

COURSE WISE BREAKUP

Fourth Year Seventh Semester

SPECIALIZATION

INORGANIC CHEMISTRY

THEORY

COURSE CODE	TITLE	CREDIT HOURS	MARKS
CHEM-451	PAPER-I: INORGANIC CHEMISTRY	03	100
CHEM-452	PAPER-II: INORGANIC CHEMISTRY	03	100
CHEM-453	PAPER-III: INORGANIC CHEMISTRY	03	100

PRACTICALS

COURSE CODE	TITLE	CREDIT HOURS	MARKS
CHEM-451	PAPER-I: INORGANIC CHEMISTRY	02	50
CHEM-452	PAPER-II: INORGANIC CHEMISTRY	02	50
CHEM-453	PAPER-III: INORGANIC CHEMISTRY	02	50

- Total Credits of the Semester = 15 (theory 09 & practicles 06 credits)
- Maximum Marks = 450 (theory 300 & practicles 150 marks)

4th Year; 7th Semester

PAPER-I

Title of the Course: INORGANIC CHEMISTRY

Code: CHEM-451

Credit Hours: 03

Marks: 100

Objective of the Program

After completing this program students will be able to learn the following:

1. Periodic Anomalies and Bonding in Electron deficient Compounds
2. Kinetics and Reaction Mechanism of Inorganic Reactions
3. Electron Transfer Reaction

Course Contents:

Periodic Anomalies and Bonding in Electron deficient Compounds

First- and second- row anomalies; the use of *d*- orbitals by non-metals; reactivity and *d*- orbital participation; $p\pi-d\pi$ bonds; the use of *p*- orbitals in π - bonding; periodic anomalies of non-metals and post-transition metals. Multicenter bonding in electron deficient molecules, three centre two electron bond (3c-2e) and three-center, four-electron (3c-4e) bond model.

Kinetics and Reaction Mechanism of Inorganic Reactions

Classification of reaction mechanisms; rate laws; steady state approximation; inert and labile complexes; substitution reactions; octahedral complexes: acid hydrolysis, acid catalyzed aquation, anation reactions, base hydrolysis, attack on ligands, steric effects of inert ligands; square planar complexes: nucleophilic reactivity, trans-effect, cis-effect, effect of leaving group, mechanism of substitution, racemization reactions.

Electron Transfer Reactions

Electron transfer reactions in co-ordination compounds, mechanism of electron transfer reactions, outer sphere or tunneling mechanism, inner sphere or ligand bridge mechanism, factors effecting the rate of electron transfer reactions, two electrons transfer reactions, complementary or non complementary electron transfer reactions, oxidation reduction reactions of metal ions

RECOMMENDED BOOKS:

1. Basolo, F., and Pearson, R. G., "Mechanism of Inorganic Reactions", Wiley, New York, 1982.

2. Huheey, J. E, Keiter, E. A. and Keiter, R. L., "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Harper & Row, New York, 2001.
3. Benson, D., Mechanisms of Inorganic Reactions in solution: McGraw Hill. 1968.
4. Purcell, K.F. and Kotz, J.C., "Inorganic Chemistry" W.B. Saunders Company Holt-Saunders Internal editions 1977.
5. Shirve D.F. Atkins P.W. and Langford C.H. "Inorganic Chemistry", Oxford University Press 1990.
6. Wilkins R.G. "Kinetics and Mechanism of Reactions of Transition Metal Complex" VCH Publishers, Inc., 1991.
7. William. J., Modern inorganic chemistry second edition McGraw Hill Company 1991.
8. Porter Field. W.W., Inorganic Chemistry a Unified Approach 2nd ed. Elsevier Publishers, 2005 Douglas, McDaniel & John Alexander. "Concepts and Models of Inorganic Chemistry" by John Willey and Sons, 1994.
9. R.B. Jordan, Reaction Mechanisms of Inorganic and Organometallics Systems. Oxford University Press, New York, 1991. An excellent introduction.
10. R.G. Wilkins, The study of kinetics and Mechanisms of Reactions of transition metal complexes 2nd ed., VCH Publishers, New York, 1991.

4th Year; 7th Semester

PAPER-II

Title of the Course: **INORGANIC CHEMISTRY**

Code: **CHEM-452**

Credit Hours: **03**

Marks: **100**

Objective of the Program

After completing this program students will be able to learn and had a sound knowledge of the following:

1. Organic Reagents used in Inorganic Analysis, their selectivity, specificity etc.
2. Polymer Chemistry

Course Content:

Organic Reagents Used in Inorganic Analysis

Types of reagent, specificity and sensitivity of the reagents, methods of application with specific examples, complexometric and gravimetric methods involving various reagents, chelates and chelate-effect.

Polymer Chemistry

Molecular species: Introduction, homoatomic and heteroatomic inorganic polymers, chains and cages of Boron, Silicon, Nitrogen, Phosphorous and Sulphur; their synthesis, reactivity and applications, metal clusters. Polyionic species: Isopoly and heteropoly anions of transition metals, Silicates, borates, condensed phosphates, zeolites.

RECOMMENDED BOOKS:

1. Malcoim, P.S. "Polymer Chemistry" Oxford University Press 2005.
2. Mandelkern "An Introduction to Macromolecules" 2nd Springer 1983
3. Ravue, "Principles of Polymer Chemistry" 2nd edition Plenum Publishers 2000.
4. Emeleus and Sharpe., "Modern Aspects of Inorganic Chemistry". Huheey, J. E, Keiter, E. A. and Keiter, R. L., "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Harper & Row, New York, 2001.
5. F. W. Billmeyer. "A Text book of Polymer Science" John Willey & Sons, New Delhi, 2002.
6. P.Powell. "Non Metal Chemistry", Chopman & Hall., 1974.
7. Miessler G.L. and Tar Donald, A. "Inorganic Chemistry" Prentice Hall Int. edition, 1991.
8. Douglas, McDaniel & John Alexander. "Concepts and Models of Inorganic Chemistry" by John Willey and Sons, 1994.

4th Year; 7th Semester

PAPER-III

Title of the Course: **INORGANIC CHEMISTRY**

Code: **CHEM-453**

Credit Hours: **03**

Marks: **100**

Objective of the Program

After completing this program students will be able to learn and able to interpret simple spectra.

1. Nuclear Magnetic Resonance Spectroscopy.
2. Ultra violet spectroscopy
3. Infrared spectroscopy
4. Mass Spectrometry
5. Thermal Analysis

Course Contents:

Instrumental Methods of Analysis

Physical methods in Inorganic Chemistry, TGA & DTA, NMR, IR, UV Spectroscopy, Mass Spectroscopy; Basic principles, Instrumentation and Applications

RECOMMENDED BOOKS:

1. Vogel, A. I., "A Text book of Quantitative Inorganic Analysis", English language Book Society 4th edition, 1978.
2. Daniels, T., "Thermal Analysis" 1998.
3. Pavia, D. L., Lampman, G. M. and Kriz, G.S., "Introduction to Spectroscopy", Saunders College Publishing, 1980
4. Silverstein, R. M., Barler, C. G. and Mogrill, T. C., "Spectrometric Identification of Organic Compounds",
5. Kemp, W., "NMR in Chemistry A Multi Nuclear Introduction", McMillan Press Ltd., 1986.
6. Drago, R. S., "Physical Method in Inorganic Chemistry", W.B. Saunders Company, 1997.
7. Bassetta, J., Denney, C., Jeffery, G. H. and Mendham, J., "Vogel's Textbook of Quantitative Inorganic Analysis including Elementary Instrumental Analysis", English language book society 4th edition, 1978.
8. Douglas, A. Skoog, F. James Holler, Trmothy, A., "Principles of Instrumental Analysis", 5th edition, Saunders College Publishing, New York, 1997.
9. Ewing, G.W., "Instrumental Methods of Chemical Analysis", 5th edition, McGraw Hill, New York, 1985.

4th Year; 7th Semester

PAPER-I

Title of the Practical: **INORGANIC CHEMISTRY**

Code: **CHEM-451**

Credit Hours: **02**

Marks: **50**

1. Use of some organic reagents for the estimation of various elements
2. Preparation of at least six compounds/organometallic compounds in a pure state and determination of their state of purity
3. The experiments may be set making use of conductivity meter and potentiometer depending upon the availability.

4th Year; 7th Semester

PAPER-II

Title of the Practical: **INORGANIC CHEMISTRY**

Code: **CHEM-452**

Credit Hours: **02**

Marks: **50**

1. Spectroscopic determination of some metal ions.
2. Recording and characterization of at least five organometallic compounds by IR and UV spectrophotometer to the subject of availability of facilities.
3. Estimation of different metals in food, tap water and brass etc. by Atomic Absorption Spectrometer/ flame photometer / UV / Visible spectrophotometer, subject to the availability of facilities.

4th Year; 7th Semester

PAPER-III

Title of the Practical: **INORGANIC CHEMISTRY**

Code: **CHEM-453**

Credit Hours: **02**

Marks: **50**

RECOMMENDED BOOKS:

1. Bassette, J., Denney, G. H. and Mendham, J., "Vogel's Textbook of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis" English Language Book Society, 4th Edition, 1981.

2. Fritz, J. S. and Schenk, G. H., "Quantitative Analytical Chemistry", Allyn and Bacon Inc., 4th Edition, 1979.
3. Pass, G and Sutcliffe, H., "Practical Inorganic Chemistry", Van Nostrand Reinhold Company, 1972