

## Course outcomes (Chemistry)

Course Instructor: Dr Anoop Singh

B.Sc. 1st year

### Paper 1<sup>st</sup> (CH-101) -Inorganic chemistry

**Unit 1-** This unit provides the basic to advance knowledge about atomic structure

**Unit 2-** Periodic Properties- Periodic properties make students to understand the chemical and physical behavior of elements such as ionization energy electronic affinity, and electonegativity.

**Unit 3-** Chemical Bonding –This unit provide detailed information about types of bonding as well as understanding of how and why molecules have different shape, size and angle and type of hybridization. After study of ionic solid, students will become familiar with ionic solid and its characteristics.

**Unit 4-** This unit explain chemical reactions and different compounds formed by the s-block elements and Noble gases

**Unit 5-** This unit explains chemical reactions and different compounds formed by the p-block elements

### Paper 2nd (CH-102) Organic chemistry

**Unit 1-** Structure And Bonding Mechanism of Organic Reactions, Alkanes & Cycloalkanes - Able to understand different type of bonds by learning about concept of hybridization, resonance hyperconjugation, inductive effect intermediate molecule help them to predict the mechanism of reactions. which help them to determine the shape and stability of Students are able to naming them by IUPAC, They can compare the structure and stability of alkane as well as their cyclic structure (Cycloalkane)

**Unit 2-** This units describe the three dimensional properties of molecules and different relationship among the molecules e.g. enantiomers, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization etc.

**Unit 3-** Students can have the understanding of synthesis, physical properties and chemical reactions of alkenes cycloalkenes, dienes and alkynes. Stability and regioselectivity of products also described.

**Unit 4-** Arenes and Aromaticity- Students can understand, why aromatic compounds mover stable than compounds, electrophilic substitution reactions of aromatic compounds are also characteristics of this unit.

**Unit 5-** Synthesis, chemical reactions and relative reactivity of alkyl and aryl Halide are also explained.

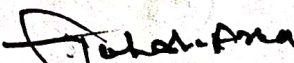
### Paper 3d (CH103) - Physical Chemistry


**Unit 1-** Gaseous State compares the gaseous and vapors state, real and ideal behavior of gases

**Unit 2-** Students can understand the difference between liquid crystal, liquid and solid states

**Unit 3-** In this unit student can understand the characteristics of solid crystals

**Unit 4-** Colloidal State - Understanding of the concept of collides, sols, gels and emulsions

  
Dr. Mahesh Chandra Arya  
IQAC/NAAC Coordinator  
BSR Rajkiya Mahavidhyalaya  
Rikhnikhil (Pauri Garhwal)

  
प्राचार्य  
भारत सिंह रावत  
राजकीय महाविद्यालय रिखनखिल  
चौडी गढ़वाल



**Unit 5-** By understanding the chemical kinetics and catalysis, students can explain time, speed and direction of the mechanism of reactions.

### (CH-104)- Laboratory Practical-

The course includes inorganic mixture analyses.

Organic Chemistry leads calibration of Thermometer, M.P. and B.P. determination, distillation, sublimation, crystallization. Functional group identification of organic compounds also an important part of practical.

In physical Chemistry Students will learn about chemical kinetics and determination of surface tension and viscosity

### BSc. 2nd year

#### Paper 1st (CH-201)- Inorganic chemistry

**Unit 1-** Transition Elements- Students can understand chemistry of the elements of 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> transition series and their comparison.

**Unit 2-** Co-Ordination Compound- Students can gain extensive information about co-ordination compound

**Unit 3-** Chemistry of Lanthanides and Actinides make understanding of periodic properties and chemical properties of Lanthanide and Actinide.

**Unit 4-** To understand the oxidation and reduction, electrode potential, electrochemical series and its applications and principles involved in the extraction of the elements.

**Unit 5th-** To understand various laws which can explain and categories the acid and base such as Arrhenius, Bronsted theory etc.

#### Paper 2-(CH-202)-Organic chemistry

**Unit 1-** It is an important exercise by which students can understand how to predict the different kind of bonds, functional group present in a given molecule.

**Unit 2-** To understand physical properties chemical reactions and methods of synthesis of alcohols and phenols

**Unit 3-** To understand physical properties chemical reactions and methods of synthesis of ether, epoxide, aldehyde and Ketone

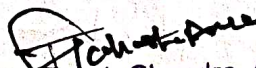
**Unit 4-** To understand physical properties chemical reactions and methods of synthesis of Carboxylic acid and its derivatives

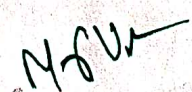
**Unit 5-** To understand physical properties chemical reactions and methods of synthesis of nitrogenous compounds

#### Paper 3rd - (CH-203)-Physical Chemistry

**Unit 1<sup>st</sup>-** Thermodynamics I- To understand the first law of thermodynamic and its various parameters

**Unit 2<sup>nd</sup>-** Thermodynamics II- To understand the second law of thermodynamic and its various parameters

  
Dr. Mahesh Chandra Arya  
IQAC/NAAC Coordinator  
BSR Rajkiya Mahavidhyalaya  
Rikhnikhil (Pauri Garhwal)

  
प्राचीय  
भारत सिंह रावत  
राजकीय महाविद्यालय रिखणीखार  
श्रीडी गढ़वाल



**Unit 3- Chemical Equilibrium-** students gain wide knowledge about chemical equilibrium.

**Unit 4- Electrochemistry I-** provide deep knowledge about electrolyte and conductance, different type of solutions, Raoult's and Henry's law

**Unit 5- Electrochemistry –II:** To describe the reversible electrodes, redox electrodes, Electrode reactions, Nernst equation, derivation of cell E.M.F.

To describe single electrode potential, standard hydrogen electrode-reference electrodes and their applications, standard electrode potential, sign conventions, electrochemical series and its significance.

To describe electrolytic and Galvanic cells—reversible and irreversible cells, conventional representation of electrochemical cells, EMF of a cell and its measurements, Computation of cell EMF,

To describe the calculation of thermodynamic quantities of cell reactions (QG, QH and K) Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

To describe pH and pKa and determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods, Buffers – Mechanism of buffer action, Henderson-Hazel equation, application of buffer solution, Hydrolysis of salts

Phase equilibrium topic provide deep knowledge about the terms-phase, component and degree of freedom, and various type of system.

#### (CH 204) Laboratory Practical

Course Description – Inorganic practical consist of calibration of fractional weight, pipettes, burettes, preparation of standard solutions dilution, Volumetric analysis and Gravimetric analysis.

Organic practical leads to thin layer Chromatography, paper Chromatography, identification of organic compounds.

Physical Chemistry explains the determination of transition Temperature, phase Equilibrium, thermochemistry experiments.

#### BSc. 3 year Paper 1st-(CH-301)- Inorganic chemistry

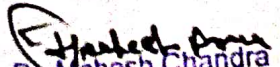
**Unit 1- Transition Metal Complexes-**Students can obtain deep knowledge about metal-ligand bonding in transition metal Complexes, thermodynamic and Kinetic aspects of transition Metal Complexes

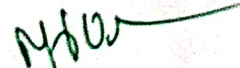
**Unit 2- Magnetic Properties of Metal Complexes and Electronic Spectra –**

After understand the bonding and stability of transition metal complexes, students can understand the magnetic properties and electronic spectra of transition metal complexes.

**Unit 3- Organometallic compounds and Silicones and Phosphazenes -** Students can understand the concept of bonding preparation, reactions and stability of organometallic compounds and also some brief introduction about inorganic polymers

**Unit 4- Hard and Soft acid and Basis –**this unit delivers information about HSAB principle.

  
Dr. Mahesh Chandra Arya  
IQAC/NAAC Coordinator  
BER P. Jyoti Mahavidyalaya  
Rikhnikhai (Pauri Gairwal)

  
प्राचार्य  
भारत सिंह रावत  
राजकीय महाविद्यालय रिखनखात  
पौड़ी गढ़वाल



**Unit 5-** Bioinorganic Chemistry provides basic idea about bioinorganic molecule and their importance.

### **Paper 2<sup>nd</sup> (CH-302)-Organic Chemistry**

**Unit 1-** Spectroscopy (HNMR) - Students will understand how to determination the structure of organic molecules with the help of NMR spectroscopy.

**Unit 2-** This unit improves an understanding of chemical, biological importance and structure present in organometallic compound and heterocyclic compounds

**Unit 3-** Carbohydrates, Amino Acid, Peptides, Properties and Nucleic acid -

Students are able to understand the reaction, preparation, structure of carbohydrates and amino acids apart from that brief information about RNA and DNA also explained

**Unit 4-** unit provide crucial knowledge concerning fats, oils detergents, synthetic polymers and synthetic dyes

**Unit 5-** Students will come to know the importance of enolates as synthetic intermediates.

### **Paper 3<sup>rd</sup> (CH-303)- Physical Chemistry**

**Unit 1-** Students can understand physical properties of atoms such as Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen, Compton effect, de-Broglie's hypothesis and some quantum operators

**Unit 2-** Physical Properties and Molecular structure: Students can receive vast knowledge about dipole momentum and its relation with molecular structure.

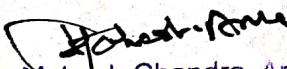
**Unit 3-** students can understand the basics of rotational vibrational, Raman and electronic spectra and its importance.

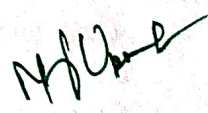
**Unit 4-** Students can understand law of photochemical process and able to differentiate between photochemical reactions and thermal reactions.

**Unit 5-** Solutions, Dilute Solutions, and Colligative properties- this unit furnished deep knowledge about solutions and its colligative properties.

### **(CH-304) Laboratory Practical**

Students learn how to perform inorganic as well as organic synthesis. Apart from that they will also understand column chromatography, steam distillation, column, Conductometry, refractometer, polarometry and determinations of molecular weight.

  
Dr. Mahesh Chandra Arya  
IQAC/NAAC Coordinator  
BSR Rajkiya Mahavidhyalaya  
Rikhnikhal (Pauri Garhwal)

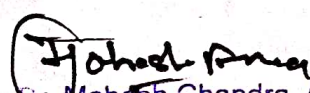
  
प्राचाय  
भारत सिंह रावल  
राजकीय महाविद्यालय रिखणिक  
बौडी गढ़वाल

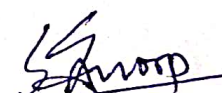


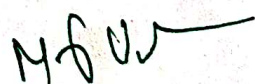
## Programme outcome Course outcomes (U.G. Chemistry)

Course Instructor: Dr Anoop Singh

- ✓ It is obvious to expect that graduate students should have comprehensive knowledge and understanding of practical as well as theoretical knowledge in chemistry.
- ✓ After the completion of three year under graduate course students will gain understanding of theory and its application in critical thinking, practical, analytical reasoning and logical prospective.
- ✓ The course curriculum also includes basic training of students in order to build technical writing skills and oral presentation skills. Conducting practical in chemistry lab helps the students to improve their team spirit.
- ✓ This programme is designed in such a way that analytical skills could be developed in students as a result they will be able to get ample opportunity to get a placement in industry, academic and administrative work.
- ✓ After study the course students will be able to justify why chemistry is important for addressing economic, economic and environmental problems.

  
Dr. Mahesh Chandra Arya  
IQAC/NAAC Coordinator  
BSR Rajkiya Mahavidhyalaya  
Rikhnikhhal (Pauri Garhwal)

  
Dr. Anoop Singh  
Assistant Professor  
Chemistry  
BSR Rajkiya Mahavidyalaya  
Rikhnikhhal

  
प्राचार्य  
भारत सिंह रावत  
राजकीय महाविद्यालय रिखणाखाल  
शौड़ी गढ़वाल