

SYLLABUS

CHEMISTRY

As per NEP-2020

B.Sc. II YEAR III SEMESTER EXAMINATION, 2025-26



JAI NARAIN VYAS UNIVERSITY
JODHPUR

INTRODUCTION

Jai Narain Vyas University, Jodhpur was established in July 1962. It is a regional University now and operates in the limits of Jodhpur, Jalore, Barmer, Pali and Jaisalmer districts. The Department of Chemistry is located in the New Campus of the University, near the Bhagat-ki Kothi Railway Station, Pali Road. (The Department runs post graduate course in chemistry and has various research laboratories). More than 700 candidates have been awarded with degree of Ph.D. and three candidates have been awarded D.Sc. degree. About 1700 research papers from various faculty members and research scholars have been published in the International and National Scientific Journals. The Department has received research projects from different agencies like U.G.C., C.S.I.R., D.S.T., D.B.T., I.C.A.R., DRDO, DAE etc from time to time. In 1983, U.G.C. has formulated a programme under which certain departments, selected on the basis of their achievements in the field of teaching and research, they were provided with infrastructure for raising the standard of their post-graduate education and research to international level. The programme was formulated as Committee on Strengthening of Infrastructure of Science and Technology (COSIST) of U.G.C.

The Department is one among the three departments of chemistry in the country, which were selected for this programme. M.Sc. was awarded under COSIST programme from 1985 to 2003, there after department was identified by the UGC under SAP (Special Assistance Programme) in 2010 for research support to the department. Thereafter DST awarded II level FIST programme to the department in 2010.

CBCS scheme for post graduate course (M.Sc. Chemistry) was implemented from the session 2015 onwards. Now from the session 2023-24 the course curriculum for both UG & PG has been revised as per the National Education Policy 2020.

Awards

Apart from the university gold medal for securing highest marks in M.Sc/B.Sc., following awards have been instituted in the Department of Chemistry for the meritorious students:

1. Professor R.C. Kapoor Gold Medal for securing highest marks in M.Sc. (Chemistry)
2. Professor J.P. Saxena Award for excellence in Organic Chemistry
3. Sushila Bhandari Ugam Kanwar Bhandari Memorial Abhay-II Award for excellence in Physical Chemistry
4. Dr. Kamla Tandon Memorial Award for excellence in Inorganic Chemistry.
5. B.M.Gang Memorial Award for excellence in Analytical Chemistry

Academic and Research Programme

Under Special Assistance Program (SAP), Department of Chemistry offers a two year (4 semesters) integrated programme leading to the Master's degree in Chemistry in two sections of 40 students each. Syllabus is designed to cover all four branches of chemistry viz. Inorganic Chemistry, Organic Chemistry, Physical Chemistry and Analytical Chemistry. IInd and IVth semester offers a choice of eight electives each to strengthen diverse field of interdisciplinary nature.

Department of Chemistry has advanced facilities for research in major areas of Chemistry leading to Ph.D.. The major research interests of the faculty members includes: Nanotechnology, Biosensors; Electrochemistry & Electroanalytical Chemistry, Chemical Dynamics & Reaction Mechanism; Mineral Beneficiation; Oil & Fats; Natural Products; Synthetic Heterocyclics; Chemical Spectroscopy; Synthetic & Structural Organo & Organometallic Chemistry; Effluent Treatment; Environmental Chemistry; Synthetic Organic Chemistry; Photochemistry; Solar Energy Conversion & Storage; Co-ordination Chemistry; Green Chemistry and Applied Chemistry.

ADMISSION

The minimum qualification for admission to M.Sc. course is B.Sc. (10+2+3) degree with Chemistry as a major subject. The details of the eligibility conditions and admission procedure is available on University official Website. The admission for M.Sc. Chemistry is done strictly as per the university rules. Reservation for SC, ST, OBC, MBC & EWS quota would also be done as per J.N.V. University, Jodhpur rules.

ATTENDANCE

Candidates are required to attend minimum 75% of the classes in theory and practicals both.

EXAMINATION SCHEME

Detailed examination scheme will be as per the common guidelines at faculty/University level.

FACILITIES

The Department of Chemistry possesses several sophisticated, advanced and modern equipments required for teaching and research. The specialized instruments includes Electrochemical Analysers, Surface plasmon Resonance Spectrometer, Fluorescence Spectrophotometer, FTIR, UV-VIS spectrophotometers, Stopped-flow spectrophotometers, HPLC, Low temperature thermostats, Flame photometers, Ion meters, Centrifuge and computers for networking. In addition, certain facilities related to equipments are also available with USIC in the Faculty of Science.

VISION

To develop and nurture a strong spirit for strengthening unexplored scientific heritage for better and greener society

MISSION

Our mission is to provide high quality application oriented scientific education and research to younger generation through a blend of science, engineering and technology.

FACULTY MEMBERS

RESEARCH AREA

PROFESSOR & HEAD

Dr. (Mrs.) S. Loonker

Polymers, Environmental and applied Chemistry

Ph.D.

PROFESSORS

Dr. (Mrs.) V. Choudhary

Co-ordination Chemistry ,

Ph.D.

Environmental Chemistry

Dr. (Mrs.) S. Gaur

Co-ordination Chemistry ,

Ph.D.

Dr. V. Gupta

Environmental Chemistry, Applied Chemistry;

Ph.D.

Effluent Treatment Studies

Dr. (Mrs.) P. Mishra

Organic Reaction Mechanism

Ph.D.

Dr. K.R. Genwa

Solar energy conversion technologies

Ph.D.

Dr. R.C. Meena

Photochemistry (Solar energy

Ph.D.

Conversion technologies)

Dr. Rajendra Mathur

Polymer Science, Nano Science & Natural Materials

Ph.D.

Dr. P. Koli

Organic Chemistry and Solar Conversion and Storage

Ph.D.

ASSOCIATE PROFESSOR

Dr. S.L. Meena

Photo Electrochemistry, Corrosion & its prevention

Ph.D.

ASSISTANT PROFESSORS

Dr. Jaishree Rathore

Organic Chemistry

Ph.D.

Dr. Meenakshi Jonwal

Inorganic Chemistry and Solar Conversion and Storage

Ph.D.

Dr. Anita Meena

Physical Chemistry

Ph.D.

Dr. Priyanka Purohit

Chemical Kinetics

Ph.D.

Dr. Rajni Bais

Green/Nano Chemistry

Ph.D.

Dr. Sangeeta Parihar

Environmental Chemistry

Ph.D.

Dr. Om Prakash

Chemical Kinetics

Ph.D.

Dr. R.L. Saini

Organic Chemistry

Ph.D.

Dr. Anurag Choudhary

Chemical Kinetics

Ph.D.

Dr. Seema Parveen

Organic and Phytochemistry

Ph.D.

Dr. Amita Dhariwal

Analytical Chemistry

Ph.D.

SYLLABUS OF B.Sc. II year (Chemistry) III semester CBCS as per NEP-2020

Syllabus for III SEMESTER DCC

CHE6001T: Advanced Chemistry-I

UNIT-I: Basics of Electrochemistry

Conductance, Specific conductance, Molar and equivalent conductance and their variations with dilution for weak and strong electrolytes. Kohlrausch Law of independent migration of ions. Activity, activity coefficient and ionic strength. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only).

UNIT-II: Chemical Kinetics

Rate, order, molecularity and stoichiometry of a reaction, Derivation of Integrated rate law and characteristics of zero, first and second order reactions, Pseudo-first order reaction, Determination of the order of reaction-differential method, method of integration (hit and trial method), half-life method and isolation method.

Theories of Reaction Rate: Simple collision theory and its limitations, transition state theory (equilibrium hypothesis) and derivation of the rate constant, Thermodynamical formulation of rate constant, Comparison of collision theory and transition state theory, Numericals.

UNIT-III: Hydroxyl and Carbonyl Compounds:

Classification and nomenclature. Monohydric alcohols – nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols.

Dihydric alcohols – nomenclature, methods of formation, chemical reactions of vicinal glycols,

Trihydric alcohols – nomenclature and methods of formation, chemical reactions of glycerol.

Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohol and phenol, resonance stabilization of phenoxide ion. Reactions of phenols: Electrophilic aromatic substitution, acylation and carboxylation. Mechanism of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, LedererManasse reaction and Reimer Tiemann reaction.

Nomenclature and structure of the carbonyl group. Physical properties and Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids.

UNIT-IV: Chemistry of Transition Elements

General Characteristics and Periodicity in properties with emphasis on their electronic configuration and multiple oxidation states of 3d, 4d and 5d series elements.

Colored ion formation, magnetic, catalytic properties and complex formation tendency in 3d series elements. Frost diagram for manganese.

UNIT-V: f-Block elements

Chemistry of Lanthanides: Electronic structure, oxidation state, ionic radii, colors, spectral and magnetic properties. Lanthanide contraction and its consequences.

Chemistry of actinides: General characteristics, comparative treatment of actinides and lanthanides with respect to ionic radii, oxidation states, magnetic behavior and spectral properties.

Books Suggested

1. Inorganic Chemistry by B.R. Puri and L.R. Sharma
2. Inorganic Chemistry by Sangeeta Loonker (Ramesh Book Depot.)
3. A Text Book of Organic Chemistry by M.K. Jain
4. Organic Chemistry, R.T. Morrison and R.N.Boyd, Prentice-Hall
5. Advanced Organic Chemistry by Singh, Mukherji & Kapoor Vol I & II
6. Physical Chemistry by P.W. Atkins
7. Physical Chemistry by Bahl & Tuli (S. Chand & Co.)
8. Chemistry-Semester-III by R.L. Madan (S. Chand & Co.)

Practical Chemistry-III-CHE6001P:

Excercise1:

- (i) Determination of M.P. & B.P. of organic compounds. [The following compounds may be used for the calibration purpose 80° - 82° (Naphthalene), 113.5° - 114° (Acetanilide), 132.5° - 133° (Urea) and 122° (Benzoic acid).]
- (ii) Qualitative Analysis: - Identification of organic compounds (one liquid and one solid) through the functional group analysis (containing only one functional group).

Excercise2.

Complexometric Titration:

To determine the total hardness of given water sample.

SKILL ENHANCEMENT COURSE

SEC-1

Water Analysis

Unit-I:

Introduction, water sources (ground water, surface water, municipal water supplies)

Characteristics of water, water standards.

Simple water analysis techniques for

a] Physical parameter

B] Chemical parameter

Color, odour, turbidity, hardness ($\text{Ca}^{+2}/\text{Mg}^{+2}$) TDS, pH, alkalinity, conductivity, dissolve oxygen(DO), chloride, sulphate, nitrate, fluoride.

Unit-II

Biological oxygen demand(BOD) and chemical oxygen demand(COD) some important water analysis equipment/instruments. Interpretation of water quality parameter.

Unit-III:

Estimation of the hardness of the given sample of water by standard EDTA

method.Determination of carbonate, bicarbonate and hydroxide alkalinity of water sample.

Determination of concentration of chlorides in the given sample of water.Determination of the amount of dissolve oxygen (DO) in the given sample of water by Winkler's method.

Books Recommended:

1. Industrial Chemistry (Including Chemical Engineering) : B.K. Sharma: Goyal Publishing House
2. Engineering Chemistry by Jain & Jain, Goyal Publishing House
3. Water Pollution by B.K. Sharma.