

Navjivan Science College, Dahod

2015-2016

M.Sc (Chemistry)

Level	Course code	Title	Course Objective	Outcome End of this paper the students will be able to understand the
Sem I	CHE 401	Inorganic	<ul style="list-style-type: none">• Quantum theory.• Atomic Structure.• Symmetry and Group Theory.• Magnetochemistry.• Bio-inorganic Chemistry	<ul style="list-style-type: none">• Schrodinger wave equation and applications.• Representation of group some properties of matrices and vectors, representation of groups• Pascal constant and its utility, Curie law and Curie-Weiss law, antiferromagnetism and ferromagnetism.• Metalloporphyrins (enzyme) definition, hemoglobin and cytochrome.• Vitamin B₁₂• Chelation therapy.

	CHE 402	Organic	<ul style="list-style-type: none"> • Elimination Reaction. • Nucleophilic Substitution Reaction. • Aromaticity. • Acid base concept. • Reactive intermediates. • Rearrangements(Carbon to Carbon migration of R, H and Ar and Carbon to Nitrogen migrations). • Stereo Chemistry. 	<ul style="list-style-type: none"> • The E₁, E₂, E₁CB mechanism. • Reactivity effects of substrate, structures, attacking. • Mixed SN¹ ,SN² and SET mechanism • Resonance and chemical stabilization – aromatic character based on NMR criteria Huckel's rule, energy level of (p_z) molecular orbital (HMO) method and Hammett equation. • Carbocation stability, Carbanions, Carbenes-stability and Nitrene. • Pinacol- pinacolone, Favorskii, Wagner-meerwein, Curtius, Lossen and Schmidt rearrangement. • Chirality and chiral centre, axis and plane helicity.
	CHE 403	Physical	<ul style="list-style-type: none"> • Chemical thermodynamics. • Chemical Kinetics, • Solid state chemistry • Surface chemistry. 	<ul style="list-style-type: none"> • Nernst heat theorem and its applications to gaseous system, Gibbs-Duhem equation, Raoult's law, fugacity of gases and liquids and methods of its determination. • Unimolecular reactions, explosion limits, Theory of absolute reaction

				<p>rates and isotope effect.</p> <ul style="list-style-type: none"> • Bond theory metals, defects in crystals, Frenkel defects using statistical method. • BET and HJ equations, Gibb's equation, micellisation and detergency.
	CHE 404	Analytical	<ul style="list-style-type: none"> • Analytical Objectives. • Data Handling and Good Laboratory Practice (GLP). • Sampling and Calibration Methods. • Fundamentals of Spectrophotometry, Applications of Spectrophotometry. 	<ul style="list-style-type: none"> • GLP-standard operating procedures, Non-aqueous titrations: principles, theory, role of solvents and their classification. • Calibration of glass wares. Calibration curves, Chemical concentrations. • Beer's law in chemical analysis, photometric accuracy-ringbom plot. • Stoichiometry-method of continuous variation the Jobs plot.
	CHE 405 PR	Practical (Inorganic + Organic)	<ul style="list-style-type: none"> • Semi-microqualitative analysis. • One Step Preparation of organic compounds 	<ul style="list-style-type: none"> • Each having six radicals including less familiar elements (Mo, W, Li, Th, V, Zr, Ce, Be, Ti). • Nitration, Bromination, Acylation, Reduction, oxidation, Condensation, Diazotization, Friedl-Craft's, Cannizzaro and Aldol condensation.

	CHE 406 PR	Practical (Physical + Analytical)	<ul style="list-style-type: none"> • Conductometry Potentiometry, pH metry, Adsorption and kinetics and Distribution method • Analytical chemistry 	<ul style="list-style-type: none"> • Conductometry (Titration of mixture of strong acid and weak acid with strong base, Solubility product of sparingly soluble salts- PbSO₄ & BaSO₄). • Potentiometry (Solubility product of silver halides) • pH metry (Titration of mixture of strong acid and weak acid with strong base & find the strength of the acids) • Adsorption and kinetics and Distribution method(Hydrolysis of esters & distribution of acetic acid between H₂O and butanol) • Calibration of glass wares and balance, pH meter, conductometer and potentiometer, Preparation of stock solution and standardization • Determination of available chlorine in bleaching powder, vitamin C in orange juice/amlu, acetic acid in vinegar, sodium carbonate and sodium bicarbonate in washing soda, ascorbic acid in
--	---------------	---	--	---

				<p>vitamin C tablets.</p> <ul style="list-style-type: none"> • Calcium and magnesium in water sample & total dissolved solids. • Sulphate and chloride in water samples.
Sem II	CHE 407	Inorganic	<ul style="list-style-type: none"> • Chemical Bonding • Application of symmetry • Organometallic Compounds • Reaction Mechanism 	<ul style="list-style-type: none"> • The method of linear combination, huckel theory & pariser-parr-pople approximation. • Interpretation of IR and raman spectral data. • Role of organometallic compounds in catalytic reaction. • Steric effect, Oxidation-reduction reaction, electron tunneling effect, Marcus-Hush theory.
	CHE 408	Organic	<ul style="list-style-type: none"> • Spectroscopy • Photochemistry • Chemistry of Heterocycles • Name reactions • Reagents in organic synthesis 	<ul style="list-style-type: none"> • ¹³CNMR, Mass spectroscopy, examples of mass spectral fragmentation of organic compounds, NMR, IR, UV with respect to their structure determination. • Norrish type I & II reactions, Paterno-Buchi reaction, Diels-Alder methane rearrangement, dienone photochemistry. • Nomenclature of

				<p>heterocycles, (Hantzsch widman system), Five-Six membered and benzofused six membered heterocycles.</p> <ul style="list-style-type: none"> • Vilameier- Hack, Mitsunobu, Suzuki, Balz-schiemann, Sonogarshira coupling, Stobbe condensation , Jones oxidation, Swern oxidation, Perkin, Darzen , Mannich, Finkelatein, Ullmann, Wattung, Knoevanagel. • Gilman’s reagent, (LDA), (DCC), (Umpoling reagent), Dess –martin periodinane, Bakers – isobutyronitrile, Oxaziridide, DDQ, Ter-butyl hydro peroxide, Di-methay dioxirane & Phase transfer catalysis.
	CHE 409	Physical	<ul style="list-style-type: none"> • Statistical thermodynamics • Nuclear chemistry • Polymer chemistry • Electrochemistry 	<ul style="list-style-type: none"> • Boltzmann’s most probable distribution. • Nuclear models-sheli model & Fermi gas model, use of radioisotopes as tracers. • Molecular weight of polymer (number average and weight average).

				<ul style="list-style-type: none"> Equation of polarographic wave Elkovic equation.
	CHE 410	Analytical	<ul style="list-style-type: none"> Sample Preparation Techniques Chromatographic Methods pH metry and Conductometry Potentiometry and Ion-selective electrodes 	<ul style="list-style-type: none"> Craig's counter-current distribution, Protein precipitation and solid phase extraction(SPE) & hibride SPE and solid phase micro extraction (SPME). Van deemter equatin & HPTLC and ion exchange chromatography. Error in pH measurement & Precipitation and complex formation titration . Principal properties and design of ion-selective electrodes & Application of potentiometric titration.
	CHE 411 PR	Practical (Inorganic + Organic)	<ul style="list-style-type: none"> Preparation. Mixture analysis. 	<ul style="list-style-type: none"> Preparation and determination of purity of double and complex salts. At least ten preparations should be done and Colourimetric estimation of Ni, Fe. Mixture analysis: ternary mixture to be given(S+S+S) or (L+L+L). Type determination. Separation by physical

				and chemical methods.
	CHE 412 PR	Practical (Physical + Analytical)	<ul style="list-style-type: none"> • Conductometry • Potentiometry, • pH metry, • Adsorption and kinetics and Distribution method. • Analytical: Determination of various products. 	<ul style="list-style-type: none"> • Test of validity of Ostwald's dilution law & determination of dissociation constant of weak electrolyte like CH_3COOH & ClCH_2COOH. • Verification of Debye-Huckel-Onsager's equation in case of strong electrolytes like HCl, NaCl. • Titration of dibasic acid, Precipitation titration & Redox titration. • Adsorption of acetic acid on activated charcoal. • Determination of the formula of the complex. • Determination of saponification, Iodine and Acid value of oil. • Determination of chemical oxygen demand and iron in iron tablets. • Simultaneous estimation of chromium (III), iron (III), calcium (II), zinc (II) , lead (II) and magnesium (II) by EDTA titration. • Determination of Ca in

				Ginger Sample.
Sem III	CHE 501	Natural products and Biomolecules	<ul style="list-style-type: none"> • Natural pigment • Alkaloids and vitamins • Steroids and hormones • Terpenoids and carotenoids 	<ul style="list-style-type: none"> • Synthesis, biosynthesis studies of anthocyanins, flavones, flavanol, Hemoglobin & chlorophyll. • Chemistry of quinine, emetine, strychnine and colchicines. Synthesis and biochemical function of vitamin B₁, D₂, C, Biotin and Pantothenic acid. • Biosynthesis studies of steroids, cholesterol, ergosterol, stegmasterol, chemistry of bile acids. • Synthesis of abietic acid, carvone, cadinene, Farnesol and Zingiberine, tri-terpenoids and tetra terpenoids.
	CHE 502	Medicinal Chemistry	<ul style="list-style-type: none"> • Antibiotics • Psychoactive drugs • Antimalarial and Antituberculosis drugs • Cardiovascular, diuretics and hypoglycemic agents 	<ul style="list-style-type: none"> • Biosynthesis Penicillin and cephalosporin, Non lactum antibiotics, SAR among penicillinis and terramycin. • CNS depressant, Antipsychotic drugs, Synthesis of the Chloroprocaine, lidocaine, prilocaine, Ibuprofin, meclofenate sodium, novalgin,

				<p>pethidine.</p> <ul style="list-style-type: none"> • Synthesis of quinacrine, chloroquine, primaquine and daraprim mode of action of antimalarial agents SAR of antimalarial agents. Synthesis: Isoniazid, pyrazinamide, Ethambutol, DDS. • Synthesis of amyl nitrate, diltiazim, propranolol, methyl dopa, tolezamide, carbutamide, glibenclamide, Marceline, chlorothiazide, furosemic and ethacrynic acid.
	CHE 503	Organic Spectroscopy	<ul style="list-style-type: none"> • UV& IR • NMR • C13 NMR and Mass spectrometry • Application of UV,IR, PMR, CMR and mass spectroscopy. 	<ul style="list-style-type: none"> • UV: Chromophores, auxochromes, bathochromic and hypsochromic shifts, solvent effects, wood ward fieser rules for dienes, enones and aromatic compounds application, geometric isomers of U. V., instrumentation & diagram. • NMR: sample preparation , chemical shifts, coupling

				<p>instrumentation, diagram and principles, instrumentation, deuterium labeling , double resonance, nuclear overhauser effect. 2D NMR(COSY & HETCOR) applications, coupling constant J.</p> <ul style="list-style-type: none"> • C^{13} NMR: Maclefferty rearrangement, different between NMR & PMR, effects of coupling Mass spectrometry, hyphenated mass spectroscopy techniques. • Structural elucidation of drug molecules based on joint application of UV, IR, PMR, CMR and mass spectroscopy.
	CHE 504	Industrial Chemistry	<ul style="list-style-type: none"> • Basic principles • Unit processes in organic chemistry • 12 principles of green chemistry • Manufacture and uses of Argochemicals 	<ul style="list-style-type: none"> • Chemical process selection, safety, hazardous, fire toxic materials, research and development patents, good manufacturing practice and laboratory practice. • Nitration, sulphonation, halogenations & Amination • Greensolvents-aqueous

				<p>phase reactions Wurtz reaction, witting-Horner, Michael, aldol condensation, Grignard, diels-alder, O-alkylation and N-alkylation. Green catalysts of green reagents.</p> <ul style="list-style-type: none"> • Manufacture and use of Argochemicals & Unitoperations.
	CHE 505 PR	Practical (Preparation)	<ul style="list-style-type: none"> • Preparation of industrially important compounds by following name reactions 	<ul style="list-style-type: none"> • Mechanism, purification and characterization of the synthesized compounds: • Sandmeyer, Pechmann, Skraup, Rieme-Tiemann, Kolbe-smith, Claisen-smith, Hoffman, Diels-alder & Green reaction.
	CHE 506 PR	Practical (Estimation)	<ul style="list-style-type: none"> • Bromination Estimation 	<ul style="list-style-type: none"> • Drug assay, Non aqueous titration, Nitrite value & Drug dissolution.
Sem IV	CHE 507	Advanced Organic Chemistry	<ul style="list-style-type: none"> • Pericyclic reactions • Conformational analysis • Oxidation • Reduction 	<ul style="list-style-type: none"> • Generalisation of wood-ward Hoffmann rule, sigmatropic rearrangement-suprafacial and antarafacial shifts of H. Stereoselectivity in sigmatropic rearrangement, enantioselectivity in

				<p>pericyclic reaction.</p> <ul style="list-style-type: none"> • Stereochemistry of the compounds containing nitrogen, sulphur and phosphorous. • Oxidation with Cr(VI), Mn(VII), Mn(IV), OsO₄, periodic acid. • Shapiro reduction preparation and properties and application of Pd and Ti compounds as organometallic agents.
	CHE 508	Advanced Organic Synthesis	<ul style="list-style-type: none"> • Protection of groups • Disconnection approach • One group C-C disconnections • Ring synthesis 	<ul style="list-style-type: none"> • Synthetic analysis and planning, control of stereochemistry. • Disconnection approach, the importance of the order of events in organic synthesis one group C-X and two group C-X disconnections, chemoselectivity, reversal and polarity. • Use of acetylenes and aliphatic nitro compounds in organic synthesis. • Synthesis of 3, 4, 5 and 6-membered rings, aromatic heterocycles in organic synthesis.
	CHE 509	Bioorganic	<ul style="list-style-type: none"> • Water and vitamins 	<ul style="list-style-type: none"> • Vitamins A, D, E, K, C,

		Chemistry	<ul style="list-style-type: none"> • Proteins and enzymes • Carbohydrates and nucleic acid • Lipids 	<p>B, B₂, B₆, H and folic acid.</p> <ul style="list-style-type: none"> • Proteins: Purification and characterization, sequencing of peptides, sanger's method, edman degradation. • Enzymes: Reaction using chymotrypsin, hexokinase, enolase and lysozyme. • Nomenclature of nucleotides, nucleosides, structure DNA and RNA. • Nomenclature, structure and physical properties of some naturally occurring fatty acids, triacylglycerol and waxes as sources of stored energy.
	CHE 510	Selected topics in Medicinal Chemistry	<ul style="list-style-type: none"> • Drug design • Pharmacokinetic and pharmacodynamics • Dosage forms, Quality control and application of computers in chemistry • Medicine 	<ul style="list-style-type: none"> • Partition coefficient, electronic ionization constant, concept of 3-DQSAR. • Use of pharmaceuticals in drug development process. Significance of drug metabolism in medicinal chemistry. • Dosage forms, Quality control and application of computers in chemistry.

				<ul style="list-style-type: none"> Overview, Medicinal use of nanomaterials- Drug delivery. Protein and peptide delivery
	CHE 511 PR	Practical (Organic Preparation & Estimation	<ul style="list-style-type: none"> Preparation Estimation : <ol style="list-style-type: none"> Glycine (Amino acids) Aspirine. ' Isoniazid. (INH) Ibuprofen. 	<ul style="list-style-type: none"> Cinnamic acid from Benzaldehyde. Benzophenone Oxime from Benzophenone. Antraquinone from Anthracene. 4-phenyl-6-methyl-5-carbethoxy-2-pyrimidone from urea, Benzaldehyde, EAA. 2-phenyl-iodole from acetophenone and phenylhydrazine. 2-methylberuimidazole from o-phenylenediamine. 1,1-bis-2-naphthol from 2-Naphthol.
	CHE 512	Industrial Training	<ul style="list-style-type: none"> Training (Minimum 21 days training) 	<ul style="list-style-type: none"> The industrial training program improves students awareness in single particular technology. The learners can obtain hands-on experience and know the real job scenario. It cultivates the leadership ability of students and gives them the responsibility to execute and perform the given task.