

# Department of Chemistry- 2021-22, COURSE OUTCOMES



## M.Sc. (CHEMISTRY) SEMESTER – I

### PAPER- I : CO-ORDINATION CHEMISTRY

- ✓ Students will understand the theories of chemical bonding in co-ordination chemistry.
- ✓ Students will understand the metal  $\pi$ -Complexes,  $\pi$ -acceptor ligands, 18 e- rule, Hapticity, Sandwich compounds, etc.
- ✓ Students will interpret metal ligand equilibria in solution through stepwise and overall formation constants, chelate effect, inert and labile complexes.
- ✓ Students will have an understanding of reaction mechanism of transition metal complexes through kinetics of octahedral substitution, acid hydrolysis, the trans effect, etc.

### PAPER- II : BASICS OF ORGANIC CHEMISTRY AND REACTION MECHANISM

- ✓ Students will develop an understanding of nature of bonding in organic molecules, aromaticity, anti-aromaticity, homo-aromaticity, various reaction intermediates.
- ✓ Students will develop an understanding about elimination reaction mechanisms, aliphatic and aromatic nucleophilic substitution mechanisms.
- ✓ Students will develop an understanding about aliphatic electrophilic substitution, aromatic electrophilic substitution, etc. through examples.
- ✓ Students will learn about addition to carbon – carbon multiple bonds, carbon-hetero multiple bonds, Grignard reagent, organo zinc and organo lithium reagents.

### PAPER- III : MATHEMATICS FOR CHEMISTS, QUANTUM CHEMISTRY AND CHEMICAL DYNAMICS

- ✓ Students will be able to perform mathematical analysis of vectors, matrix algebra and probability, rules and applications of differentiation and integration
- ✓ Students will have an insight into the atomic structure, quantum Chemistry, Schrodinger equation and its application, basic idea about angular momentum.
- ✓ Students will study the application of Schrodinger equation to multielectron system through approximate methods.
- ✓ Students will get acquainted with the basics of chemical dynamics, Photochemical reaction, Homogeneous catalysis, kinetics of enzyme reaction, fast reaction.

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**PAPER- IV : GROUP THEORY, PRINCIPLES OF SPECTROSCOPY AND COMPUTER FOR CHEMISTS**



- ✓ Students will study symmetry and group theory in chemistry and will be able to imagine and visualize the point group,
- ✓ Students will get acquainted with the unifying principles of spectroscopy like uncertainty relation, natural line width, selection rules, Born-Oppenheimer approximation, energy levels, etc.
- ✓ Students will get acquainted with the basics of computers and computing, computer programming in 'C' Language.
- ✓ Students will learn atomic absorption spectroscopy, its basic principle, instrumentation and applications in soil and water analysis.

**LABORATORY COURSE I : PHYSICAL CHEMISTRY**

- ✓ Students will perform study surface tension – concentration relationship, chemical kinetics and experiments related to phase equilibria, solutions, polarimeter, conductometry, potentiometry/pH metry, etc.

**LABORATORY COURSE II : INORGANIC CHEMISTRY**

- ✓ Students will be capable of carrying out qualitative and quantitative analysis, volumetric and gravimetric methods.

**M.Sc. (CHEMISTRY) SEMESTER – II**

**PAPER- I : TRANSITION METAL COMPLEXES AND DIFFRACTION METHODS**

- ✓ Student will have an Understanding of Electronic Spectra of Transition Metal Complexes
- ✓ Students will understand the Magnetic Properties of Transition Metal Complexes
- ✓ Students will learn X-Ray Diffraction Concept and Electron diffraction
- ✓ Students will acquainted with the basics of Neutron Diffraction, Metal clusters and Isopoly and Heteropoly Acids and Salts.

**PAPER- II : BIOMOLECULES AND STEREOCHEMISTRY**

- ✓ Students will study Stereochemistry and Conformational analysis in chemistry and will be able to predict the structure and orientation of optically active organic compound.
- ✓ Students will understand pericyclic reaction with many examples.

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- ✓ Students will study Carbohydrates, Lipids and their many types. Students will understand the structure and functions of Peptides, Proteins and Nucleic Acid



### **PAPER- III : THERMODYNAMICS, ELECTROCHEMISTRY AND SURFACE CHEMISTRY**

- ✓ Students will learn the basics of Classical Thermodynamics.
- ✓ Students will study the Statistical Thermodynamics and their Theories.
- ✓ Students will understand Theories of Electrochemistry and Electrocatalysis.
- ✓ Students will acquainted the Surface Chemistry and they will be able to imagine the structure of Micelles and Macromolecules.

### **PAPER- IV : SPECTROSCOPY**

- ✓ Students will understand Instrumentation and working procedure of Molecular Spectroscopy and Microwave spectroscopy.
- ✓ Students will study the Infrared spectroscopy, Raman Spectroscopy and their Instrumental Techniques.
- ✓ They will be able to predict structural properties of compound.
- ✓ Students will study Nuclear Magnetic Resonance Spectroscopy and Nuclear Quadruple Resonance Spectroscopy.
- ✓ Students will acquainted The Photoelectron Spectroscopy, Photo acoustic Spectroscopy and Electron Spin Resonance Spectroscopy.

### **LABORATORY COURSE : ORGANIC CHEMISTRY PRACTICAL**

- ✓ The students have been taught different analytical techniques like saponification, different organic compound preparation and best knowledge of instruments like pHmeter and conductometer.

### **LABORATORY COURSE : ANALYTICAL CHEMISTRY & COMPUTERS PRACTICAL**

- ✓ Students will learn error analysis, statistical data analysis, volumetric analysis, chromatography, flame photometry / AAS / FIA, spectrophotometry, nephelometry / turbidimetry, etc.

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## M.Sc. (CHEMISTRY) SEMESTER – III

### PAPER- I : APPLICATIONS OF SPECTROSCOPY

Students will learn about the instrumentation and application of various spectroscopy instruments like FTIR, UV-VIS, NMR, MASS spectra etc. for the structural determination of organic and inorganic molecules

### PAPER- II : BIO-CHEMISTRY

This section deals with metal and their significant role in biological process like respiration, photosynthesis and catalytic activities.

### PAPER- III : ORGANOTRANSITION METAL COMPLEXES

Organometallic chemistry is the major part of chemistry which deals with synthesis and chemical properties like catalysts, drugs of synthesized organometallic complexes

### PAPER- IV : PHOTOINORGANIC AND ANALYTICAL CHEMISTRY

This unit contains brief analysis of various photoinorganic reactions and role of instruments those are used in structural elucidation of molecules.

### LABORATORY COURSE I : ANALYTICAL CHEMISTRY PRACTICALS

The students have the detailed knowledge of analytical ore analysis of different element, quantitative organic compound analysis and also have the spectroscopic determination method.

### LABORATORY COURSE II : PROJECT WORK

Students will perform project work to understand scientific methodologies and research activity.

## M.Sc. (CHEMISTRY) SEMESTER – IV

### PAPER- I : PHOTOCHEMISTRY AND SOLID STATE CHEMISTRY

- ✓ Understanding of Photochemical reaction, determination of reaction mechanism of photochemical reaction.
- ✓ Understanding of Photo Fries Rearrangement and Barton reaction.



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- ✓ Understanding of solid state chemistry, crystal structures of various ionic compound, defects.
- ✓ Understanding of electronic properties & band theory of insulator, conductors and semiconductors.

### **PAPER – II : ENVIRONMENTAL CHEMISTRY**

- ✓ Development of understanding of environment, biogeochemical cycles of C.N.P.S.
- ✓ Understanding of quality of water and its qualitative analysis, treatment of water pollutant.
- ✓ Understanding of air pollution and its causes.
- ✓ Detailed knowledge of various industrial pollutants, toxicology.

### **PAPER- III : BIO-INORGANIC AND SUPRAMOLECULAR CHEMISTRY**

- ✓ Detail knowledge about Bioinorganic and supramolecular & photo inorganic chemistry.
- ✓ Metalloenzymes- understanding of metalloenzymes and their functions in human body/living body.
- ✓ Detail knowledge about metal chelates as medicine, study about synthetic approach of antibiotics.
- ✓ Understanding about Supramolecular chemistry .

### **PAPER- IV : CHEMISTRY OF MATERIALS & RADIOCHEMISTRY**

- ✓ Detailed knowledge about glasses, ceramics, composites & non-materials.
- ✓ Understanding of Microscopic composites, nanomaterials.
- ✓ Understanding about Principle and application of TGA, DTA, & DSC.
- ✓ Understanding of Radiation Chemistry, radio analytical techniques.

### **LABORATORY COURSE I : PROJECT WORK**

Students will perform project work to understand scientific methodologies and research activity.

### **LABORATORY COURSE II : ANALYTICAL CHEMISTRY PRACTICAL**

The students have a wide range of experiments related to analysis of alloy ores and minerals and extraction of organic compounds from natural products.

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