

## SEMESTER-V

### PAPER-14

Marks: 150

### THEORY

#### SECTION A-INORGANIC: REACTION RATES & MECHANISM

##### Unit 1: Reaction Kinetics and Mechanism:

Introduction to Inorganic Reaction Mechanism. Substitution reactions in square planar complexes, Trans- effect, theories of trans effect, Mechanism of nucleophilic substitution in square planar complexes, Thermodynamic and Kinetic stability, Kinetics of octahedral substitution, Ligand field effects and reaction rates, Mechanism of substitution in octahedral complexes.

##### Unit II: Introduction to catalysis of chemical reactions by organometallic compounds

Discuss the processes that commonly feature in the mechanism of following reactions:

1. Alkene hydrogenation (Wilkinsons Catalyst)
2. Hydroformylation (Co salts)
3. Wacker Process
4. Synthetic gasoline (Fischer Tropsch reaction)
5. Synthesis gas by metal carbonyl complexes

##### Reference text:

1. Huheey, J. E.; Keiter, E. A. & Keiter, R.L. *Inorganic Chemistry, Principles of Structure and Reactivity 4<sup>th</sup> Ed.*, Harper Collins 1993, Pearson, 2006.
2. Douglas, B. E.; McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry 3<sup>rd</sup> Ed.*, John Wiley and Sons, NY, 1994.
3. Basolo, F. & Person, R. *Mechanisms of Inorganic Reactions: Study of Metal Complexes in Solution 2<sup>nd</sup> Ed.*, John Wiley & Sons Inc; NY.
4. Purecell, K.F. & Kotz, J.C., *Inorganic Chemistry*, W.B. Saunders Co. 1977
5. Miessler, G. L. & Donald, A. Tarr, *Inorganic Chemistry 4<sup>th</sup> Ed.*, Pearson, 2010.
6. Cotton, F.A. & Wilkinson, G. *Advanced Inorganic Chemistry 4<sup>th</sup> Ed.*, Wiley India.
7. Collman, James P. et al. *Principles and Applications of Organotransition Metal Chemistry*. Mill Valley, CA: University Science Books, 1987.
8. Crabtree, Robert H. *The Organometallic Chemistry of the Transition Metals*. New York, NY: John Wiley, 2000.
9. Spessard, Gary O., & Gary L. Miessler. *Organometallic Chemistry*. Upper Saddle River, NJ: Prentice-Hall, 1996.

## **SECTION B-ORGANIC: PHARMACEUTICALS, NATURAL PRODUCTS AND POLYMERS**

### **Unit I: Pharmaceutical Compounds**

Structure activity relationship. Classification, structure, mode of action and therapeutic uses of pharmaceutical compounds belonging to the following classes:

1. Analgesics and antipyretics: Paracetamol (synthesis), Ibuprofen (traditional and green synthesis).
2. Antibacterial agents: Sulphonamides. sulphadiazine (synthesis).
3. Antimalarials: Chloroquine (synthesis).
4. Antibiotics: Chloramphenicol (synthesis and structure elucidation).

Medicinal values of curcumin, azadirachtin and vitamin C and antacid (ranitidine)

### **Unit II: Natural Products: Terpenoids and Alkaloids**

**Terpenoids:** Natural occurrence, classification and biosynthesis of terpenoids (with suitable examples including carotenoids).

Structure and specific uses of citral, limonene and  $\alpha$ -terpineol.

**Alkaloids:** Natural occurrence, general methods of Isolation and structural features. (Ziesel's method, Herzig Meyer's method, Hofmann's exhaustive methylation and Emde's modification).

Medicinal importance of nicotine, quinine, morphine and reserpine.

### **Unit III: Polymers**

Polymers: Introduction and classifications.

Polymerisation reactions: Addition, condensation and ring opening metathesis. Polymerisation: Polymerisation: Mechanism of cationic, anionic and free radical addition polymerization, Ziegler-Natta polymerisation of alkenes, stereochemistry of polymers, role of stabilisers, plasticisers, antioxidants, telomers and inhibitors in polymer synthesis.

Preparation from appropriate monomers and applications of following polymers: Polythene, polyvinyl chloride (PVC), polymethylmethacrylate, polyacrylonitrile, polyamides, polyesters, buna-S, neoprene, bakelite and polyurethanes polymers.

Process of vulcanization and its importance.

Introduction to biodegradable, conducting sol-gel and liquid crystal polymers with their importance in day to day life.

**Recommended Texts:**

1. Morrison, Robert Thornton & Boyd, Robert Neilson *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Sixth Edition, 2003.
2. Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Sixth Edition, 2003.
3. Finar, I. L. *Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Fifth Edition, 1975.
4. Graham Solomons, T.W., Craig B. Fryhle *Organic Chemistry*, Ninth edition John Wiley & Sons, Inc. 2008.
5. Kalsi, P. S. *Textbook of Organic Chemistry 1<sup>st</sup> Ed.*, New Age International (P) Ltd. Pub. Delete this text
6. Billmeyer, F. W. *Textbook of Polymer Science*, John Wiley & Sons, Inc.
7. Gowariker, V. R.; Viswanathan, N. V. & Sreedhar, J. *Polymer Science*, New age International, First Edition, 1986
8. Clayden, J.; Greeves, N.; Warren, S.; Wothers, P.; *Organic Chemistry*, Oxford University Press, First Edition, 2001.
9. Singh, J.; Ali, S.M. & Singh, J. *Natural Product Chemistry*, Pragati Parakashan 2010.

**PRACTICAL****SECTION A-INORGANIC: PREPARATION OF SELECTED INORGANIC COMPOUNDS AND USE SPECTROSCOPIC TECHNIQUES**

- i. Measurement of 10 Dq by spectrophotometric method
- ii. Verification of spectrochemical series.
- iii. Controlled synthesis of two copper oxalate hydrate complexes: kinetic vs thermodynamic factors.
- iv. Preparation of acetylacetonato complexes of  $\text{Cu}^{2+}/\text{Fe}^{3+}$ . Find the  $\lambda_{\text{max}}$  of the complex.
- v. Synthesis of ammine complexes of Ni(II) and its ligand exchange reactions (e.g. bidentate ligands like acetylacetonone, DMG, glycine) by substitution method.

**Recommended Texts:**

1. Marr. G & Rockett, B.W. *Practical Inorganic Chemistry*, John Wiley & Sons, 1972.

**SECTION-B ORGANIC: EXTRACTION OF NATURAL PRODUCTS, SYNTHESIS OF SELECTED DRUGS AND POLYMERS**

1. Extraction of caffeine from tea leaves.
2. Preparation of sodium polyacrylate
3. Preparation of urea formaldehyde.
4. Extraction of active pharmaceutical ingredient from commercial tablet, acetylsalicylic acid from aspirin, its synthesis in laboratory and comparison of the two samples by melting point and TLC.
5. Isolation of ibuprofen and p-acetylaminophenol by solvent extraction from combiflam and their purity analysis by melting point and TLC.
6. Estimation of Vitamin C by titrating it against a solution of 2, 6-dichlorophenol indophenol dye.
7. Quantitative estimation of glucose using Fehling's solution method.

**Recommended Texts:**

1. Vogel, A.I. *Quantitative Organic Analysis*, Part 3, Pearson 2012.
2. Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education 2009.
3. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry*, 5<sup>th</sup> Ed., Pearson 2012.
4. Ahluwalia, V.K. & Aggarwal, R. *Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis*, University Press 2000.
5. Ahluwalia, V.K. & Dhingra, S. *Comprehensive Practical Organic Chemistry: Qualitative Analysis*, University Press 2000.