SYLLABUS

CHEMISTRY

As per NEP-2020

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

JAI NARAIN VYAS UNIVERSITY

JODHPUR

Syllabus for VI Semester DSE-4

CHE7104T: INDUSTRIAL INORGANIC MATERIALS:

UNIT-I: Cement and Lime: Composition and types of Cement, Manufacture of Portland cement.Lime: Industrial preparation, Properties and Uses.

UNIT-II: Glass: Types and properties of glasses, coloring agents, Industrial manufacturing of glass. Nitrogen fixation- Natural and Artificial fixation.Role of nitrogenase in biological nitrogen fixation.

UNIT-III: Concepts of Metallurgy: Basic principles and main steps of Metallurgy, Magnetic separation, Leaching , Bessemerisation, Reverberatory furnace , Blast furnace, Alumino- thermic process, Refining of metal .types of metallurgical processes.

UNIT-IV:. Metallurgy of Typical Metals: Metallurgy of Copper and platinum from their main ores. extraction of Zinc from zinc blende, extraction of uranium from pitch blende .Uses of Uranium

UNIT-V: Bioinorganic Chemistry: Essential and trace elements in biological processes, Biological role of alkali (Na, K, Li) and alkaline earth (Mg, Ca) metals. Role of iron in biological process. Biological Nitrogen fixation

Books Suggested:

1. Inorganic Chemistry by B.R. Puri and L.R. Sharma
2. Concise Inorganic Chemistry by J.D. Lee
3. Engineering Chemistry by Jain & Jain (Dhanpat Rai Pub. Co.)

Syllabus for VI Semester DSE-5

CHE7105T: Organic Spectroscopy and Industrial Organic Material:

UNIT-I: Electromagnetic Spectrum : Absorption Spectra

Ultraviolet (UV) absorption spectroscopy – absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.UV applications including identification of groups.

UNIT-II: INFRA RED SPECTROSCOPY:

Infrared radiation and types of molecular vibrations, Hooke's law, functional group and finger print region. IR spectra of common organic functional groups.

UNIT-III: Spectroscopy

Nuclear magnetic resonance (NMR) spectroscopy.

Proton magnetic resonance (^{1}H PMR) spectroscopy , nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, areas of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.

UNIT-IV: Fats, Oils, Detergents

Introduction to oil, andfats. Mineral oils, essential oils. Extraction, physical and chemical properties of oil and fats. Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Analysis of oil & fats-Saponification value, iodine value, acid value, R/M value. Classification of oils. Difference between animal & vegetable oils. Waxes, paraffin wax.Candles.

Lipids- Introduction to lipids, general physical and chemical properties, classification: simple lipids, compound lipids, lipoproteins, derived lipids, classification based on fatty acids, classification based on requirements by the human body, biological significance of lipids.

Soaps & soapless detergents. Soaps- manufacture of soap, toilet soap & laundry soap, special varieties of soaps, cleansing action of soap. Synthetic detergents, alkyl and aryl sulphonates, micelles, various types of micelles.

UNIT-V: INDUSTRIAL POLYMERS:

Natural rubbers, synthetic rubbers, Buna rubbers. Silicone rubber- introduction, history, curing, properties, production, structure, special grades and forms of silicone rubber, 3D printing, applications, Versatile Silicone Rubbers. Comparison of silicon rubbers with organic rubber. Silicone rubber vs thermoplastics vs thermoplastic elastomers.

Books Suggested:

1. Organic Spectroscopy by Y.R. Sharma (S.Chand)
2. Organic Spectroscopy by Jagdamba Singh (Pragati Prakashan)
3. Organic Chemistry by Bahl & Bahl
4. Polymer Chemistry by P. Bahadur & N.V. Shastri

Syllabus for VI Semester DSE-6

CHE7106T: Electrochemistry:

UNIT-I:Applications of conductivity: measurements: determination of degree of dissociation, determination of K_a of acids, determination of solubility product of a sparingly soluble salt, Conductometric titrations and their types.

UNIT II: Electrode Potential

Transport number, definition and determination by Hittorf method and moving boundary method.Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode, reference electrodes, standard electrode potential, sign conventions.

UNIT III: Electrolytic and Electro Chemical Cells:

Reversible and irreversible cells, conventional representation of electrochemical cells. EMF of a cell and its measurements. Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K). Determination of pH using hydrogen, quinhydrone and glass electrodes.

UNIT IV: Concentration Cells:

Concentration cell with and without transport (mathematical treatment), liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient.Potentiometric titrations and their types.

UNIT V: Electrochemical Corrosion:

Fundamental and mechanism of corrosion, corrosion current, corrosion potential, Measurement of Corrosion rate, Types of Corrosion and prevention methods. Thermodynamics and stability of materials. Tafel equation.

Books Suggested:

1. The Elements of Physical Chemistry, P.W. Atkins, Oxford.
2. Physical Chemistry Through problems, S.K. Dogra and S. Dogra, Wiley Eastern Ltd.
3. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and M.S. Pathania, Shobhan Lal Naginchand & Co.
4. Physical Chemistry By K.R. Genwa RBD
5. Physical Chemistry, Bahal & Tuli, S. Chand & Co. Ltd.
6. Physical Chemistry, R.C. Saraswat and A.K. Goswami, RamPrasad & Sons.

CHE7104P/CHE7105P/CHE7106P: **Practical Chemistry-VI**

Excersice1:

Thin Layer Chromatography

(i) Separation of dyes

(ii) Separation of green leaf (Spinach) pigments.

Excersice2:

(a) Colloids: To determine precipitation value for the following sols and also verify Hardy's Schultz law (i)As_2S_3 Sol (ii)Fe $(OH)_3$ Sol .

(b) Distribution law: To determine the partition coefficient of benzoic acid between water and benzene at R.T.

(c) Adsorption: To study the adsorption of acetic acid by activated charcoal and verify the Freundlich adsorption isotherm.

SKILL ENHANCEMENT COURSE

SEC-4

Conservation and Management of cultural Heritage

Course Objectives: The primary objective is to build awareness and competence in the country on the recent developments in Heritage and historical aspects of conservation and Protecting and save our culture and civilization.

Heritage and their types, Heritage and historical aspects of corrosion in India. Ethics of conservation, restoration and preservation and its history. Importance of knowledge of archaeology, chemistry, geology, Anthropology, art and architecture for conservation of heritage monuments. Guiding principles for conservation / preservation of monuments as per international conventions. Distribution of monuments in different geographical / seismic zones and their conservation problem. Stone, Building materials and their classifications, degradation equation. Causes of Decay of Heritage structure and Antiquities. Economic value of cultural heritage, methods and technique in conservation treatment, An overview on analytical methods and approach to the conservation process, Procedures for scientific analysis research of cultural heritage. ionic and non-ionic solutions ,Micro-climate, preparation techniques for lime mortar. Establishment of laboratory (Necessary instruments tools, equipments and chemicals) and field study tour/visit.

Books:

1. History of Indian Archaeology: The Beginning to 1947 by Dilip K . Chakrabarti **,**Munshiram Manoharlal Publishers (1 May 1995)
2. An Introduction to Archaeological Chemistry by By T. Douglas Price, James H. Burton ,Springer Science
3. Electrochemical Methods in Archaeometry, Conservation and Restoration **by Antonio Doménech-Carbó,** María Teresa, Virginia **Costa**, Spirnger.
4. Chemical Methods of Rock Analysis (Third Edition) ***by D. Hutchison and P.G. Jeffrey*** Pergamon press New York.
5. Petrology Igneous, Sedimentary, and Metamorphic by Ernest G. Ehlers, Harvey Blatt, W. H. Freeman& Company, USA.
6. Protection, Conservation and Preservation of Indian Monuments ***by*** S.L. Nagar, Aryan Books International, Ansari Road Delhi (November 30, 1993)
7. Conservation of Cultural Property in India by O.P. Agrawal, Publisher: Agam Kala Prakashan.
8. The Conservation of Antiquities and Works of Art: Treatment, Repair and Restoration by H. J. Plenderleith, A. E. A. Werner, Oxford University Press; 2nd edition (March 9, 1972).
9. Conservation science: Heritage Materials by Eric May and Mark Jones, RSC Publication Cambridge U.K.