

EXPECTED LEARNING OUTCOMES

PROGRAM SPECIFIC OUTCOME

The purpose of the M.Sc. (Chemistry) program at Govt. Digvijay PG Autonomous college is to provide the key knowledge, base and laboratory resources to prepare students for achieving their career goals as professionals in the field of chemistry, biological chemistry and related fields.

LEARNING OUTCOMES

- Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in Analytical, Inorganic, Organic and Physical Chemistries.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.
- Students will be skilled in problem solving, critical thinking and analytical reasoning as applied to scientific problems.
- Students will be able to clearly communicate the results of scientific work in oral, written and electronic formats to both scientists and the public at large.
- Students will be able to explore new areas of research in both chemistry and allied fields of science and technology.
- Students will appreciate the central role of chemistry in our society.
- Students will become aware of the ethical behavior in issues facing chemists including an understanding of safe handling of chemicals, environmental issues and important issues being faced by our society such as energy, health and medicine.

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 π –Complexes, π -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.

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.
- 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.

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.

- 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 : ENVIRONEMNTAL 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.

EXPECTED LEARNING OUTCOMES

B.Sc. (Subject - Chemistry)

PROGRAM OUTCOMES

- Students will have a basic knowledge of fundamentals and application of current chemical and scientific theories.
- Students will be able to record and analyze the results of experiments.
- Students will be skilled in problem solving, critical thinking and analytical.
- Students will understand the central role of chemistry in our society.
- Students will become aware of the ethical behavior in issues facing chemists.

PROGRAM SPECIFIC OUTCOME

The purpose of the B.Sc. program at Govt. Digvijay PG Autonomous college is to provide the key knowledge, base and laboratory resources to prepare students for achieving their career goals as professionals in the field of chemistry, biological chemistry and related fields. They will be able to work as chemists and technicians in different laboratories.

COURSE OUTCOMES

B.Sc. I year (Subject - CHEMISTRY)

PAPER - 1 (Inorganic Chemistry)

Unit 1- Students will develop an understanding about the atomic structures and their rules.

Unit 2 - Students will have an insight look about V.B.T. and types of hybridization .

Unit 3 - Students will be able to understand about different characteristics of ionic solids , semiconductors and band theories.

Unit 4 - Students will have an insight comparative study of s-block elements.

Unit 5 - Students will understand about different properties & structures of p-block elements & inorganic chemical radicals.

PAPER - 2 (Organic Chemistry)

Unit 1- Students will be able to develop an understanding about electronic structure bonding & mechanism.

Unit 2 - They will be able to learn about stereochemistry of organic compounds.

Unit 3 - Students will have an idea about aliphatic and aromatic ring compounds.

Unit 4 - Students will be able to perform chemical reactions , structures , substitution reactions of alkenes ,dienes and alkynes.

Unit 5 - Students will develop an understanding about the mechanism & substitution reactions of alkyl and aryl halides.

PAPER - 3 (Physical Chemistry)

Unit 1 - Students will be able to perform mathematical concept for chemist & computers.

Unit 2 - Students will be able to understand the concept of Maxwell's law & J-T effect.

Unit 3 - Students will have a basic idea about Raoult's law & Van't Hoff factor of liquids.

Unit 4 - Students will have an insight view about classification , structures and applications of liquid crystals, colloidal & solid state.

Unit 5 - Students will study the about chemical kinetics & catalysis.

LABORATORY COURSE

Student will learn calibration , determination of physical properties of compound and qualitative analysis.

B.Sc. II year (Subject - CHEMISTRY)

PAPER - 1 (Inorganic Chemistry)

Unit 1- Deals with basic property like complexation,colour transition and various in oxidation state of elements of 3d series.

Unit 2- student will learn about the similarities of between 4d and 5d series in to various aspect like magnetic property lanthanide contraction and spectral phenomenon.

Unit 3- In this unit various theories like VBT, MOT, LFT has been elaborated which is to coordination complexes and their spectral characteristics.

Unit 4- this unit deal with various isolation processes for the separation of La and Ac also complex formation and variation in oxidation state has been studied in detail.

Unit 5- various proposed method for acid and bases has been studied in detail which is useful in various chemical reaction as well as basics of organic and inorganic chemistry

PAPER - 2 (Organic Chemistry)

Unit 1- method of preparation, physical and chemical properties of alcohols, phenols, ethers and epoxides has been studied in detail.

Unit 2 - Important synthesis methods and chemical reactions and oxidising nature of aliphatic and aromatic aldehyde and ketones has been studied.

Unit 3 - Acidic property, effect of substituents of carboxylic acid and chemical and physical properties of their derivatives explain in detail

Unit 4 - Chemical reaction, effect of substituents on aliphatic and aromatic nitrogen containing compound has been studied

Unit 5 - important reaction, mechanism and synthesis of heterocyclic compounds and their role in drugs synthesis. Role of Amino acids in biological process and end group analysis of amino acids has been explained.

PAPER - 3 (Physical Chemistry)

Unit 1 - This unit states with first law of thermodynamics and calculation of various mathematical expression related to ideal gases.

Unit 2- Second and third law of thermodynamics studied in detail with the basic concepts of entropy, pressure and temperature

Unit 3 - Various theories including nernst equation, lee chateliers equation and principle and gibbs phase rule and explain their importance;explain in detail.

Unit 4 - Principles and theories which explain the electrolytic solution and their conductivity has been explained

Unit 5 - Redox, EMF, electrode reaction and concentration cells and their importance explain in brief.

LABORATORY COURSE

Students will learn calibration, volumetric analysis, chromatography, qualitative analysis and thermochemistry.

B.Sc. III year (Subject - CHEMISTRY)

PAPER - 1 (Inorganic Chemistry)

Unit 1 - This unit give important information about metal-ligand bonding in transition metal complexes and types of ligand.

Unit 2 - Student gains important information about ionic bond also this unit explains crystal field theory and its applications.

Unit 3 - Students gains the knowledge of organometallic compounds and their chemical reactions.

Unit 4 - Important elements and their important role in chemistry discussed in this unit.

Unit 5 - In this unit concept of acid and base are discussed and the forms in which compounds occur in nature is explained.

PAPER - 2 (Organic Chemistry)

Unit 1 - Units give the knowledge of different organometallic compounds and organic synthesis via enolates.

Unit 2 - Students the knowledge of biomolecules and their important roles in chemistry and daily life.

Unit 3 - Students gains the knowledge of polymers, types of biopolymers, formation, their properties and uses.

Unit 4 - This unit gives information about mass, infrared and UV/Visible spectroscopy. Students gains knowledge of basic principles of these spectroscopy.

Unit 5 - Students gains knowledge about NMR and ^{13}C Spectroscopy their principle and applications.

PAPER - 3 (Physical Chemistry)

Unit 1 - Students will know about the structure of atom, orbitals and importance of quantum mechanics in chemistry.

Unit 2 - From this unit students gain the knowledge about applications of quantum mechanics.

Unit 3 - Spectroscopy plays a very important role in determination of molecular and atomic structure. This unit gives basic knowledge about spectroscopy subject.

Unit 4 - Students gains the knowledge about orientation of magnetic properties in substances.

Unit 5 - This unit gives knowledge of third law thermodynamics.

LABORATORY COURSE

Students will understand preparation of complex, synthesis and analysis of organic compound, qualitative analysis and handling of instruments.

EXPECTED LEARNING OUTCOMES

B.Sc. (Subject - Industrial Chemistry)

PROGRAM OUTCOMES

- Students will have a basic knowledge of fundamentals and application of current chemical and scientific theories.
- Students will be able to record and analyze the results of experiments.
- Student will know about material balance, metal and alloys. manufacturing process important for industries.
- Students will learn about chemical processes and industrial economics.
- Students will be skilled in problem solving, critical thinking and analytical.
- Students will understand the central role of chemistry in our society.
- Students will become aware of the ethical behavior in issues facing chemists.

PROGRAM SPECIFIC OUTCOME

The purpose of the B.Sc. (Industrial Chemistry) program at Govt. Digvijay PG Autonomous college is to provide the key knowledge, base and laboratory resources to prepare students for achieving their career goals as professionals in the field of chemistry, biological chemistry and related fields. They will be able to work as chemists and technicians in different laboratories, industries, pollution control agencies, etc.

B.Sc. I (INDUSTRIAL CHEMISTRY)

PAPER- I : INDUSTRIAL ASPECTS OF ORGANIC & INORGANIC CHEMISTRY

- Student will learn by this unit chemical name and chemical composition or structure of any raw material or products.
- Student know about crude material of petroleum and coal.
- Natural resource of products, student know about extraction of raw chemical and its metallurgical process.

- Extraction process of earth metals.
- Industrial important raw material

PAPER- II : INDUSTRIAL ASPECTS OF PHYSICAL CHEMISTRY, MATERIAL AND ENERGY BALANCE

- Study about atom, molecule, product surface nature and its activity use for soap, shampoo, detergent, gel productions.
- Student will learn about catalyst type material and its use in production.
- Industrially physical working process of material and separation of pure material in industry.
- Students know standard and dimensions unit about material balancing in final production process.
- Material composition changes between process one to another phase.

PAPER- III : UNIT OPERATION IN CHEMICAL INDUSTRY AND UTILITIES, FLUID FLOW AND HEAT TRANSPORT IN INDUSTRY

- Student will know about all type of distillation and absorptions equipments, working and handling process.
- Student learn about many type dryers, evaporators, filters equipments and workings benefits in industries.
- What is utility role in plants and its products handling process.
- All type of pumps and fluid flow pumps working process or important in plants.
- Heat exchanger process and its device working properties in industries.

LABORATORY COURSE

- Students will learn by this year practical how to doing any simple laboratory techniques like distillation process, boiling point, melting point, extraction process, manufacturing of standard solutions, and calibration of machine chromatography techniques, surface tensions process and refractive index process mainly safety process.

B. Sc. II (INDUSTRIAL CHEMISTRY)

PAPER- I : MATERIAL SCIENCE AND ENVIRONMENTAL STUDIES

- Material of construction and use in industry, cement, ceramic, metals manufacturing process.
- Polymer manufacturing process in industries and natural polymer extraction.
- Glass manufacturing in industries and corrosion process in metal or other surface.
- Pollution and its pollutants.
- Advance knowledge about air pollutions.

PAPER- II : ORGANIC CHEMICALS MANUFACTURING AND WASTE MANAGEMENT

- Nitration process in industries for manufacturing of nitro aromatic chemical, explosive other etc.
- Important industrial uses of radicals halogenations process include direct chlorination and allelic chlorination.
- Sulfonation process used in electrophilic aromatic substitution used for detergents, dye and drugs.
- Water treatment plant process and aerobic and anaerobic type treatment process.
- Multiple instrument using in industries and industrials shifty process.

PAPER- III : ORGANIC SYNTHESIS AND INDUSTRIAL INSTRUMENTATIONS

- Student will learn how to catalytic oxidation done remediation of pollutants, production of valuable chemicals used in water treatment.
- Hydrocarbons used in food industry like unsaturated vegetable oils and fats.
- Esterification used in polymer manufacturing industry, soaps, synthetic rubber, paints, varnishes, medicines, dyes.
- Student will learn real time measurement and control of process such as level, flow, pressure, temperature, ph, humidity.
- Pressure transmitter determine liquid level in a tank. many type equipments process in industries.

LABORATORY COURSE

- Student will learn by this year practical unit process like nitration polymerization process, many type instrument methods uses in industry, material testing, process of any instrument work in plant and water treatment process.

B. Sc. III (INDUSTRIAL CHEMISTRY)

PAPER- I : CHEMICAL PROCESS AND INDUSTRIAL ECONOMICS

- Student will know chemical estimation and cost accounting.
- Student will learn marketing policy, cost value, taxes on export or imports on material.
- Industrial sampling purchasing, raw material, collection data from area to area, particle and material determination, student know about quality assurance department and management about QA & QC .
- Industrial application, planning for material production or quality parameter control location for setup any industries.
- Safety management ,welfare the human resources.

PAPER- II : PHARMACEUTICALS

- Student will learn the pure history about Pharmaceuticals parameter, type for using routes of administration.
- It will help in nursing and sterilization process, and Parma industry and additives in medicine.
- Student will know about packaging and quality control process for raw material. F.D.A. process.
- Crude product for manufacturing pharmacy. all type chromatography process.
- Instruments handling on laboratory for analysis of material raw & final.

PAPER- III : DRUGS

- Student will know about effluent handling ,collection and cultivation of photochemical plants.
- Chemical constitution about isolation procedures for ingredients of medicine.
- Student will know about antimicrobial, analgesic, steroidal hormones drug.
- Student know about vitamin, barbiturates, blockers, cardiovascular, antihistamines medicine, role of its metabolism of medicine.
- Student know how to manufacturing of penicillin, vitamins, steroidal drug. its use or microbial effect. fermentation process.

LABORATORY COURSE

- Student will know how to manufacturing industrials compound like Benzes amide, aldehyde, alcohol, fatty oil and acid. determination of material packaging material.

- Limit test heavy metals & two representing bulk drug.
- Acidimetric and alkalimetry formulation of this type analysis. microbiological and antimicrobial testing zone and cup method.
- Know about TLC method for determination of few drug.