

**Department of Chemistry, Sonari College**

***Program Outcomes (PO)***

**Bachelor of Science**

**PO1:** To instill curiousness and sense of inquiry into a student's mind about the whereabouts of the surrounding world with a scientific mindset.

**PO2:** The students can develop a deeper understanding of the subjects by learning about their practical applications.

**PO3:** The students will be capable of pursuing their higher studies in different post graduate courses and appearing in various competitive examinations to follow a career of their choice.

**PO4:** The program will encourage the students towards research-oriented careers to develop newer ideas in different fields of science as well as in day-to-day lives.

***Program Specific Outcomes (PSO)***

**B.Sc. in Chemistry**

**PSO1:** The students will be provided a sound knowledge base and laboratory experiences to prepare them for post-graduate studies as well as for careers as professionals in the field of chemistry.

**PSO2:** The students would be able to understand, analyse and solve problems in different units of the course.

**PSO3:** The course will provide the basic skills to handle different laboratory equipments and chemicals with required safety precautions.

**PSO4:** the students will be encouraged to pursue research works in different aspects of chemistry.

***Course Outcomes (CO)***

**B.Sc. in Chemistry**

**CHEMISTRY-C-101 (Inorganic Chemistry)**

**CO1:** The students will understand the basic theory about atomic structure.

**CO2:** The students will be able to analyse the periodic transformations of different properties of the elements and their applications.

**CO3:** They will have the basic understandings of the bonding theories.

**CHEMISTRY-C-101-LAB (Inorganic Chemistry)**

**CO1:** The students will be able to handle different laboratory equipments and have the knowledge about titrimetric analysis.

**CHEMISTRY-C-102 (Physical Chemistry)**

**CO1:** The students will get the idea of kinetic molecular model of a gas, behaviour of real gases etc.

**CO2:** The different properties of the liquid state and gaseous states will also be understood.

**CHEMISTRY-C-102-LAB (Physical Chemistry)**

**CO1:** The students will be able to apply their understanding of the liquid state properties and ionic equilibrium in laboratory processes.

**CHEMISTRY-C-201 (Organic Chemistry):**

**CO1:** Students will be able to develop preliminary knowledge in basic organic chemistry ideas in analysing a reaction.

**CO2:** They will have the basic understandings of stereochemistry and conformational analysis.

**CHEMISTRY-C-201-LAB (Organic Chemistry):**

**CO1:** Students will be introduced to different purification techniques like crystallization, chromatographic techniques etc.

**CHEMISTRY-C-202 (Physical Chemistry):**

**CO1:** The students will understand the concepts of chemical thermodynamics and solve the mathematical problems therein.

**CO2:** They will be able to derive relation between the four colligative properties using chemical potential (Thermodynamics derivation).

**CHEMISTRY-C-202-LAB (Physical Chemistry):**

**CO1:** The students can apply the understandings of chemical thermodynamics and equilibrium in laboratory processes.

**CHEMISTRY-C-301 (Inorganic Chemistry):**

**CO1:** Students will be able to understand different metallurgical processes.

**CO2:** The concepts of acid and bases will be understood.

**CHEMISTRY-C-301-LAB (Inorganic Chemistry):**

**CO1:** The students will understand the processes of iodometric titrations and preparation techniques of inorganic molecules.

**CHEMISTRY-C-302 (Organic Chemistry):**

**CO1:** The students will develop the understanding of the reactivities of different functional groups like halides, carbonyl groups etc.

**CHEMISTRY-C-302-LAB (Organic Chemistry):**

**CO1:** The students would learn the applications of different reactions and functional group tests.

**CHEMISTRY-C-303 (Physical Chemistry):**

**CO1:** Students will be able to understand the concepts of chemical kinetics and catalysis.

**CO2:** They will understand the concepts of phase and phase diagrams for different physical state equilibria.

**CHEMISTRY-C-303-LAB (Physical Chemistry):**

**CO1:** The concepts of kinetics and surface chemistry will be applied in laboratory processes.

**CHEMISTRY-C-401 (Inorganic Chemistry):**

**CO1:** Students will get the basic concepts of quantitative aspect of ligand field and MO theory, stability of various oxidation states and emf of transition elements.

**CO2:** They will understand the properties of transitional metals and inner transitional metals.

**CO3:** They will understand the role of different metals in biological systems.

**CHEMISTRY-C-401-LAB (Inorganic Chemistry):**

**CO1:** Students can apply the knowledge of preparation and purification techniques for inorganic complex.

**CHEMISTRY-C-402 (Organic Chemistry):**

**CO1:** Students will gain the knowledge of preparation and properties of nitrogen containing heterocyclic compounds, including alkaloids and terpenes.

**CHEMISTRY-C-402-LAB (Organic Chemistry):**

**CO1:** Students can get the experience for functional group tests and qualitative analysis of organic compounds.

**CHEMISTRY-C-403 (Physical Chemistry);**

**CO1:** Students will be able to understand the basic knowledge on electrochemistry, various laws governing electrochemical process and their applications.

**CO2:** Students will gain the knowledge on electrical and magnetic properties of atoms and molecules.

**CHEMISTRY-C-403-LAB (Physical Chemistry):**

**CO1:** Students will gain the practical knowledge on conductometric and potentiometric titrations.

**CHEMISTRY-C-501 (Organic Chemistry):**

**CO1:** Students will be able to design a synthesis through retrosynthetic approach.

**CO2:** They will understand the chemical basis for biological phenomena and cellular structure, the enzymatic action and the nucleic acids and their role in heredity.

**CHEMISTRY-C-501-LAB (Organic Chemistry):**

**CO1:** Students will be able to perform protein estimation, enzymatic action and DNA estimation experiments.

**CHEMISTRY-C-502 (Physical Chemistry):**

**CO1:** Students will understand the basic concepts of quantum mechanics and qualitative treatment of hydrogen atom and hydrogen like ions.

**CO2:** They will also be introduced to photochemistry and different molecular spectroscopy techniques.

**CHEMISTRY-C-502-LAB (Physical Chemistry):**

**CO1:** Students can learn about UV/VIS spectroscopy and its applications and the use of colorimetry technique in concentration determination.

**CHEMISTRY-C-601 (Inorganic Chemistry):**

**CO1:** Students will get the basic concepts of organometallic compounds and their reaction mechanisms.

**CO2:** They will also get the knowledge on catalytic applications of organometallic compounds.

**CHEMISTRY-C-601-LAB (Inorganic Chemistry):**

**CO1:** Students will learn the qualitative inorganic analysis of mixtures of different cations and anions and the chemistry therein.

**CHEMISTRY-C-602 (Organic Chemistry):**

**CO1:** Students will learn the use of molecular spectroscopic techniques in organic compound analysis.

**CO2:** They will be acquainted with carbohydrate chemistry, and different biodegradable polymers and dyes.

**CHEMISTRY-C-602-LAB (Organic Chemistry):**

**CO1:** Students will get the experience on organic qualitative analysis and application of spectroscopy in organic structure determination.

**CHEMISTRY-DSE-501 (Analytical Methods in Chemistry):**

**CO1:** Students will get a deeper knowledge on different analytical methods for chemical compounds.

**CHEMISTRY-DSE-501-PRACT. (Analytical Methods in Chemistry):**

**CO1:** Students will learn the application of chromatographic techniques in purification in a laboratory scale.

**CHEMISTRY-DSE-502 (Green Chemistry):**

**CO1:** Students will learn about the principles of green chemistry with real life applications and the future trends.

**CHEMISTRY-DSE-502-LAB (Green Chemistry):**

**CO1:** Students will experience the green reaction technologies such as photocatalyst, green solvent etc.

**CHEMISTRY-DSE-503 (Research Methodology for Chemistry):**

**CO1:** The students will acquaint themselves with literature survey for research purpose and writing the findings of a research work in a scientific and ethical way after analysis of data.

**CO2:** Students will learn about the safe and ethical handling of different chemicals.

**CHEMISTRY-DSE-601 (Inorganic Materials of Industrial Importance):**

**CO1:** Students will understand the working principles of fertilizers, surface coating, silicate industries, batteries etc.

**CHEMISTRY-DSE-601-LAB (Inorganic Materials of Industrial Importance):**

**CO1:** Students will gain the practical knowledge on different inorganic material analysis.

**CHEMISTRY-DSE-602 (Industrial Chemicals and Environment):**

**CO1:** Students will learn about the impact of industrial chemistry on environment and handling.

**CO2:** Students will be introduced to the concept of biocatalysts.

**CHEMISTRY-DSE-602-LAB (Industrial Chemicals and Environment):**

**CO1:** Students will learn about industrial processes in laboratory scale.

**CHEMISTRY-DSE-603 (Project Work):**

**CO1:** Students will be introduced to a scientific problem and the ways to solve it.

**CO2:** They will be introduced to the basics of data analysis, scientific writing and verbal presentation of their work.

**CHEMISTRY-SEC-301 (Basic Analytical Chemistry):**

**CO1:** Students will be acquainted with different analysis process like water and soil analysis.

**CO2:** They will get further knowledge on chromatographic processes.

**CHEMISTRY-SEC-401 (Fuel Chemistry):**

**CO1:** Students will get the knowledge of different sources, both renewable and non-renewable sources of fuels and their extractions.

**Four-Year Undergraduate Program (FYUGP)**

***Program Outcomes (PO)***

**Bachelor of Science**

The aims of the Four Year Under-Graduate Programme (FYUGP) in Chemistry are:

1. To equip the students with the potential to contribute to academic and industrial environments.
2. To impart knowledge in fundamental aspects of various branches of Chemistry.
3. To apply the key concepts and standard methodologies to solve problems related to Chemistry.
4. To prepare students for higher education and a career in Chemistry.
5. To develop laboratory skills, viz. proper handling of apparatus, chemicals, and experimental techniques.
6. To make students apply chemistry in their day-to-day life.
7. To create the students as responsible citizens by creating environmental awareness.
8. To impart digital fluency, professionalism and leadership qualities, social responsibility and ethical integrity in the students.

***Program Specific Outcomes (PSO)***

**B.Sc. in Chemistry**

By the end of the programme an undergraduate student of Chemistry should be able to:

1. Understand the basic principles of various branches of Chemistry.
2. Demonstrate a range of practical skills to conduct and infer experiments independently and in groups.
3. Apply the key concepts and standard methodologies to solve problems related to Chemistry.
4. Apply methodologies to the solution of unfamiliar types of problems.
5. Exhibit skills leading to employability in Chemistry and allied industries.
6. Comprehend the fundamental aspects of research in Chemistry.
7. Possess the level of proficiency in the subject required for post-graduation as well as for pursuing research in Chemistry and related interdisciplinary subjects.
8. Demonstrate teaching competencies required for keeping oneself professionally engaged.

***Course Outcomes (CO)***

## **B.Sc. in Chemistry**

### **CHMC1 (CORE COURSE -1)**

**CO1:** Student will understand the basic concepts of inorganic and organic chemistry.

**CO2:** Student will understand the basics of gaseous and liquid states of matter.

**CO3:** Student will get the understanding of purification of organic compounds and measurement of physical properties of matter.

### **MINCHM1 (Fundamentals of Chemistry – 1)**

**CO1:** Student will be able to explain the sign of wave function, counter boundary and probability diagrams, different types of bonds and its application.

**CO2:** Student will understand the kinetic molecular model of a gas, behaviour of real gases, van der Waal's equation, viscosity of gases.

**CO3:** Student will be able to explain the basic organic chemistry and its importance with reaction mechanism.

**CO4:** Student will be able to analyse the inorganic salt mixture qualitatively.

### **GECCHM1 (Chemistry in Daily Life- I)**

**CO1:** Student will understand the composition, processing and analysis of dairy products.

**CO2:** Student will learn about the various food preservatives and artificial food colorants and their role in food processing industries.

**CO3:** Student will be aware of the adverse effects of food adulterants in human health

### **SEC123 (Basic Analytical Chemistry)**

**CO1:** Student will understand the analysis of soil, water, food products, cosmetics and principles of different types of chromatography.

**CO2.** Student will learn to determine pH, physical and chemical parameter in soil and water which are significant in day-to-day life.

**CO3.** Student will learn to separate mixtures using separation techniques.

### **CHMC2 (CORE COURSE -2)**

**CO1:** Student will understand the preparation, structure and uses of non-transition elements; extraction techniques of metals; various terms and laws of thermodynamics; crystal structure and crystal defects; preparation & properties of alkanes, alkenes and alkynes etc.

**CO2:** Student will learn to estimate iron and oxalic acid indifferent stock solutions provided to the learners which have immense applications in industry and day to day life.

**CO3:** Student will be able to detect elements and functional groups indifferent organic samples.

### **MINCHM2 (Fundamentals of Chemistry - 2)**

**CO1:** To understand VBT, CFT and applications of some complexes in various fields.

**CO2:** Student will be able to explain the VSEPR theory, MOT and their applications.

**CO3:** Student will be able to illustrate the applications of solubility and solubility product principle.

**CO4:** Student will understand the stereochemistry and conformational analysis.

**CO5:** Student will be able to handle pH meter, viscometer and stallagometer for determination of pH, viscosity and surface tension of liquids.

**GECCHM2 (Chemistry in Daily Life- II)**

**CO1:** Student will understand and demonstrate how structure of biomolecules determines their reactivity and biological functions.

**CO2:** Student will be able to explain the various types of vitamins and their role.

**SEC223 (Basic Analytical Chemistry (Fuel Chemistry))**

**CO1:** Student will be able to distinguish conventional petroleum-based fuels and alternative & renewable fuels.

**CO2:** Student will be able to gain the knowledge of the origin of petroleum, crude oil, composition, different refining processes employed industrially to obtain different fractions of petroleum.

**CO3:** Student will be able to perform various test used to qualify different types of fuels.