of distillation, Principle of simple distillation,

purification of organic liquid by distillation.

2. Crystallization

Introduction to crystallization, purification of benzoic acid by crystallization.

3. Sublimation

Introduction to Sublimation, purification of Naphthalene by sublimation.

REFERENCE BOOKS

5. I Vogel, “Elementary Practical Organic Chemistry Part-II, Qualitative Organic Analysis”, CBS Publishers & Distributers, New Delhi, Second Edition, 2004.

6. V.K. Ahluwalia, Sunita Dhingra, “Comprehensive Practical Organic Chemistry – Qualitative Analysis”, University Press (India) Private Limited, Hyderabad, First Indian Edition, 2010.

7. Mohan Jag, “Organic Analytical Chemistry theory and Practice”, Narosa Publication, New Delhi, 2003. 5. J Leonard, B Lygo, G Procter, “Advanced Practical Organic Chemistry”, Stanley Thornes (Publishers) Ltd., First Indian Edition, 2004.