



PROGRAMME : B.Sc., Chemistry

COURSE CODE : 1C

COURSE TITLE : General Chemistry

QN.NO : 4402

TIME : 3 Hours

MAX.MARKS :75

UNIT- I a : Nuclear Chemistry I: α , β , and γ radiations and their properties. The decay law – Mean life, Half life, their relationship and determination. Successive and parallel decay schemes, Fajan Soddy’s law and the radioactive series. Natural and artificial transmutation of elements; Artificial radioactivity. Methods of separation of isotopes– uses of isotopes both radioactive and non- radioactive as tracers.

I b: Nuclear Chemistry II: Elementary treatment of particle accelerators – cyclotron , synchro cyclotron and linear accelerator. Mass-Energy relation-binding energy and its relation to packing fraction. Simple treatment of nuclear forces (no discussion of the nuclear models) – Nuclear spin and the two forms of hydrogen, Fission and Fusion, Nuclear reactor (elementary treatment)

UNIT- II: Solid State : Unit cells of simple, body centered and face centered cubic lattices – crystal planes and Miller indices. Typical crystal systems. Cubic Crystal. Examples such as NaCl, KCl, CsCl, Structure of diamond and graphite. Lattice energy – Born-Haber cycle – Born Lande equation. X- ray diffraction – The Bragg equation – discussion of the Bragg method for the structure of crystals. (NaCl, KCl only) Determination of Avagadro-number through ‘X’--ray diffraction of crystals.

UNIT- III: Gaseous State: Maxwells’ law for the distribution of the molecular velocities (Mathematical expression only). Graphical representation, Effect of temperature on velocity distribution - Mean velocity, most probable velocity and root – mean square velocity and their inter relationship.

Real gases; Vander waal’s equation, significance of ‘a’ and ‘b’. Critical Phenomena- critical constants- relation between critical constants and Vander waal’s constants – Law of corresponding state. Heat capacities of gases – C_p and C_v , C_p/C_v ratio and its use.

UNIT- IV: Macro molecules: Molecular weight of polymers – number average and weight average molecular weight- Determination of Molecular weights by light scattering, sedimentation and Osmometry.

Catalysis: Acid- base catalysis, Enzyme catalysis.

Surface chemistry: Adsorption- adsorption of gases by solids – types of adsorption- Freundlich adsorption isotherm- Langmuir adsorption isotherm – Applications of adsorption.

UNIT V

Basic concepts in organic : Problem leading to empirical formula, molecular formula, types of cleavage. Reaction intermediate, Electronic effects – resonance, hyperconjugation, electromeric effect. Reagents – nucleophile, electrophile, Bond breaking process. Isomersm and streomerism – basic concepts.

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
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RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry

COURSE CODE : 1SC

**COURSE TITLE : Match industry &
Fireworks**

QN.NO : 4404

TIME : 3 Hours

MAX.MARKS :75

UNIT I a. MATCH INDUSTRY: Introduction- chemistry of matches Lucifer,, Safety, and Friction matches.

b. EXPLOSIVES: Types, Primary, Secondary, low explosives – requisites – lead azide- potassium chlorate – ammonium nitrate, pentaerythritoltetranitrate (PETN), RDX, Propellants, Rocket fuels. Methods of extinguishing fire – different agents used.

UNIT –II a PYROTECHNIC-I (INGREDIENTS OF FIREWORKS):

Ingredients – Properties and their role – Aluminium – barium nitrate – calcium carbonate – Sulphur – Charcoal – clay – Dextrin – Potassium chlorate – phosphorous – iron fillings - Potassium nitrate – magnesium – strontium nitrate - strontium carbonate - barium carbonate – copper powder – Paris green.

b. PYROTECHNIC-II (MANUFACTURING OF FIREWORKS):

Analytical Test – Physical appearance – test for nitrate, chlorate, aluminium, barium, copper, iron, magnesium, potassium, strontium, phosphorous, titanium. Method of manufacturing – General method of manufacturing of gum powder –quick matches – rockets – Chinese crackers –marnoons – flower pot – chakkarams – sparkles.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 1B/4MPZ

AC (upto 2016)

COURSE TITLE : Chemistry I / II

QN.NO : 4406

TIME : 3 Hours

MAX.MARKS :75

UNIT I : BASIC ORGANIC CHEMISTRY

Classification of Organic compounds, empirical formula, molecular formula and structural formula-definitions only. Tetrahedral arrangement of the valencies of the carbon atom. Classifications of reactions-addition, substitution, elimination and polymerization. Isomerism - definition & examples of structural isomerism. Stereo isomerism: Optical isomerism of lactic acid and tartaric acid. Heterocyclic compounds-preparation, properties and uses of furan, Thiophene, pyrrole and pyridine.

UNIT II : BIOENERGETICS

First, Second and Third Law of Thermodynamics (Statement only), enthalpy, entropy and Gibbs free energy (only definition), sign of these functions for various processes, energy cascade in biological systems.

UNIT III: ANALYTICAL CHEMISTRY

Separation techniques- extraction-distillation-crystallization. Chromatographic separations- Principles and application of column, paper, thin layer, gas-liquid, ion exchange and HPLC.

UNIT IV: CARBOHYDRATES

Classification, preparation and reactions of glucose and fructose. Interconversion. Discussion of open and ring structure of glucose, mutarotation. . Properties of starch, Cellulose and derivatives of cellulose- Diabetes-Causes and control measures.

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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Chemistry - II
TIME : 3 Hours

COURSE CODE : 2C (Upto 16)
QN.NO : 4408
MAX.MARKS :75

UNIT- I

(a) Aliphatic Saturated Hydrocarbons

Elementary ideas of Conformational analysis-(ethane, 1,2- dichloro ethane and n-butane only)

Petroleum Products – cracking, octane No and flash point.

(b) Aliphatic Unsaturated Hydrocarbons

Electromeric effect. Markownikoff's rule and peroxide effects. Mechanism of addition to $>C=C<$.

Alkadienes: Isolated, cumulated and conjugated double bond systems. Thiele's theory of partial valency. Preparation, properties and reactions of acetylene. Delocalization of pi electrons.

UNIT- II

(a): Aliphatic Halogen compounds:

Preparation, properties and reactions of C_2H_5I , $CHCl_3$, CHI_3 , CCl_4 , allyl chloride, westron & freon.

Mechanism of elimination reactions. (E_1 and E_2 mechanism)- Mechanism of substitution reactions (S_N^1 and S_N^2) of alkyl halides -elementary treatment.

(b) Organometallic compounds: Preparation and synthetic reactions of Grignard reagent.

UNIT- III

(a) : Aliphatic Alcohols:

Chemistry of Allyl alcohol: glycol, glycerol and nitroglycerin. Estimation of hydroxyl groups.

(b) Oxygen and Sulphur Compounds:

Preparation, properties and reactions of diethyl ether. Thio alcohols and thioethers. Estimation of acetoxy groups. Sulphonol and mustard gas.

(c) Aliphatic Aldehydes and Ketones:

General methods of Preparation, properties and reactions of aldehydes and ketones. formaldehyde,

acetaldehyde & acetone, condensation products of acetone. Chemistry of acrolein and crotonaldehyde.

Mechanism of important carbonyl addition & condensation reactions of aldehydes and ketones.

UNIT- IV

(a) : Quantum Theory I:

The spectrum of hydrogen Bohr Sommer feld theory – Experimental support for the theory, criticism of the theory, black body radiation and Planck's theory –Particle aspect of radiation, electron and other particles- Photoelectric effect, Compton effect- de Broglie concept and wave nature of matter- Heisenberg's uncertainty principle. The Schrödinger equation (one particle- non-relativistic expression only).

(b)Quantum Theory II:

The significance of the wave function ψ – interpretation of ψ^2 . the quantum numbers n, l, m and s and their significance. The atomic orbitals –representation of angular and radial parts of the wave functions- nodal planes and nodal spheres –'g' and 'u' character. Zeeman effect. The spin of the electron – Pauli principle. Hund's rule. Aufbau principle. The electronic configuration of atoms and the building up of periodic table.

UNIT- V

(a) **Hybridisation** : Theory of sp, sp², sp³, dsp², d²sp³ types of hybridization.

(b)Chemical Bonding:

Types of bonds- Ionic, covalent and coordinate - Elementary treatment of valence bond and molecular orbital approaches as applied to H₂⁺ and H₂; M.O diagrams for simple homonuclear and heteronuclear diatomic molecules. Localised and non-localised molecular orbitals – the concept of resonance. Hydrogen bond.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 1B/4MPZ
AC(Upto 16)

COURSE TITLE : Oil, Food and Soaps

QN.NO : 4412

TIME : 3 Hours

MAX.MARKS :75

UNIT –I a OILS AND FATS

Role of oils and fats in cooking –Changes in fats and oils while cooking – Factors affecting absorption of fat during cooking – Composition of oils and fats – Sources of oils and fats – Functions of oils and fats – properties of oils and fats – Effect of prolonged heating on the nutritive value of oils and fats – Changes undergone by oils and fats during storage – Hydrogenation of oils.

b. SOAPS AND DETERGENTS:

Detergents – Raw materials – Surfactant – Classification – SUDS regulators - builders – additives –manufacture – bio degradability, Straight chain alkyl benzene. **Soaps** – Fatty acids and fatty alcohols – manufacturing of soaps and detergents – typical soaps – Tall oils and soaps

UNIT –II a. Flavour and Aroma of Food:

Sensation of flavour – taste, odour, feeling – measurement of flavour – Spices – flavour intensifier (Chinese salt) – flavouring extract – role in cookery – other flavouring agents.

b. FOOD PRESERVATION AND FOOD ADDITIVES:

Food spoilage, preservation methods – Use of Chemical preservatives – low temperature methods - high temperature methods. **Food additives:** Natural and artificial colouring agents – role in cookery – Sweetening agents - artificial sweetness – legal safe guards – Adulteration in food.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 2B/6MPZ AC
(Upto 16)

COURSE TITLE : Anc.Chemistry-II / IV

QN.NO : 4414

TIME : 3 Hours

MAX.MARKS :75

UNIT I: NUCLEAR CHEMISTRY

Fundamental particles of Nuclear isotopes, Isobars, Isotones and Isomers- Difference between chemical reactions and nuclear reactions: Fusion and fission – group displacement law- Mass defect- Binding energy. Rock dating and carbon dating.

UNIT II : PHOTOCHEMISTRY

Introduction to photochemistry- statement of Grothuss-Draper Law, Stark-Einstein’s Law, Quantum yield, Photosynthesis, Photosensitization, Phosphorescence, Fluorescence, Chemiluminescence-Definition with examples. Flash-photolysis.

UNIT III : INDUSTRIAL CHEMISTRY

Fertilizers: Definition-role of elements in plant growth-classification (natural or chemical fertilizer) Nitrogenous, phosphoric and Potash (NPK) fertilizers. Manufacture of following fertilizers: Calcium cyanamide, urea, super phosphate of lime, Triple superphosphate and potassium nitrate. Hardness of water: Degree of hardness, Temporary and Permanent hardness, disadvantages of hard water- softening of hard water-Zeolite process, demineralization process and reverse osmosis.

Insecticides: Fungicides and Pesticides-definition and classification according to the methods of applications and action, preparation and use of DDT and BHC, Bordeauxmixture and dithiocarbamate.

UNIT IV: ALKALOIDS, TERPENOIDS AND DYES

Alkaloids: Definition, extraction of alkaloids and general properties and biological actions of Coniine and Piperine.

Terpenoids: Introduction, Classification and occurrence- isolation and properties of Citral, Geraniol and Menthol.

(Structural discussion and synthesis are not expected)

Dyes: Definition and classification- preparation of Methyl Orange, Bismark brown, crystal violet and Malachite green.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 3C

COURSE TITLE : Organic and Inorganic QN.NO : 4418

Chemistry

TIME : 3 Hours

MAX.MARKS :75

ORGANIC CHEMISTRY

UNIT I (a) Aliphatic monocarboxylic acids: General methods of Preparation, properties and reactions of mono carboxylic acids. Formic acid, crotonic acid, and oleic acids. Effect of alkyl and halogen substituents on acidity. Inductive effect.

(b) Acid derivatives: Acid chlorides, anhydrides, amides and esters.

UNIT II a) Aliphatic dicarboxylic acids: General methods of Preparation, properties and reactions of dicarboxylic acids. – oxalic, malonic, and succinic acids.

(b) Active methylene Compounds: Synthetic reactions of diethyl malonate and ethyl acetoacetate. Pyruvic and Laevulinic acids. Prototropy and Anionotropy.

INORGANIC CHEMISTRY

UNIT I: (a) Hydrogen: Ortho and para hydrogen – Ionic or salt like hydrides. Covalent hydrides, metallic or interstitial hydrides.

(b) Group Zero: Noble Gases-Electronic structure – Isolation and general properties – compounds of noble gases.

(c) Group I: Elements:– Alkali metals – electronic structure – general properties - Chemical properties – Solubility and hydration – Stability of carbonates and bicarbonates: Halides – extraction of Li, Na and K. Study of the following compounds: i) Sodium nitrite ii) Sodamide.

UNIT II Group II: (a) Alkaline earth metals – Be, Mg, Ca, Sr, Ba, Ra – Electronic structure – General properties of the elements and their compounds – Anomalous behavior of Be - Chemical properties - extraction of Mg, Ca, Sr, Ba and Ra. Study of the following compounds: 1)Plaster of paris 2)Calcium Cyanamide.3) Calcium carbide 4) Baryta.

(b) Group III Elements: General properties – electro positive character- Hydrides- Oxides- halides- extraction of Boron and Aluminium, anhydrous $AlCl_3$, Borates.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 3B/5MPZ SC
(Upto 16)

COURSE TITLE : Clinical Chemistry

QN.NO : 4420

TIME : 3 Hours

MAX.MARKS :75

UNIT –I a -ELECTROPHORESIS:

Theory – Moving boundary electrophoresis – Zone electrophoresis – protein and hemoglobin electrophoresis – Immunoelectrophoresis.

Centrifugation–Theory – Relation between RPM and g. Differential centrifugation and other types – Different centrifuges.

UNIT –I b

Radio isotopes in biochemistry: isotopic tracer technique and isotope dilution method. Separation of molecules based on their size – Gel filtration – Dialysis – spectrometry: Definitions for wavelength and frequency – energy equation – molar extinction coefficient – Beer-Lamberts law and its application.

UNIT –II a -CLINICAL TESTING

Testing of Cholesterol in serum, Bilurubin in plasma, Sugar, Salt in serum and Urine Sugar(GTT) – Estimation of Hemoglobin.

UNIT –II b -FIRST AID:

First aids for accidents (i) cuts, abrasions, bruises (ii) bleeding (iii) fracture (iv) burst (v) fainting (vi) poisonous bites, antidotes for poison – acids, alkali disinfectants, hallucinogen, atropine, alcohol, mercury salicylate.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 3B/5MPZ AC
(UPTO 16)

COURSE TITLE : Anc.Chemistry - III

QN.NO : 4422

TIME : 3 Hours

MAX.MARKS :75

UNIT I : VITAMINS AND HORMONES

Vitamins-historical -Vitamin A,D,E and K- Water soluble vitamins- Vitamin B complex,
Vitamin C- brief mention of the source and physiological role.

Hormones: Structure, Source and importance of Androsterone, Estrosterone,
Estrone,Testosterone, Progesterone-thyroxin.

UNIT II : ELECTROCHEMISTRY

Ionic equilibrium: Ionic product of water – Definition calculation of pH and pOH-buffer
solution-Henderson’s equation-application of pH & buffer in biological processes.

Galvanic cells- EMF- Standard electrode potential- relation between EMF and ΔG -
electrochemical series- reference electrodes- hydrogen, calomel-Determination of pH.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 3CNM/4CNM
(Upto 16)

COURSE TITLE : Applications of
Chemicals in Human Life

QN.NO : 4423/4432

TIME : 3 Hours

MAX.MARKS :75

Inorganic Chemistry

I Alloys: Definition, Necessity, uses of important alloys- copper, zinc, tin, aluminum, magnesium, lead, iron, cobalt, manganese, titanium, bismuth. Role of carbon in steel and heat treatment.

II Match Industry: pyrotechnic and explosives.

III Fertilizer-definition: role of various elements in plant growth-classification i) natural and chemical ii) According to nature of the elements present-functions of the following: ammonium Sulphate, urea calcium cyanamide, super phosphate of lime, triple super phosphate, potassium Sulphate, potassium chloride, potassium nitrate.

Organic Chemistry

I Cosmetics: preparation and uses of cosmetics-face creams, toilet powders, hand lotions and creams, make up preparations, nail lockers, remover and bleaches, dentifrices, toilet soaps, shaving preparations, hair oils, tonics, pomades, shampoos, hair dyes, hazards of cosmetics.

II Food poison –Chemical poisons, toxins, naturally present in food toxic minerals, metals, organic toxicants, toxins in fish food additives, contaminations of oils and fats.

III a) Methods of extinguishing fire – different agents used

b) First aids of accidents – i) cuts, abrasions, bruises ii) bleeding iii) fracture iv) burns v) fainting vi) poisonous bites, antidotes for poison.

Physical Chemistry

I) Corrosion of metals–definition, disadvantage, prevention of corrosion, coating with other metals (galvanizing, tinning, electroplating) and painting.

II) Gaseous fuels-definition-classification-advantages and disadvantages.

III) Pollution- Air pollution, composition of air, sources of air pollution –effect of air pollution, effect of CFC, ozone layer formation. Depletion theory and control of acid rain, methods of prevent air pollution. Radioactivity pollution: sources, nuclear waste, effect of radiation and prevention.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 4C (Upto 16)

COURSE TITLE : Organic and Physical
Chemistry

QN.NO : 4424

TIME : 3 Hours

MAX.MARKS :75

UNIT I

a) CHEMICAL THERMODYNAMICS:

First law Temperature and zeroth law of. Reversibility and maximum work – The enthalpy of a system- Heat capacity- dependence of state function of variables- The Thermodynamics behaviour of ideal gases – Isothermal and adiabatic processes in ideal gases – The Joule Thomson effect- Carnot cycle - Carnot cycle for ideal gases- Thermodynamic efficiency.

b) THERMOCHEMISTRY:

Heat of reaction at constant volume and constant pressure – Calculation of ΔE from ΔH and vice versa. Thermo-neutrality of salt solutions – Heat of reaction from bond enthalpies – Variation of heat of reaction with temperature.

ORGANIC CHEMISTRY

UNIT I

(a) Study of aldol, diacetonealcohol, glyoxal, pyruvaldehyde, acetyl acetone

I b (i) STEREO ISOMERISM:

Preparation, properties and reactions of Maleic and fumaric acids and Determination of configuration. Unsymmetrically substituted ethylene derivatives and aldoximes and ketoximes. E, Z – notation

1b (ii) Optical isomerism: Optical activity: Elements of symmetry. Optical isomerism of lactic and tartaric acids. Threo and erythro nomenclature. Relative and absolute configuration. R,S-Notation; Resolution, racemisation Walden inversion. Optical isomerism of allenes, Spirans and diphenyls.

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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Fuel and Batteries
TIME : 3 Hours

COURSE CODE : 4SC
QN.NO : 4428
MAX.MARKS :75

UNIT I

(a) Fuels and Combustion

Introduction –classification-origin of coal -types of coal-factors for the choice of coal-

Grading of coal :proximate analysis;, relevance of ultimate analysis

(b) Petroleum-origin-Mendeleev theory, Eugler theory, Modern theory; Composition, refining of crude-cracking : thermal, catalytic; Reforming- Synthetic petrol-polymerisation-Fischer,Tropsch, Bergius- knocking; Diesel Engine fuels- gaseous fuels- LPG, natural gas-coal gas- oil gas , producer gas, water gas, blast furnace gas, biogas, gobar gas; Non-petroleum fuels- petrochemicals

UNIT II

(a) Batteries

Principles of battery- primary and secondary- lead storage battery- Zinc-carbon dry cell, alkaline battery- mercury battery-silver oxide battery – Nickel-cadmium battery-Lithium battery.

(b) Fuel cells: Hydrogen-oxygen fuel cell –advantages of fuel cells, Types of fuel cell- fuel cell electrodes – Electro catalysis-biological batteries.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 4B/3MPZ AC
(Upto 16)

COURSE TITLE : Ancillary Chemistry - IV

QN.NO : 4430

TIME : 3 Hours

MAX.MARKS :75

UNIT I : DRUGS

Chemotherapy: Sulpha drugs – sulphadiazine – sulphanilamide – preparation and applications.

Antimalarial : Chloroquine and plasma quine.

Arsenical drugs: Salvarasan – 606 Neosalvarasan

Antibiotics: definition – penicillin – tetracyclines - structure (only) - mode of applications.

UNIT II: ADSORPTION AND CATALYSIS

Adsorption – Adsorption of gases on solids – Physisorption, Chemisorption – Differences- factors influencing adsorption-application of adsorption – adsorption indicators.

Catalysis – Definition, Types of catalysis, acid-base catalysis, enzyme and auto catalysis.

Distribution law – Maxwell distribution law derivation.

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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Applications of
Chemicals in Human life

COURSE CODE : 4C NM (Upto 16)
QN.NO : 4432

TIME : 3 Hours

MAX.MARKS :75

Inorganic Chemistry

I Alloys: Definition, Necessity, uses of important alloys- copper, zinc, tin, aluminum, magnesium, lead, iron, cobalt, manganese, titanium, bismuth. Role of carbon in steel and heat treatment.

II Match Industry: pyrotechnic and explosives.

III Fertilizer-definition: role of various elements in plant growth-classification i) natural and chemical ii) According to nature of the elements present-functions of the following: ammonium Sulphate, urea calcium cyanamide, super phosphate of lime, triple super phosphate, potassium Sulphate, potassium chloride, potassium nitrate.

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I Cosmetics: preparation and uses of cosmetics-face creams, toilet powders, hand lotions and creams, make up preparations, nail lockers, remover and bleaches, dentifrices, toilet soaps, shaving preparations, hair oils, tonics, pomades, shampoos, hair dyes, hazards of cosmetics.

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III a) Methods of extinguishing fire – different agents used

b) First aids of accidents – i) cuts, abrasions, bruises ii) bleeding iii) fracture iv) burns v) fainting vi) poisonous bites, antidotes for poison.

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I) Corrosion of metals–definition, disadvantage, prevention of corrosion, coating with other metals (galvanizing, tinning, electroplating) and painting.

II) Gaseous fuels-definition-classification-advantages and disadvantages.

III) Pollution- Air pollution, composition of air, sources of air pollution –effect of air pollution, effect of CFC, ozone layer formation. Depletion theory and control of acid rain, methods of prevent air pollution. Radioactivity pollution: sources, nuclear waste, effect of radiation and prevention.



PROGRAMME : B.Sc., Chemistry

COURSE TITLE : ORGANIC CHEMISTRY –I

TIME : 3 Hours

COURSE CODE : 5C1 (UPTO 16)

QN.NO : 4433

MAX.MARKS :75

Unit - I :-Aliphatic Nitrogen and diazo compound:

- a. Methods of preparation, properties and reactions of aliphatic amines.
Methods of separation and distinctions of primary, secondary and tertiary amines.
- b. Chemistry of nitroalkanes and alkyl nitrites, alkyl cyanides and isocyanides. Synthetic importance of diazomethane and diazoacetate. Urea-preparation properties, reactions uses, structure and estimation.

Unit – II a) Aromatic hydrocarbons:

Isolation of aromatic hydrocarbons from coal tar- Benzene- preparation, properties reactions and structure. Aromaticity and Huckel's (4n+2)rule. Concept of resonance, resonance energy and applications.

- b) Homologues of benzene:-

Toluene, xylene and mesitylene; Hyperconjugation.

- c) Aromatic substitution:

- i) Orientation in benzene ring- empirical rules and directive influence of substituents; Mechanism of aromatic electrophilic mono substitution.
- ii) Aromatic nucleophilic substitution:
Unimolecular, bimolecular and benzyne mechanism; Free radical of homolytic substitution.

- d) Aromatic halogen compounds: Preparation, properties and reactions of chlorobenzene, chlorotoluene, benzylchloride, benzalchloride and Benzotrchloride.

- e) Sulphonic acids: Preparation, properties and reactions of benzenesulphonic acids, sulphonamide, chloroamin –T, saccharin; Sulpha drugs.

Unit – III a) Aromatic Nitro compounds:

Preparation, properties and reactions of nitrobenzene and Reduction products of nitrobenzene – meta-dinitrobenzene.T.N.T.

- b) Aromatic amino compounds: Methods of preparation, properties and reactions of aniline, toluidines, chloro and nitroanilines, methylaniline, diphenylamine, dimethyl aniline, benzylamine, phenylene diamine and sulphanilic acid.

P.T.O.

c) Diazonium compounds: Diazotisation. Benzenediazoniumchloride – preparation, properties, reactions and structure. Chemistry of phenyl hydrazine.

Unit - IV Aromatic hydroxy compounds: General methods of preparation, properties and reactions of phenol cresols, nitro and aminophenols; Dihydric and trihydric phenols; Benzylalcohol, anisole and phenetole.

Aromatic aldehydes and ketones:

General methods of preparation, properties and reactions of aromatic aldehydes-

Benzaldehyde: (benzoin condensation, claisen condensation, Perkin reaction), Cinnamaldehyde.

Phenolic aldehydes: Salicylaldehyde and vanillin.

Aromatic ketones: Acetophenone and benzophenone quinones,

Aromatic acids:

General methods of preparation, properties and reactions of aromatic acids: Benzoic acid-benzoylchloride - anhydride and benzamide; Anthranilic acid, phenylacetic acid, cinnamic acid and salicylic acid; Phthalic acid and its derivatives.

Text Book:

1. Organic Chemistry – Singh, Mukharji.
2. Organic Chemistry -K.S. Tiwari, Mehrotra, Vishnor.

Reference Book:

1. Organic Chemistry – I.L. Finar Voll.
2. Organic Chemistry – R.T. Morrison and Boyd. (6th Edition)

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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Inorganic Chemistry
TIME : 3 Hours

COURSE CODE : 5C2 (Upto 16)
QN.NO : 4434
MAX.MARKS :75

UNIT I

a) Group IV- Extraction, properties and uses of titanium and thorium. Important compounds-TiO₂, TiCl₄, ThO₂, ThCl₄, Thorium oxydichloride, Thorium nitrate and Thorium Sulphate.

b) Group V- Extraction, properties and uses of Vanadium, Multivalency of vanadium. Important compounds – VCl₂, VCl₄, V₂O₅, Ammonium vanadate and hexaaquovanadium(III).

c) Group VII-Important compounds MnO₂, KMnO₄, Mn₂O₇ and Mn(OH)₂.

UNIT II

a) Group VI- Metallurgy of W, U and Cu. Comparative account of Cu, Ag, Au. Preparation, Chemical reaction and uses of the following compounds.

Sodium nitroprusside, potassium ferrocyanide, potassium ferricyanide, FAS (Ferrous ammonium sulphate), Cobalt nitrate, hexamine cobaltic chloride, NAS (Nickel ammonium sulphate), Bis(dimethylglyoximate)nickel(II), PtCl₄, chloroplatinic acid, Types of Platinum - spongy platinum, Platinum black, Platinum asbestos, Colloidal Platinum.

UNIT III

f-Block Elements- Lanthanide series- Electronic structure anomalous valency states- Magnetic properties (simple treatment only) chemical properties- solubility, colour- Lanthanide contraction- separation of lanthanide elements.

UNIT IV

Coordination compounds- Nomenclature- Theories-Werner, Pauling and crystal field theories and their limitations- Isomerism in coordination compounds- Stereo chemistry of complexes having 4 and 6 coordination with special reference to the complexes of Copper, Cobalt Nickel and Platinum. Simple applications of chelation.

Text Book :-

1. Concise Inorganic Chemistry – J.D. Lee
2. Text Book of Inorganic Chemistry – P.L. Soni.
3. Text Book of Inorganic Chemistry – Satya Prakash.

Reference Book :-

1. Selected topics in Inorganic Chemistry – Madan, Malik and Tuli.
2. Advanced Inorganic Chemistry - F.A. Colton and G. Wilkinson

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PROGRAMME : B.Sc., Chemistry

COURSE CODE :5C3 (Upto 16)

COURSE TITLE : Physical Chemistry-I

QN.NO : 4436

TIME : 3 Hours

MAX.MARKS :75

UNIT I: CHEMICAL THERMODYNAMICS

Various statements of the II Law (brief discussion) the concept of entropy- Entropy changes in isolated systems- Dependence of entropy on variables of system- Entropy changes in ideal gases- entropy changes in physical transformations – entropy changes in chemical reactions.

THE THIRD LAW: Nernst heat theorem- development of the III Law- Unattainability of absolute zero. Evaluation of absolute entropies -Use of absolute entropies.

UNIT II: FREE-ENERGY AND EQUILIBRIUM

The Holmholtz' free energy or work function “A” – “A” for reaction- The Gibb's free energy- ‘G’ - DG for reactions – Properties and significance of DG - Calculation of free energy changes. Standard states for solid and liquids- isotherm- standard free energies of formation-criteria of equilibrium –Physical equilibria involving pure substance-Clapeyron equation and its use-variation of vapour pressure with temperature-Clausius- Clapeyron equation. The thermodynamic equilibrium constant, variation of equilibrium constant with temperature. Partial molal quantities- variation of chemical potential with temperature-significance of chemical potential – chemical potential of ideal gas. Gibb's-Duhem equation-The fugacity and activity concepts (elementary ideas only)

UNIT III: DILUTE SOLUTION AND PHASE RULE

COLLIGATIVE PROPERTIES: Raoult's law (mole concept) lowering vapour pressure of solvent- Boiling point elevation of solutions- freezing point depression of solutions – Osmosis and osmotic pressure-Solutions of electrolytes- colligative Properties of electrolytes.

PHASE RULE: Phase, component, degree of freedom(definitions)- Gibb's phase rule- Two component systems- Solid- Liquid equilibria- Simple eutectic system- (Silver-Lead) Pattinson's process, desilverization of lead. Formation of compound with congruent melting point (Hg-Cd system)- Freezing mixtures (KI – water systems) –CuSO₄.5H₂O system – Transition temperature. Theory of fractional distillation, systems with a boiling point minimum and a boiling point maximum- azeotropic mixture-Partially miscible liquids- Phenol-water, triethylamine-water, nicotine-water systems – completely immiscible liquids- steam distillation – Nernst distribution law and its applications.

P.T.O.

UNIT IV::MOLECULAR PROPERTIES AND STRUCTURE:

Dipole moments and molecular structure- dielectric constant-dielectric polarization and dielectric constant-Clausius- Mosotti equation- Debye equation-orientation polarization-determination of dielectric constant.- Methods of determination – Bond moments-Molecular structure and dipole moments. Magnetic properties of substances- Paramagnetic and diamagnetic substances- Magnetic susceptibility, its determination and its relation to molecular structure..

Text Book:-

1. Principles of Physical Chemistry – Maron and MLando.
2. Elements of Physical Chemistry – Lewis and Glasstone.
3. Physical Chemistry – Vemulappali.
4. Physical Chemistry – Alberty.
5. Physical Chemistry – Puri, Sharma and Pathania.

Reference Books

1. Principles of Physical Chemistry – Prutton and Maron.
2. Text Book of Physical Chemistry – Samuel Glasstone.
3. Basic Physical Chemistry – W.J. Moore.
4. Physical Chemistry – P.W. Atkins. Oxford University Press (6th Edition),.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 5C4 (Upto 16)

COURSE TITLE : Nano & Green Chemistry

QN.NO : 4438

TIME : 3 Hours

MAX.MARKS :75

UNIT:I

Introduction-green chemistry and eco-efficiency-environmental protection law. Need for green chemistry-principles of green chemistry-alternative approach to solvent chemistry. Solvent free techniques-microwave activations-solid-liquid phase transfer catalysis (PTC). Green chemistry reactions- condensation, oxidation and reduction reactions.

UNIT:II

Organic reactions in ionic liquid medium: Synthesis of ionic liquids and its physical characteristics-applications in organic synthesis. Supercritical fluids (CO₂)-introduction and applications. Uses of biocatalysts in green chemistry- modification of enzyme by polyethylene glycol(PEG.)

UNIT:III

Nanochemistry-introduction-need for preparation-preparation of nanomaterials-hydrothermal, solvothermal and gelsol methods-properties-colour change, mechanical strength, optical, electrical. Application of carbon nano tubes in various fields.

UNIT:IV

Nanoparticles used for the fabrication of modified electrodes-nanoparticles in semiconductors. Nanostructure of zeolites-nanomaterials in photoluminescence process-nanoparticles used as fuels and sensors.

Reference:

1. Green Chemistry by Rashmi Sanghji, M.M. Srivastava.
2. Introduction to Nanotechnology Charles P. Poole Jr and Frank J. Owners.

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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Organic Chemistry-II
TIME : 3 Hours

COURSE CODE : 6C1 (Upto 16)
QN.NO : 4440
MAX.MARKS :75

UNIT I - i) Carbohydrates A detailed study of monosaccharides- glucose and fructose. Muta rotation. Structure, configuration, conformation of glucose and fructose. Methods of ascending and descending the sugar series. Inter-conversions of aldose and ketoses.

ii) Cycloalkanes:

Nomenclature, General methods of preparation and reactions of cycloalkanes. Bayer's strain theory and its modifications. Conformational analysis of cyclohexane. Elementary treatment.

UNIT II:- i) Polynuclear hydrocarbons:

Preparation, properties and reactions of diphenyl, diphenylmethane, triphenylmethane, Naphthalene: Isolation from coal tar, reactions and structure; Naphthols, and naphthaquinone, Anthracene, anthraquinone and alizarin;

ii) Heterocyclic compounds:

Chemistry of pyrole, pyridine, quinoline.

iii) Chemistry of natural products:

General methods of determination of the structure of alkaloids and terpenes. Structure and synthesis of the following.

a) Terpenes: Citral and camphor

b) Alkaloids: Coniine and nicotine

UNIT III :- Molecular rearrangements:

Pinacol-pinacolone, Beckmann, Hofmann, Benzilic acid, Fries, Claisen, Benzidine rearrangements.

A general review of organic reactions:

a) Reaction types and reagents. Reaction intermediates. Transition state theory.

Thermodynamic and kinetic control of competing reactions.

- b) Determination of reaction mechanisms through the following techniques. cross – over experiments, isotopic labeling, kinetic and stereo chemical studies.
- c) Free radicals:
Preparation, reactions and stability. Chain reactions and their characteristics.
- d) Theory of colour and constitution :
Preparation and uses of the following dyes: Methyl orange, fluorescein & malachite green.

BOOKS RECOMMENDED:

1. Reaction mechanism in organic chemistry S.M.Mukherji and S.P,Singh.
2. Text book of organic chemistry – Bah ! and Arun Bah!
3. Text book of organic chemistry - P.L.Soni
4. Text book of organic chemistry – K.S.Tewari, S.N.Mehrotra and N.K.Vishnoi
5. Organic Chemistry (I.L.Finar – Vol.I and II)

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 6C2 (Upto 16)

COURSE TITLE : Inorganic Chemistry-II

QN.NO : 4442

TIME : 3 Hours

MAX.MARKS :75

UNIT I

Group IV- Metallic and non-metallic character- difference between carbon, silicon and the remaining elements- General properties- (inert pair effect) –hydrides-oxides - halides– Silicates, Glass, silicones - allotropy of carbon– carbides, carbonyls. Study of the following compounds: I) White lead ii) Lead nitrate iii) Lead acetate iv) Lead tetra ethyl v) Lead chromate.

UNIT II

Group V- Electronic structure and oxidation states- metallic and non-metallic character-difference between nitrogen and other elements- occurrence and extraction of As, Sb and Bi. elements –hydrides-liquid ammonia as a solvent, hydrides of group V elements; Halides, oxides, oxyacids of group V element Sodium bismuthate, tartar emetic- Inorganic fertilizers.

UNIT III

Group VI-Hydrogen peroxide and ozone, hydrides, halides, oxides, oxyacids of sulphur and their salts- oxyhalides of sulphur

Group VII-Halogens- electronic structure and oxidation states- General properties- oxidizing power- reactivity of the elements hydrogen halides- halogen oxides – oxyacids and their salts- inter halogen compounds- poly halides- basic - Properties of the halogen-Pseudo Halogens.

Text book

1. Inorganic Chemistry – R.D. Madan
2. Inorganic Chemistry - P.L. Soni.
3. Concise Inorganic Chemistry – J.D. Lee.
4. Inorganic Chemistry – Satya Prakash.

Reference books

1. Inorganic Chemistry – Purcell and Kotz.
2. Inorganic Chemistry – James E. Huheey.

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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Physical Chemistry -III
TIME : 3 Hours

COURSE CODE : 6C3 (UPTO 16)
QN.NO : 4444
MAX.MARKS :75

UNIT I: i) CHEMICAL KINETICS: Effect of temperature on reaction rate-The Arrhenius equation - Energy of activation- and its significance – theories of reaction rate, the collision theory of gaseous bimolecular reactions- the theory of absolute uni-molecular reactions (Lindenmann theory only) The theory of absolute reaction rates- entropy and enthalpy of activation.

ii) PHOTOCHEMISTRY: The absorption of radiation- Lambert’s law Beer’s law – laws of photochemistry – The Grotthaus – Drapper law- Stark Einstein’s law of photochemical equivalence deviation in the law.- Quantum efficiency – Actinometry, Photochemical equilibrium-photochemical reactions The hydrogen halogen reactions High and low quantum yield. hydrogen chlorine and hydrogen bromine reactions only.

Self study: Fluorescence – Phosphorescence. Photosensitisation Chemiluminescences- Elementary idea on flash photolysis – Application of photochemistry-photography- photoelectric effect in wireless.

UNIT II: i) ELECTRICAL CONDUCTANCE: Debye Huckel theories strong electrolytes (qualitative treatment) Transport phenomena and transference number and its determination – Hittorf and moving boundary method – simple problems. Absolute velocities of ions- simple ideas of activity and activity coefficients.

ii) IONIC EQUILIBRIA: Ionisation, constants of weak acids and weak bases - Ionic product of water- pH, pOH, pH- buffer solutions- generalized concepts of acids and bases-hydrolysis of salts of weak acids and strong bases, strong acids and weak bases and weak acids and weak bases: Buffer solutions-different types - Henderson’s equation-theory of indicators - Solubility and solubility product - common ion effect - Application of solubility product in analytical chemistry.

i) ELECTROCHEMICAL CELLS: Electromotive force and its measurements – standard cells –cell reaction and E.M.F-convention for cell representation and sign of E.M.F. – single electrode potentials- standard electrodes – primary and secondary. calculation of cell EMF from single electrode potentials- –Thermodynamics and EMF- ΔG , ΔH , ΔS and the equilibrium constant K of a reaction from EMF data- The Nernst equation, classification of electrodes – Electrochemical cells- chemical cells with and without transference- concentration cells with and without transference- Liquid junction potential- use of salt bridge- application of EMF measurements determination of solubility product and pH from EMF measurements Polarisation- Over voltage- decomposition potential (elementary ideas only)

Self study

Glass electrode- quinhydrone electrode, potentiometric titrations- - Electrochemical principles of corrosion and passivity-prevention of corrosion-electrochemical cells-the source of energy-lead acid batteries-measurement of charging and discharging-fuel cell.

UNIT III: a. Molecular spectra- Rotation-spectra-vibration-rotation spectra-Electronic spectra,Raman spectra - spectrophotometer-Applications of molecular spectra (for simple molecules and systems only)-Electronic absorption-Franck-Condon principle, pre-dissociation. Nuclear magnetic resonance- Fundamentals of proton magnetic resonance-Chemical shift- spin-spin splitting- Electron spin resonance spectroscopy, basic idea, instrumentation, hyperfine splitting.

b. Symmetry and group theory: Symmetry elements, symmetry operations, definition and examples with respect to simple molecules- identification of point groups- illustrative examples (H_2O , NH_3).

Text Book 1, Principles of Physical Chemistry – Maron and MLando, 2, Elements of Physical Chemistry – Lewis and Glasstone.

3, Physical Chemistry – Vemulappali,

4. Physical Chemistry – Alberty., 5. Physical Chemistry – Puri, Sharma and Pathania.Reference Books : 1.Principles of Physical Chemistry – Prutton and Maron, 2.

Text Book of Physical Chemistry – Samuel Glasstone., 4. Physical Chemistry – P.W. Atkins. Oxford University Press 6th Edition

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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Pharamceutical Chemistry
TIME : 3 Hours

COURSE CODE : 6C4 (Upto 16)
QN.NO : 4446
MAX.MARKS :75

UNIT 1: Fundamentals

Definitions-pharmacology and molecular pharmacology; major process involved in drug action pharmacokinetics; concept of bioisosterism- pharmacodynamics; phases-receptors and classification of membrane bound receptors-enzyme inhibitors as drugs, drug design-Factors governing drug design; method of variation-drug design through disjunction and conjunction ; tailoring of drugs.

UNIT II: Medicinally useful antibiotics and steroids

Structural features and therapeutic uses –Cephalosporin and their semi synthetic analogs (beta lactum), tetracyclines.

Physiologically active steroids-their structural features and therapeutic use. Oral contraceptives, anabolic steroids, anti-inflammatory steroids.

Chemotherapeutic agents:

Antineoplastic agents: Classification, study of cyclophosphamide, Chlorambucil, methotrexate, 6-mercaptopurine, 5-fluorouracil.

CNS stimulant drugs: Amphetamine, caffeine, nikethamide, methyl phenidate

CNS depressant drugs: phenelazine, Isocarboxazide, imipramine, nortriptyline, amitriptyline, desipramine.

UNIT III: Structure and Application of the following

Antitubercular drugs: Isoniazid, Rifampicin, Ethambutol.

Antimalarial drugs: Classification, study of chloroquin, mefloquine, pyrimethamine

Diuretics: Classification, study of furosemide, acetazolamide, chlorothiazide.

Antihypertensive drugs: Nifedipine, hydralazine and guanethidine.

Antihistamines: H1-Antagonists: Chlorpheniramine, promethazine, H2 Antagonists: cimetidine, ranitidine

Antiinflammatory drugs: Aspirin, phenylbutazone, Mefenamic acid, diclofenac sodium.

Reference:

1. **C.Lakshmi**, Medicinal chemistry
 2. **B.Jeyasree ghosh**, Pharmaceutical chemistry
 3. **Ashutosh Kar**, Medicinal Chemistry.
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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Polymer Chemistry
TIME : 3 Hours

COURSE CODE : 6C5 (2008 on)
QN.NO : 4448
MAX.MARKS :75

ELECTIVE

Unit –I Classification and types of polymerization.

Additional polymerization – cationic, anionic and free radical polymerization and distinguishing features of chain polymerization and step polymerization, copolymerization, copolymerization - addition and bulk copolymers, living polymers.

Unit II

Molecular weight of polymers its determination number average molecular weight(M_n – mass – average molecular weight- monodisperse - polydisperse determination of molecular weight by osmotic pressure- viscosity(Mark – Harwink equation)- Ultra centrifuge sedimentation – sedimentation equilibrium and sedimentation velocity, light scattering methods , molecular weight distribution – gel permeation chromatography.

Unit III Polymers & stereochemistry and characterization.

Architectural – orientational (head & head , head and tail) – configurational (Iostactic, Syndiobactic and atactic) Geometric – Ziegler – Nata Catalysts for streoregular polymer.

Physical properties of solid polymers – crystalline- degree of polymerization – kinetics chain length end group analysis – plasticity – elasticity stability – glass transition temperature T_g – X ray diffraction – electron diffraction- IR spectroscopy NMR.

Reference

1. Gowrikar V.R., Viswanathn N.V and Jeyadev Sreedar, Polymer science, New age International, New Delhi (1986).
2. Misra G.S, Introdction to polymer chemistry, Wiley Easton (1993).

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PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Water Analysis and Treatment

COURSE CODE : 6SC (Upto 16)
QN.NO : 4452

TIME : 3 Hours

MAX.MARKS :75

UNIT I

a) WATER POLLUTION

The importance and source of water . Classification of water pollutants: organic, inorganic, radioactive materials, thermal pollutants. Significance and experimental determination of BOD and COD. Trace elements in water.

b) WATER ANALYSIS

Sampling of water, Preservation of water samples. Onsite analysis like colour, turbidity, dissolved oxygen.

Selected methods of water analysis:

- 1) Spectrophotometry – Colorimetry, UV-Vis
- 2) Flame – emission spectrophotometry
- 3) Atomic absorption spectrophotometry

UNIT II a) WATER TREATMENT

Hardness of water – Types and determination. Removal of suspended impurities – sedimentation - sedimentation with coagulants – filtration. Removal of micro organisms using bleaching powder, chlorine, ozone and UV light

Removal of dissolved salts; Lime soda process, Permutit process, Ion exchange process.

Desalination – Electrodialysis, reverse osmosis, defluoridation

Boiler feed water – sludge and scale formation – external & internal treatment – boiler corrosion.

b) WASTE WATER TREATMENT

Pretreatment and primary treatment : Screening, separation, neutralization.

Physiochemical treatment : Precipitation, Chemical oxidation

Biological treatment : Aerobic and anaerobic treatment

Advanced treatment : Ultra filtration, carbon adsorption, chemical oxidation.

Effluent treatment : Rain water collection, methods of purification and its use

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U1CMC1

COURSE TITLE : General Chemistry-I

QN.NO : 8601

TIME : 3 Hours

MAX.MARKS :75

UNIT I ATOMIC STRUCTURE & INTRODUCTION TO WAVE MECHANICS

Fundamentals of atomic particles - e/m ratio of an electron - Rutherford's atomic model – The Bohr theory of hydrogen atom – the spectrum of hydrogen atom – The Sommerfield modification - Quantum theory of radiation – Einstein photoelectric equation – particle and wave character of electron – de Broglie equation – Davisson-Germer experiment – Heisenberg's uncertainty principle – Quantum numbers and their significance – Compton effect - Stark Einstein effect - Zeeman effect – Pauli exclusion principle – Hund's rule of maximum spin multiplicity – Aufbau principle – Shapes of orbitals.

UNIT II PERIODIC CLASSIFICATION & PERIODIC PROPERTIES

Periodic table: The long form of periodic table - periodic law and electronic configuration of elements - Classification of elements on the basis of their electronic configuration – Periodic properties – atomic and ionic radii - Ionisation energy- electron affinity – Electronegativity - Different scales – Mulliken and Pauling scale - Factors affecting periodic properties - Diagonal relationship.

UNIT III BASIC CONCEPTS OF ORGANIC CHEMISTRY

Classification of organic compounds – empirical and molecular formulae – definitions and problems related to empirical and molecular formulae – the breaking and forming of bonds (homolytic and heterolytic) – types of organic reactions – reaction intermediates: carbanion, carbocation and free radical: Structure, geometry, formation and stability – basic ideas of nucleophilic and electrophilic addition and substitution reactions – elimination reactions – benzyne formation. Basic ideas of inductive, electronic, resonance, mesomeric, hyperconjugation and steric effects (elementary idea with examples).

UNIT IV RADIOACTIVITY AND NUCLEAR CHEMISTRY

a) Radioactivity: Properties of α , β , and γ radiations - Types of radioactivity –Radioactive disintegration – Half life and average life: definition and relation - Radioactive equilibrium – Group displacement law - Isotopes, isobars, isotones: definition and examples only - Uses of radio isotopes in various fields.

b) Nuclear Chemistry: Nuclear transmutation - definition and examples – Comparison of nuclear reactions and chemical reactions – Mass defect, binding energy, binding energy curve – Meson theory of nuclear forces – Nuclear fission and fusion: Concept and applications.

UNIT V SOLID STATE CHEMISTRY

Unit cells of simple, body centered and face centered cubic lattices – crystal planes and Miller indices. Seven crystal systems. Cubic Crystals. Examples such as NaCl, CsCl, Structure of diamond and graphite - X- ray diffraction – The Bragg’s equation – discussion of the Bragg method for the structure of crystals. (NaCl & KCl only) Determination of Avogadro number through ‘X’-ray diffraction of crystals – Defects in crystal system: Schotky and Frenkel defects.

Text Book(s):

1. Bhal, B.S. and Arun Bahl, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi, 2004.
2. Puri, B.R., Sharma, L.R. and Pathania, M.S., (41st Edn.), Principles of Physical Chemistry, Vishal Publications, 2014.
3. Sathya Prakash, Tuli, Basu & Madan, Advanced Inorganic Chemistry, Vol. II, 17th Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi, 1999,.
4. Puri. B.R., Sharma. L.R., Principles of Inorganic Chemistry, Shobhan Lal Nagin Chand and Co., Jalandar, 1989.

Reference Books:

1. Khosla, B.D., Physical Chemistry, S. Chand & Co., New Delhi, 1978.
2. Gurdeep, R, Advanced Physical Chemistry, Goel Publishing House, Meerut, 1997.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U1CSM1

COURSE TITLE : Industrial Chemistry-I

QN.NO : 8602

TIME : 3 Hours

MAX.MARKS :75

UNIT I

a) MATCH INDUSTRY: Introduction- Lucifier and Safety matches – Manufacture of safety matches.

b) EXPLOSIVES: Types, Primary, Secondary – Lead azide - Potassium chlorate – Ammonium nitrate – TNT.

UNIT II PETROLEUM

Occurrence – composition of petroleum – origin – mining – refining of petroleum – fraction distillation – purification - Cracking – synthetic petrol – knocking and antiknocking – octane number – reforming – cetane number – flash point.

UNIT III CEMENT

Cement: Types of cement – raw materials – reactions in the kiln- setting of cement – testing of cement – factors affecting quality – mortars and concrete.

UNIT IV PAPER INDUSTRY

Paper: Introduction – manufacture of pulp - types of pulp – manufacture of paper – calendaring –uses.

UNIT V SOAP AND DETERGENTS

Introduction of soap with examples – Types of soaps – principal groups of synthetic detergents – classification of surface active agents – anionic detergents – oxo process – Alfol process – Welsh process - biodegradability of surfactants.

Text Book(s):

1. Jain, J. Engineering Chemistry 15th Edition, Dhanpath Rai publishing company (PVL), New Delhi.
2. Sharma, B.K. Industrial Chemistry, GOEL Publishing House, Meerut, 1997.

Reference Books:

1. Ghosh, J. Fundamental concepts of Applied Chemistry, S. Chand Limited, Nagpur, 2006.
 2. Sundari, K. B. Applied Chemistry, Mjp Publishers, Mumbai.
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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U1CAC1

COURSE TITLE : Ancillary Chemistry - I

QN.NO : 8603

TIME : 3 Hours

MAX.MARKS :75

UNIT I ATOMIC STRUCTURE

Brief introduction to structure of atom - Rutherford and Niels Bohr's model of an atom and their defects - Sommerfeld's modification of atomic structure Electronic configuration and quantum numbers - Orbitals-shapes of s, p and d orbitals. - Pauli's exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle - Heisenberg's uncertainty principle.

UNIT II INTRODUCTION TO ORGANIC CHEMISTRY

Importance of organic compounds in daily life – Classification of organic compounds. Functional groups – definition – various functional groups - General formula and examples for the following: Alcohols, Alkyl Halide, Carbonyl compounds, Carboxylic acids and Amines. Types of organic reactions – Substitution, Addition and Elimination reactions (examples only, not mechanism)

UNIT III CHEMICAL BONDING

Types of Bonds – electrovalent, ionic, covalent, co-ordinate covalent, metallic and H-bonding. Characteristics of electrovalent and covalent compounds. VB Theory - Types of overlapping (s-s, s-p and p-p overlapping), Sigma and pi bonds, Hybridisation- sp^3 , sp^2 and sp hybridisation in methane, ethylene & acetylene only.

UNIT IV SURFACE CHEMISTRY

Definition of adsorption, occlusion, absorption, adsorbent, adsorbate – Types of adsorption: Physisorption and chemisorption – differences between physisorption and chemisorption – applications of adsorptions – factors influencing adsorption process.

UNIT V CATALYSIS

Definition, Characteristics of catalysts - Types of catalyst (Homogeneous and heterogeneous) – Acid base catalysis – Enzyme catalysis with example only: positive, negative and auto catalysis – catalytic promoters – catalytic poison.

Reference books:

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. SathyaPrakash, Tuli, Basu& Madan, 1999, Advanced Inorganic Chemistry. Vol. II , 17th Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi.
4. Puri. B.R., Sharma. L.R., 1989, Principles of Inorganic Chemistry, ShobhanLal Nagin Chand and Co., Jalandar.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U2CMC2

COURSE TITLE : General Chemistry-II

QN.NO : 8604

TIME : 3 Hours

MAX.MARKS :75

UNIT I GASEOUS STATE

Ideal gases: Kinetic theory of ideal gases – gas laws – ideal gas equation – definition of most probable velocity, mean velocity and RMS velocity – collision diameter – collision cross section – collision frequency – mean free path.

Real gases: Deviation from ideal behavior – derivation of Vander waal’s equation of state – methods of liquefaction of gases – Joule Thomson effect – inversion temperature – C_p - C_v relationship.

UNIT II QUANTUM CHEMISTRY

The significance of the wave function ψ – interpretation of ψ^2 . The atomic orbitals – representation of angular and radial parts of the wave functions - nodal planes and nodal spheres – ‘g’ and ‘u’ character. Derivation of Schrodinger wave equation – particle in one dimensional box – operators: Laplacian, Hermitian – eigen values – eigen functions.

UNIT III CHEMICAL BONDING

Chemical bond – definition and types.

Ionic bond: Definition, illustration of the formation of ionic bond (NaCl, MgO, CaF₂, Al₂O₃ only) – condition for the formation of ionic bonds, Lattice energy, Born Lande equation (only the equation, derivation not needed). Born Haber cycle.

Covalent bond: Definition and types (single, double and triple bonds) - illustration of the formation of covalent bond (HF, H₂O, NH₃, O₂ and N₂ only) – factors favoring the formation of covalent bonds.

Hybridisation - sp , sp^2 and sp^3 (BeCl₂, BeCl₃, H₂O, NH₃,) VSEPR - (H₂O, NH₃, PCl₅, ClF₃, SF₄, I₃⁻, SF₆, IF₇ only). MO approach: LCAO – Homonuclear (H₂, He₂, O₂ and N₂ molecules only) – Heteronuclear (CO & NO only).

Co-ordinate bond: Definition and examples.

UNIT IV HYDROCARBONS

Aliphatic Hydrocarbons: Alkanes: Preparation by Wurtz reaction and Kolbe’s electrolytic method – general properties. Alkenes: general methods of preparation – Markownikoff’s rule – peroxide effect – preparation and properties of alkadienes – 1,4- addition and 1,2- addition reactions of alkadienes – free radical addition reactions of conjugated dienes. Elimination reactions: α and β eliminations – mechanism of E₁ and E₂ reactions – factors governing E₁ and E₂ mechanisms – Hofmann and Saytzeff’s rules.

Aromatic Hydrocarbons: Introduction – aromaticity and Huckel’s rule – Structure of benzene.

UNIT V HYDROGEN, GROUP I & II ELEMENTS

a) Hydrogen: Ortho and para hydrogen – Hydrides: Ionic or salt like hydrides - covalent hydrides, metallic or interstitial hydrides – intermediate hydrides.

b) Group I elements: Alkali metals – electronic structure – general properties - Chemical properties – Solubility and hydration – Stability of carbonates and bicarbonates - halides – extraction of Li and Na. Preparation, properties and uses of the following compounds: i) Sodium nitrite, ii) Potassium nitrate iii) Lithium aluminium hydride, iv) Sodium borohydride, v) Lithium carbonate - Anomalous behavior of Lithium.

c) Group II elements: Alkaline earth metals – Electronic structure – similarities in physical and chemical properties and gradation in them – Anomalous behavior of Be – Diagonal relationship between Be and Al – Occurrence (important minerals) of Alkaline earth metals – Extraction of Be and Mg. Study of the following compounds: 1) Plaster of paris 2) Gypsum 3) Strontium sulphate 4) Barium chromate.

Text Book(s):

1. Glasstone, S. A., Text book of Physical chemistry East-West Press, New Delhi.
2. Puri, B.R., Sharma, L.R. and Pathania, M.S., “Principles of Physical Chemistry”, Forty Sixth Edition, Vishal Publishing Co., Jalandhar, 2013.
3. Bhal, A., Bhal, B.S. and Tuli, G.D., “Essentials of Physical Chemistry”, First Edition, S. Chand & Company Ltd., New Delhi, 2012.
4. Morrison, R.T., and Boyd, R.N., Organic Chemistry, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th edition, 1999.
5. Lee, J. D., Concise Inorganic Chemistry, 5th edition, Elbs with Chapman and Hall, London, 2010.

Reference Books:

1. Sharma. B.K. - Industrial Chemistry, Goel Publishing House, New Delhi, 1994.
2. Kundu. N and Jain. S.N. Physical Chemistry, S.Chand & Co, New Delhi, 1984.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U2CSM2

**COURSE TITLE : Metallurgy & Food
Chemistry**

QN.NO : 8606

TIME : 3 Hours

MAX.MARKS :75

UNIT I PRINCIPLES OF METALLURGY

Ores and Minerals, General Methods of extraction of metals – Concentration – gravity separation, electromagnetic and froth floatation methods and leaching method – Extraction – Roasting, Calcination, Smelting – Carbon and alumino thermic reduction

UNIT II METALLURGY - II

Refining – van Arkel- zone refining – electrolytic refining – Ellingham diagram- Extraction of following metals: Al & Cu only.

UNIT III FOOD ADDITIVES AND FOOD FLAVOURS

Definition – direct and indirect food additives, uses and the critical limit of food additives.

Food flavours: Apple, Orange & Banana

Definition – smell and taste of some common compounds. Food pigments: Definition – classification of natural and artificial food colors.

UNIT IV FOOD DETERIORATION AND ADULTERANTS

Food deterioration: Definition of deterioration, deterioration by microorganism, water and food preservatives. Adulterants: definition, classification, injurious adulterants / contaminants in foods and their health effects, prevention of food adulterants.

UNIT V OILS AND FATS

Sources – composition - functions of oils and fats - Role of oils and fats in cooking - changes in oil and fats while cooking - Effect of prolonged heating on nutritive value - changes undergone by oils and fats during storage - hydrogenation of oils.

Text Book(s):

1. Chopra, H.K and Panesar. P.S, Food Chemistry, Narosa Publishing House, 2010.
2. Ghosh, J., Fundamental concepts of Applied Chemistry, S. Chand Limited, Nagpur, 2006.

Reference Books:

1. Thapar, H., Food Chemistry, Pacific Books Internationals, New Delhi, 2011.
2. Swaminathan, M., Food Science and Experimental Foods, Bangalore Print. & Publishing Company, 1987.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U2CAC2

COURSE TITLE : Ancillary Chemistry-II

QN.NO : 8607

TIME : 3 Hours

MAX.MARKS :75

UNIT I PERIODIC TABLE AND ATOMIC PROPERTIES

Modern periodic law - Long form of periodic table –classification of elements based on valence shell electronic configuration - s, p, d,& f blocks – Periodic properties – Atomic and ionic radii – Ionization energy – Electron affinity – Electro negativity.

UNIT II ACIDS AND BASES

Modern concepts of acids and bases – strong and weak acids and bases – acidity and basicity. Concept of pH – common ion effect – applications - buffer solutions – definition - theory of buffer action and applications – Henderson’s Equation - Strength of solutions - calculation of equivalent weights – normality- molarity – molality – mole fraction – ppm – preparation of standard solutions.

UNIT III STUDY OF ORGANIC COMPOUNDS

Alkane: Introduction – preparation and properties of ethane. Alkene: Introduction – preparation and properties of ethylene. Alkyne: Introduction – preparation and properties of acetylene. Alcohol: Introduction – preparation properties of methanol and ethanol. Ethers: Introduction – preparation and properties of dimethyl ether.

UNITIV CARBOHYDRATES – I

Monosaccharides: Definition – classification of carbohydrate – monosaccharides – properties and uses of glucose and fructose – configuration of glucose – Mutarotation - conversion of glucose to fructose and viceversa.

UNIT V CARBOHYDRATES – II

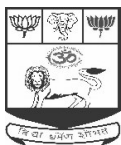
Colour reactions of carbohydrates - Disaccharides: Sucrose – manufacture – properties and uses – distinction between sucrose, glucose and fructose.

Polysaccharides: Starch: Structure, properties and uses.

Reference books:

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Puri. B.R., Sharma. L.R., 1989, Principles of Inorganic Chemistry, ShobhanLal Nagin Chand and Co., Jalandar.
3. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
4. Soni, P.L., 1998, Text book of Organic Chemistry, Sultan Chand and Co. Ltd.,New Delhi.
5. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U3CMC3

COURSE TITLE : General Chemistry - III

QN.NO : 8609

TIME : 3 Hours

MAX.MARKS : 75

UNIT I HALOGEN COMPOUNDS AND GRIGNARD REAGENTS

a) Aliphatic Halogen compounds: General methods of preparation and properties - Aliphatic nucleophilic substitution – mechanism of S_N^1 and S_N^2 reactions – stereochemistry of S_N^1 & S_N^2 reactions: Walden inversion, racemization. Preparation and properties of: $CHCl_3$, westron & freon.

Aromatic halogen compounds: Preparation and properties of chlorobenzene, chlorotoluene, benzylchloride and benzalchloride.

b) Organometallic compounds: Preparation and synthetic utilities of Grignard reagents (Reaction with formaldehyde, higher aldehyde, ketone and epoxides)

UNIT II ALIPHATIC OXYGEN AND SULFUR COMPOUNDS

a) Aliphatic Alcohols: Preparation and reactions of aliphatic alcohol, allyl alcohol, glycol and glycerol. Estimation of number of hydroxyl groups.

b) Epoxide and Sulphur Compounds: Preparation and properties of diethyl ether – Preparation, ring opening and reactions of epoxides - general methods of preparation and properties of thio alcohols and thioethers. Sulphonol and mustard gas.

UNIT III ALIPHATIC ALDEHYDES AND KETONES

Aliphatic Aldehydes and Ketones: General methods of Preparation and properties of aldehydes and ketones. Study of following members: formaldehyde, acetaldehyde & acetone. Chemistry of acrolein and crotonaldehyde.

Study of following reactions: Aldol condensation, Knoevenagel condensation, Cannizaro reaction, Wittig reaction, Pinacol-pinacolone rearrangement, Darzens condensation.

UNIT IV SURFACE CHEMISTRY & DISTRIBUTION LAW

Surface chemistry: Basics terminologies – adsorption – adsorbate adsorbent – adsorption of the gases by solid – factors influencing adsorption – types of adsorption – physical adsorption – chemical adsorption – comparison – Freundlich adsorption isotherm – Langmuir adsorption – application of adsorption.

Distribution law – thermodynamic derivation – association of the solute in one of the solvent – dissociation of the solute in one of the solvent – applications of distribution law.

UNIT V GROUP-III & IV ELEMENTS

(a) General characteristics of group III elements - Reactions of elements with acids, alkalies and dioxygen. Compounds of boron- borates, borax and diborane and its structure- Qualitative analysis of boron compounds. Alumina, qualitative analysis of aluminium, amphoteric behaviour of aluminates, trihalides of aluminium.

P.T.O

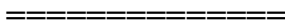
(b) General characteristics of group IV elements - Compounds of carbon- Carbides, carbon monoxide, water gas, producer gas and coal gas - Oxides of silicon, silicates and their applications and silicones.

Text Book(s):

1. Tewari, K. S., Mehrotra, S. N., and Vishnoi, N. K. Text book of Organic Chemistry, Vivas Publishing House Pvt Ltd. 1998.
2. Jain, M. K. and Sharma, S. C. Modern Organic Chemistry, Vishal PublishingCo, Jalandhar, Delhi, 4th edition, 2013.
3. Glasstone, S., Text book of Physical Chemistry, McMillan and Company Ltd., London, 1974.
4. Madan, R.D., Modern Inorganic Chemistry, Sultan Chand and Co. Ltd., New Delhi, 2005.

Reference Books:

1. Bhal, B.S. and Arun Bahl, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi, 2004.
2. Morrison, R.T., and Boyd, R.N., Organic Chemistry, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th edition, 1999.
3. Soni, P.L., Text book of Organic Chemistry, Sultan Chand and Sons, New Delhi, 1998.





PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U3CAC1

COURSE TITLE : Ancillary Chemistry-I

QN.NO : 8610

TIME : 3 Hours

MAX.MARKS :75

UNIT I ATOMIC STRUCTURE – I

Brief introduction to structure of atom - Rutherford and Niels Bohr's model of an atom and their defects - Sommerfeld's modification of atomic structure and quantum numbers – Hydrogen spectra.

UNIT II ATOMIC STRUCTURE – II

Electronic configuration and Orbitals-shapes of s, p and d orbitals. - Pauli's exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle - Heisenberg's uncertainty principle.

UNIT III INTRODUCTION TO ORGANIC CHEMISTRY

Classification of organic compounds. Functional groups – definition – various functional groups - General formula and examples for following: Alcohols, Alkyl Halide, Carbonyl compounds, Carboxylic acids and Amines. Types of organic reactions – Substitution, Addition and Elimination reactions (examples only, not mechanism)

UNIT IV CHEMICAL BONDING

Types of Bonds – electrovalent, ionic, covalent, co-ordinate covalent, metallic and H-bonding. Characteristics of electrovalent and covalent compounds. Hybridisation- Introduction, sp^3 , sp^2 , and sp hybridisation in methane, ethylene & acetylene only.

UNIT V SURFACE CHEMISTRY

Definition of adsorption, occlusion, absorption, adsorbent, adsorbate – Types of adsorption: Physisorption and chemisorption – differences between physisorption and chemisorption – applications of adsorptions – factors influencing adsorption process.

Reference books:

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. Madan, R.D., 2005, Modern Inorganic Chemistry, Sultan Chand and Co. Ltd., New Delhi.
4. SathyaPrakash, Tuli, Basu& Madan, 1999, Advanced Inorganic Chemistry. Vol. II , 17th Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi.
5. Puri. B.R., Sharma. L.R., 1989, Principles of Inorganic Chemistry, ShobhanLal Nagin Chand and Co., Jalandar.



PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U3CAC3

COURSE TITLE : Ancillary Chemistry-III

QN.NO : 8611

TIME : 3 Hours

MAX.MARKS :75

OBJECTIVES:

To empower the students to

- I. study about vitamins and its classification,
- II. understand the structure and sources of hormones,
- III. know about basic ideas of aminoacids and proteins,
- IV. study the concept of nuclear chemistry and application of radioactivity,
- V. understand the ideas of photochemistry and its applications.

LEARNING OUTCOME

- I. Understanding concepts and sequence of DNA in protein molecules.
- II. Skill and awareness of radioactive treatments in various field.
- III. Applicability of phosphorescence and fluorescence.

UNIT I VITAMINS

Vitamins: Definition, classification, sources, function and deficiency of vitamins A, B-complex, C, D, E and K (structure and synthesis not expected).

UNIT II HORMONES

Structure, Source and importance of Androsterone, Estrosterone, Estrone, Testosterone, Progesterone-thyroxin.

UNIT III AMINO ACIDS AND PROTEINS

Amino acids – Definition, general methods of preparation, properties and uses – Glycine and Alanine.

Proteins – Definition, Classification, general properties – colour reactions and relationship of aminoacid with proteins.

UNIT IV NUCLEAR CHEMISTRY

Fundamental particles: Nuclear isotopes, Isobars, Isotones and Isomers- Difference between chemical reactions and nuclear reactions - Group displacement law -Concept and applications of nuclear fission and fusion - Applications of radioactivity in medicine, agriculture and industry - as tracer elements in the investigation of reaction mechanism - carbon dating.

UNIT V PHOTOCHEMISTRY

Introduction to photochemistry- Difference between thermal and photo chemical reaction statement of Grothuss-Draper Law, Stark-Einstein's Law, Quantum yield, Jablonski diagram- Phosphorescence, Fluorescence, Chemiluminescence - Definition with examples. Photosynthesis, Photosensitization.

Reference books:

1. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
2. I.L. Finar, “Organic Chemistry”, Vol. I and II, 6thedn., ELBS, Singapore, 1994.
3. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
4. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.



PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U3CSA1

COURSE TITLE : Applied Chemistry-I

QN.NO : 8612

TIME : 3 Hours

MAX.MARKS :75

OBJECTIVES

- 1) study about the hardness of water and their removal,
- 2) know the need of plant growth using fertilizers,
- 3) study about polymers and their properties,
- 4) study about the day today application of polymers and resins
- 5) understand the ideas of corrosion and its prevention methods.

LEARNING OUTCOME

- 1) Understanding need of plant growth using fertilizers,
- 2) Useful in metallurgical, polymer and water purifying industries.

UNIT I WATER TREATMENT

Hardness of water: Degree of hardness - Temporary and permanent hardness - disadvantages of hard water- softening of hard water using Zeolite process, demineralization process and reverse osmosis.

UNIT II FERTILIZERS

Definition: role of various elements in plant growth-classification i) natural and chemical ii) According to nature of the elements present-functions of the following: ammonium Sulphate, urea, calcium cyanamide, super phosphate of lime, triple super phosphate, potassium Sulphate, potassium chloride, potassium nitrate.

UNIT III CHEMISTRY OF POLYMERS

Introduction: Definition of monomer and polymers - classification of polymers based on micro structures (Chemical and Geometrical). General mechanism of polymerization-mechanism of radical polymerization

UNIT IV INDIVIDUAL POLYMERS

General methods of preparation, properties and uses of the following polymers: polyethylene, polystyrene, polyacrylonitrile, polyesters (Kevlar), polyurethanes, poly vinyl chloride and phenol-formaldehyde resins.

UNIT V CORROSION AND PREVENTION

Definition – Types of corrosion – Factors affecting corrosion process - Corrosion control - cathodic protection – anodic protection - Corrosion inhibitors – electroplating and passivity.

Reference books:

1. Sharma, B.K., 1989, Polymer Chemistry, Goel Publishing House, Meerut.
2. Mukhopathyay. R and Datta. S, Engineering Chemistry, New Age international PVL, Publishers, New Delhi.
3. Sharma, B. K., Industrial chemistry, GoelPuplisihing House, 1994.



PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U3CNM1

COURSE TITLE : Chemistry in Day Today Life

QN.NO : 8613

TIME : 3 Hours

MAX.MARKS :75

UNIT I FOOD PRESERVATION AND FOOD ADDITIVES

Food preservation-preservation methods-low temperature, high temperature, chemical preservatives.

Food additives, natural and artificial coloring agents- sweetening agents, legal safe guards, adulteration in food.

UNIT II FOOD DETERIORATION

Food deterioration: Definition of deterioration, deterioration by microorganism, water and food preservatives.

Adulterants: definition, classification, injurious adulterants/contaminants in foods and their health effects, prevention of food adulterants.

UNIT III INDUSTRIAL CHEMISTRY

INSECTICIDE: Fungicides and Pesticides-definition and classification according to the methods of applications and action, preparation and use of DDT and BHC, Bordeauxmixture and dithiocarbamate.

SOAP AND DETERGENTS: Manufacture of Soap and Detergents - Cleansing action of soap – Disposal of Detergents waste in water resources and its effects.

UNIT IV AGRO CHEMISTRY

Nutrients for plants – Major and minor nutrients – Role of NPK – Urea – Super Phosphate – Mixed fertilizers – Fertilizer manufacturing units in India.

UNIT V DAIRY CHEMISTRY

Milk and Milk Products - Composition of Milk, Flavour and aroma of Milk, Physical properties of milk. Effect of heat on Milk - Milk products - cream, butter, ice cream, milk powder.

Text Book(s):

1. Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.
2. Chopra. H.K and Panesar. P.S, Food Chemistry, Narosa Publishing House, 2010.

Reference Books:

1. Thapar. H, Food Chemistry, Pacific Books Internationals, New Delhi, 2011.
2. Iqbal. S.A and Mido. Y, Food Chemistry, Discovery Publishing House, 2005.



PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Organic and Physical
Chemistry

COURSE CODE : 17U4CMC4
QN.NO : 8614

TIME : 3 Hours

MAX.MARKS :75

UNIT I STEREOCHEMISTRY-I

(a) Stereoisomerism: Definition – Geometrical isomerism of maleic and fumaric acids – aldoximes and ketoximes – determination of configuration of geometrical isomerism – E–Z notations.

(b) Optical isomerism: Elements of symmetry – asymmetry of the molecule – chirality – optical isomerism of compounds containing asymmetric carbon atoms – lactic and tartaric acids.

UNIT II STEREOCHEMISTRY-II

Enantiomers and diastereoisomers – racemic and meso forms – racemisation and resolution of racemic mixtures – specification of absolute configuration by *R* and *S* notations – optical activity of compounds without asymmetric carbon atoms – allenes, spirans and biphenyl compounds (elementary idea only).

UNIT III CONFORMATIONAL ANALYSIS

Introduction - conformational analysis of ethane, propane and *n*-butane.

Cycloalkanes:General methods of preparation and reactions of cycloalkanes. Bayer’s strain theory and its modifications. Conformational analysis of cyclohexane (elementary idea only).

UNIT IV COLLOIDAL STATE-I

Colloidal state: Distinction between true solution, colloidal dispersion and suspension – classification of colloids. Sol – types of sols –purification of colloidal solution – properties of colloids – optical, tyndall, kinetic-Brownian movement and electrical properties - Electrophoresis.

UNIT V COLLOIDAL STATE-II

Coagulation – methods for coagulation – coagulating power and Hardy – Schulze law – Hofmeister series – Flocculation value – protection of colloids – Gold Number. Gels – preparation and properties of gels –syneresis, thixotropy, imbibitions. Emulsion – types of emulsion - Emulsifier and application of colloids.

Text Book(s):

1. Finar. I.L, “Organic Chemistry”, Vol. I and II, 6th edn., ELBS, Singapore, 1994.
2. Morrison, R.T., and Boyd, R.N., Organic Chemistry, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th edition, 1999.
3. Soni, P.L. & Dharmarha, Text Book of Physical Chemistry, Sultan Chand & Sons, New Delhi, 1991.

Reference Books:

1. Soni, P.L., Text book of Organic Chemistry, Sultan Chand and Co. Ltd., New Delhi, 1998.
2. Puri, B.R., Sharma, L.R. and Pathania, M.S., “Principles of Physical Chemistry”, Forty Sixth Edition, Vishal Publishing Co., Jalandhar, 2013.



PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U4CSM3

**COURSE TITLE : Polymer and Water
Treatment**

QN.NO : 8615

TIME : 3 Hours

MAX.MARKS :75

UNIT I CHEMISTRY OF POLYMERS

Polymers - Classification of polymers: Linear polymers, non-linear or branched polymers, cross linked polymers, homo chain and hetero chain, homopolymers, co-polymers, block polymers and graft polymers (definition and examples only).

UNIT II INDIVIDUAL POLYMERS

Preparation and uses of the following polymers: polyethylene, polystyrene, polyacrylonitrile, PVC and polytetrafluoro ethylene.

UNIT III POLYMER PROCESSING

Polymer processing – plastics (thermo and thermosetting), elastomers, fibres, compounding, plasticizers, colorants, flame retardants.

UNIT IV WATER ANALYSIS.

The importance and source of water. Classification of water pollutants: organic, inorganic, radioactive materials, thermal pollutants. Significance and experimental determination of BOD and COD.

UNIT V WATER TREATMENT

Hardness of water – Types and determination. Removal of suspended impurities – sedimentation - sedimentation with coagulants – filtration. Removal of microorganisms using bleaching powder, chlorine, ozone and UV light.

Removal of dissolved salts; Permutit process, Ion exchange process and reverse osmosis.

Text Book(s):

1. Gowariker. V.R., Viswanathan. N.V and Sreedhar. J, “Polymer Science”, Wiley Eastern Ltd., New Delhi, 1986.
2. Arora, M. G., Singh, M. Industrial Chemistry, Anmol Publishing Pvt. Ltd., New Delhi, 1999.
3. Sharma, B.K. - Industrial Chemistry, Goel Publishing House, New Delhi, 1994.

Reference Books:

1. Billmeyer. F.W., “Textbook of Polymer Science”, 3rd edn., John Wiley and Sons, New York, 1984.
 2. Vermani, O. P., Narula, A. K. Industrial Chemistry, Galgotia Publications Pvt. Ltd., New Delhi, 2000.
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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U4CAC4

COURSE TITLE : Ancillary Chemistry-IV

QN.NO : 8618

TIME : 3 Hours

MAX.MARKS :75

OBJECTIVES

To empower the students to

- 1) study about the purification methods of organic compounds,
- 2) know the separation techniques for identification of compounds,
- 3) study the basic concepts of bio-inorganic chemistry,
- 4) study about the types of colloids and their properties
- 5) understand the ideas of emulsion

LEARNING OUTCOME

- Understanding the concepts of separation and purification of organic compounds,
- Useful in pharma industries in analytical division.

UNIT I PURIFICATION OF ORGANIC COMPOUNDS

Purification techniques of organic compounds- Distillation – fractional distillation – distillation under reduced pressure – crystallization – sublimation.

UNIT II SEPARATION OF ORGANIC COMPOUNDS

Chromatography: Definition, principles-Adsorption and partition- applications of chromatography. A brief study of thin layer chromatography (TLC) and column chromatography.

UNIT III BIOINORGANIC CHEMISTRY

Biological functions and toxicity of elements – chromium, copper and Arsenic - Role of alkali and alkaline earth metal ions in biological systems: Role of Na⁺ and K⁺ ions – Sodium pumping – Role of Mg²⁺ and Ca²⁺ ions.

UNIT IV COLLOIDS

Colloidal state of matter – various types properties of colloids- Tyndall effect- Brownian movement-Lyophobic and Lyophilic sols, difference between them – Purification of colloids -dialysis – electro osmosis – electrophoresis.

UNIT V EMULSION

Emulsion – types of emulsions with examples: oil in water and water in oil - Gels: classification and preparation by cooling of sols, double decomposition and by change of solvents. Application of colloids in the following fields: foods, medicine, industrial goods, rubber plating, chrome tanning, Cottrell precipitator and detergent action of soap.

Reference books:

1. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
2. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
3. Madan, R.D., 2005, Modern Inorganic Chemistry, S. Chand and Co. Ltd., New Delhi.
4. Soni, P.L., 1998, Text book of Organic Chemistry, Sultan Chand and Sons, New Delhi.



PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U4CNM1

**COURSE TITLE : Chemistry in Day Today
Life**

QN.NO : 8620

TIME : 3 Hours

MAX.MARKS :75

UNIT I FOOD PRESERVATION AND FOOD ADDITIVES

Food preservation-preservation methods-low temperature, high temperature, chemical preservatives.

Food additives, natural and artificial coloring agents- sweetening agents, legal safe guards, adulteration in food.

UNIT II FOOD DETERIORATION

Food deterioration: Definition of deterioration, deterioration by microorganism, water and food preservatives.

Adulterants: definition, classification, injurious adulterants/contaminants in foods and their health effects, prevention of food adulterants.

UNIT III INDUSTRIAL CHEMISTRY

INSECTICIDE: Fungicides and Pesticides-definition and classification according to the methods of applications and action, preparation and use of DDT and BHC, Bordeaux mixture and dithiocarbamate.

SOAP AND DETERGENTS: Manufacture of Soap and Detergents - Cleansing action of soap – Disposal of Detergents waste in water resources and its effects.

UNIT IV AGRO CHEMISTRY

Nutrients for plants – Major and minor nutrients – Role of NPK – Urea – Super Phosphate – Mixed fertilizers – Fertilizer manufacturing units in India.

UNIT V DAIRY CHEMISTRY

Milk and Milk Products - Composition of Milk, Flavour and aroma of Milk, Physical properties of milk. Effect of heat on Milk - Milk products - cream, butter, ice cream, milk powder.

Text Book(s):

1. Sharma, B.K., Polymer Chemistry, Goel Publishing House, Meerut, 1989.
2. Chopra. H.K and Panesar. P.S, Food Chemistry, Narosa Publishing House, 2010.

Reference Books:

1. Thapar. H, Food Chemistry, Pacific Books Internationals, New Delhi, 2011.
- Iqbal. S.A and Mido. Y, Food Chemistry, Discovery Publishing House, 2005



PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U5CME1

COURSE TITLE : Organic Chemistry-I

QN.NO : 8621

TIME : 3 Hours

MAX.MARKS :75

UNIT I ALIPHATIC CARBOXYLIC ACIDS AND THEIR DERIVATIVES

a) Aliphatic carboxylic acids: General methods of Preparation, properties and reactions of mono and di carboxylic acids - Effect of alkyl and halogen substituents on acidity - Inductive effect. Study of following members: Formic acid, acrylic acid, oxalic acid and malonic acid.

b) Acid derivatives: Chemistry of Acid chlorides, anhydrides, amides and esters (methods of preparation and general properties only). Inter conversion of acid derivatives.

Study of following reactions: Curtius rearrangement, Hofmann rearrangement, Lossen rearrangement, Beckmann rearrangement, Schmidt reaction, Arndt-Eistert reaction.

UNIT II ALIPHATIC NITROGEN COMPOUNDS

Chemistry of nitroalkanes, alkyl nitrites, alkyl cyanides and isocyanides. Synthetic importance of diazomethane and diazoacetic ester. Urea - preparation, reactions and estimation. Methods of preparation and properties of aliphatic amines - methods of separation and distinctions of primary, secondary and tertiary amines.

UNIT III AROMATIC SUBSTITUTION AND ORGANO SULFUR COMPOUNDS

a) Aromatic electrophilic substitution: Mechanism of aromatic electrophilic mono substitution. Nitration, Sulfonation, Halogenation, Friedel-Craft's alkylation, acylation and formylation of benzene – reaction and mechanism - orientation & reactivity of mono substituted benzene.

b) Aromatic nucleophilic substitution: Various mechanisms: unimolecular, bimolecular and benzyne mechanism – Orientation & reactivity in S_NAr reaction.

c) Organo Sulphur compounds: General methods of preparation and general properties – Chemistry of Aryl sulfanyl chlorides, sulfonamides, saccharin, Chloramine-T.

UNIT IV AROMATIC NITRO & ACTIVE METHYLENE COMPOUNDS

a) Aromatic nitro compounds: General methods of preparation of aromatic nitro compounds - Preparation and reduction products of nitrobenzene – Selective reduction – Electrophilic substitution – Nucleophilic substitution – Effect of nitro group on other nuclear substituents: effect on halogens, effect on alkyl groups, and effect on phenolic –OH groups.

b) Active methylene Compounds: Methods of preparation and reactions of diethyl malonate and ethyl acetoacetate. Preparation and synthetic utility of enamines and 1,3-Dithiane.

Study of following reactions: Wolff rearrangement.

UNIT V AROMATIC AMINO AND DIAZONIUM COMPOUNDS

a) Aromatic amino compounds: Structure, general methods of preparation, basicity and effect of substituents on basicity – methods of preparation, properties and reactions of aniline, nitroanilines, diphenylamine, phenylene diamines, sulphanilic acid and Sulphanilamide.

b) Aromatic diazonium salts: Formation and reactions of diazonium salts – Reactions in which nitrogen is eliminated - Reactions in which nitrogen is retained.

Study of: Benzidine rearrangement.

Text Book(s):

1. Bhal, B.S. and Arun Bahl, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi, 2004.
2. Tewari, K. S., Mehrotra, S. N., and Vishnoi, N. K. Text book of Organic Chemistry, Vivas Publishing House Pvt Ltd.1998..
3. Jain, M. K. and Sharma, S. C. Modern Organic Chemistry, Vishal PublishingCo, Jalandhar, Delhi, 4th edition, 2013.

Reference Books:

1. Morrison, R. T.,Boyd. Organic Chemistry, 6th Edition, Prentice-Hall of India Pvt. Ltd., New Delhi, 1999.
2. Soni, P.L., Text book of Organic Chemistry, Sultan Chand and Co. Ltd.,New Delhi, 1998.

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011

(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)

RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U5CMC5

COURSE TITLE : Inorganic Chemistry-I

QN.NO : 8622

TIME : 3 Hours

MAX.MARKS :75

UNIT I GROUP V ELEMENTS

Group-V - Electronic structure and oxidation states- metallic and non-metallic character-difference between nitrogen and other elements- occurrence and extraction of As, Sb and Bi. Group V elements; Halides, oxides, oxyacids of nitrogen and phosphorus, Sodium bismuthate, tartar emetic- Inorganic fertilizers – Urea, super phosphate and triple super phosphate.

UNIT II GROUP VI ELEMENTS

Group- VI - Group discussion of VI group elements: Sulphur: preparation, properties and uses of persulphides, halides and oxy chlorides (thionyl chloride and sulphuryl chlorides) – structure – preparation, properties, uses and structure of H₂SO₄, peracids and poly sulphides – preparation, properties, structure and uses of thionic acids - chlorosulphonic acid. Selenium: Extraction, properties and uses – oxides and oxy acids.

UNIT III GROUP VII ELEMENTS

Group- VII - Comparative study of halogens – Halogen – oxygen compounds – preparation, properties, uses and structure of OF₂, O₂F₂, Cl₂O, ClO₂, Cl₂O₇, Br₂O, BrO₃ and I₂O₅ – Oxyacids of halogens: introduction, oxidation state of halogens in acids- preparation, uses and structure of hypochlorous acid, chloric acid, perchloric acid and periodic acids – salts of oxyacids of halogens – bleaching powder – preparation, properties and uses. Relative strength of oxyacids of halogens.

UNIT IV INTERHALOGENS, NOBLE GASES AND NON-AQUEOUS SOLVENTS

a) **Inter halogen compounds:** introduction – general methods of preparation, properties and structure of inter halogen compounds. Polyhalides - Pseudo halogen. Difference between halogen and pseudohalogen. Basic properties of iodine.

b) **Zero group elements:** Noble gases: Group discussion of zero group elements – preparation, properties, uses and structures of XeF₂, XeF₄ and XeF₆, XeO₃, XeO₄ and XeO₂F₂.

c) **Non-aqueous solvents:** Liq ammonia.

P.T.O.

UNIT V ANALYTICAL CHEMISTRY

a) Analytical Chemistry: Terminology and theories of volumetric analysis – indicator (metal and redox indicator) – primary standards – volumetric calculations – precautions to avoid error in titrimetric analysis – redox and complexometric titrations.

b) Terminology and theories of gravimetric analysis: classification – formation of precipitate – precipitation from homogeneous solution – co-precipitation – post precipitation – precipitating agents – digestion – filtration and washing – specific and selective precipitants.

Thermoanalytical techniques: Basic principles of TGA and TDA – thermal curve for $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$.

Text Book(s):

1. Puri. B.R., Sharma. L.R., Principles of Inorganic Chemistry, Shobhan Lal, Nagin Chand and Co., Jalandar, 1989.
2. Lee J. D Concise Inorganic Chemistry, 5th edition, Elbs with Chapman and Hall, London, 2010.

Reference Books:

1. Madan, R.D., Modern Inorganic Chemistry, Sultan Chand and Co. Ltd., New Delhi, 2005.
2. Sathya Prakash, Tuli, Basu & Madan, Advanced Inorganic Chemistry, Vol. II , 17th Revised Edition, S. Chand and Co. Ltd, Ram Nagar, New Delhi, 1999.

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011

(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)

RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U5CMC6

COURSE TITLE : Physical Chemistry-I

QN.NO : 8623

TIME : 3 Hours

MAX.MARKS :75

UNIT I THERMODYNAMICS I AND THERMOCHEMISTRY

a) THERMODYNAMICS I

Terminology of thermodynamics - First law - Reversibility and maximum work – The enthalpy of a system- Heat capacity- Relation between C_p and C_v - dependence of state function of variables- The Thermodynamics behaviour of ideal gases – Isothermal and adiabatic processes in ideal gases – The Joule Thomson effect – Joule Thomson coefficient and inversion - zeroth law of thermodynamics.

b)

c) THERMOCHEMISTRY

Heat of reaction at constant volume and constant pressure – Calculation of ΔE from ΔH and vice versa. Kirchoff equation - Thermo-neutrality of salt solutions – Heat of reaction from bond enthalpies – Hess’s law and its applications - Variation of heat of reaction with temperature.

UNIT II THERMODYNAMICS II

Carnot cycle – efficiency of heat engine – various statements of second law- entropy – standard entropy change for various processes - Work (A) and free energy functions – Maxwell’s relationships – Criteria for reversible and irreversible processes – Gibbs-Helmholtz equation – Partial molar properties – Partial molar free energy – Concept of chemical potential – Gibbs Duhem equation - variation of chemical potential with temperature and pressure – Clapeyron equation – Clapeyron - Clausius equation. Nernst heat theorem - concept of entropy – Third law of thermodynamics.

UNIT III CHEMICAL KINETICS AND CATALYSIS

a) Chemical Kinetics

Introduction – rate equation – order & molecularity of reaction – pseudo unimolecular reaction – factors influencing rate of reaction – derivation of rate constant for zero, first and second order reactions – methods of determination of order of reaction – Arrhenius equation – theories of reaction rate – Collisions theory – Lindemann’s theory – ARRT.

b) Catalysis

Definition – types of catalysis – homogeneous catalysis – acid-base enzyme catalysis – auto-catalysis – Michael-Menton equation - heterogeneous catalysis – mechanism catalytic poisoning – promoters

UNIT IV SOLUTIONS

Types of solutions – Liquid in liquid – Binary liquid solutions – Raoult’s law – Vapour pressure of ideal gas – Gibb’s Duhem-Margules equation – Thermodynamics of ideal solutions – Entropy change of mixing for an ideal solution – Vapour pressure curves of completely miscible binary solution – fractional distillation of binary liquid solutions – Distillation of immiscible liquids – Solubility of partially miscible liquids – Phenol-water system – Triethylamine-water system – Nicotine-water system

P.T.O.

UNIT V COLLIGATIVE PROPERTIES & PHASE RULE

Colligative properties definition – Raoult’s law – Lowering of vapour pressure – Elevations of boiling point – depression of freezing point – Osmosis – Osmotic pressure definition only. Phase rule: Phase – component – degree of freedom – one component system (Water & sulphur system only) – Two component system (Silver & lead only) – Formation of compound with congruent melting point ($\text{FeCl}_3\text{-H}_2\text{O}$ only) – Formation compound with incongruent melting point (Copper sulphate-water system).

P.T.O.

Text Book(s):

1. Glasstone. S, “Thermodynamics for Chemists”, First Edition (Reprint), van Nostrand & Co., New York, 2005.
2. Rajaram, R. and Kuriacose, J.C., “Thermodynamics”, Third Edition, S. Chand and Co., New Delhi, 1999.
3. Engel T. and Reid, P. “Physical Chemistry”, Second South Asian Edition, Pearson Publication, New Delhi, 2011.
4. Puri, B.R., Sharma, L.R. and Pathania, M.S., “Principles of Physical Chemistry”, Forty Sixth Edition, Vishal Publishing Co., Jalandhar, 2013.

Reference Books:

1. Kapoor, K.L., “A Text Book of Physical Chemistry”, Volumes 2 & 5, Fourth Edition, Macmillan India Ltd., New Delhi, 2011.
2. Laidler, K.J. “Chemical Kinetics” Sixth Edition, Pearson Education, New Delhi, 2011.
3. Rajaram, R. and Kuriacose, J.C., “Kinetics and Mechanism of Chemical Transformation”, First Edition, Macmillan India Ltd., New Delhi, 2006.
4. Mc Quarrie, D.A. and Simon, J.D., “Physical Chemistry- A Molecular Approach”, First South Asian Edition, Viva Books Pvt. Ltd., New Delhi, 2011.
5. Ball, D. W., “Physical Chemistry”, First Indian Edition, Cengage Rearing India Pvt., Ltd., New Delhi, 2009.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U5CMC7

COURSE TITLE : Bio-Molecules and Green Chemistry QN.NO : 8624

TIME : 3 Hours

MAX.MARKS :75

UNIT I CARBOHYDRATES

Introduction and classification – *Monosaccharides*: preparation and properties of glucose and fructose – configuration of glucose and fructose – inter conversion of glucose and fructose – descending and ascending of sugar series – epimerization and mutarotation.

UNIT II ALKALOIDS AND TERPENOIDS

a) Alkaloids: Introduction, source, classification and extraction of alkaloids – general methods for determining the structure of alkaloids - structure and synthesis of following alkaloids: coniine and nicotine.

b) Terpenoids: Introduction, classification, occurrence and isolation of terpenoids – isoprene rule – general methods of determining structure – synthesis, properties and structure of citral and menthol.

UNIT III BIO-INORGANIC CHEMISTRY

Need for bio-inorganic chemistry, Porphyrin ring system – metalloporphyrin - Iron porphyrins - structure and functions of hemoglobin and myoglobin - Bohr effect - explanation for cooperativity effect. Structure and functions of chlorophyll – ionophores - sodium-potassium pump.

UNIT IV GREEN CHEMISTRY -I

Introduction – Sustainability and cleaner production - green chemistry and eco-efficiency - environmental protection laws - Need for green chemistry – 12 principles of green chemistry – Atom economy with an example.

UNIT V GREEN CHEMISTRY-II

Alternative approach to solvent chemistry: Utility of solvent free techniques - microwave (mw) activations – Advantages of mw exposure – Specific effects of mw – limitations - phase transfer catalysis (PTC). Green chemistry reactions: condensation, oxidation and reduction reactions. Ionic liquids: Basic idea and applications.

Text Book(s):

1. I.L. Finar, “Organic Chemistry”, Vol. I and II, 6th edn., ELBS, Singapore, 1994.
2. Huheey, J.E., Inorganic Chemistry, Harper Collins College Publishers, 1993.
3. Madan, R.D., Modern Inorganic Chemistry, Sultan Chand and Co. Ltd., New Delhi, 2005.
4. Sanghi, R. and Srivastava, M.M., “Green Chemistry (Environment Friendly Alternatives)”, First Edition, Narosa Publishing House, New Delhi, 2003.

Reference Books:

1. Soni, P.L., Text book of Organic Chemistry, Sultan Chand and Sons, New Delhi, 1998.
2. Sharma, B. K. Industrial Chemistry, Goel Publishing House, Meerut, 1989.



THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
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RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U6CME2

COURSE TITLE : Organic Chemistry - II

QN.NO : 8625

TIME : 3 Hours

MAX.MARKS :75

UNIT I AROMATIC HYDROXY COMPOUNDS

Preparation and properties of benzyl alcohol – *Phenols*: General methods of preparation – Acidic character and effect on substituents on acidity - Electrophilic substitution reactions – Preparation and properties of: nitrophenols, Catechol, Resorcinol, Quinol, Pyrogallol, Phloroglucinol. Study of following reactions of phenols: Fries rearrangement, Williamson ether synthesis, Claisen rearrangement, Schotten-Baumann reaction, Reimer-Tiemann reaction, Kolbe-Schmidt reaction, Gatterman synthesis, Houben-Hoesch reaction.

UNIT II AROMATIC ALDEHYDES, KETONES AND ACIDS

a) Aromatic aldehydes and ketones:

General methods of preparation and properties aromatic aldehydes – Study of following members:

- i. Benzaldehyde: (benzoin condensation, claisen condensation, Perkin reaction, Gattermann reaction, Reformatsky reaction and electrophilic substitution reactions).
- ii. Unsaturated aldehyde: Cinnamaldehyde.
- iii. Phenolic aldehydes: Salicylaldehyde and vanillin.

Aromatic ketones: Acetophenone, benzophenone and quinones,

Study of: Benzilic acid rearrangement, Dienone-phenol rearrangement, Bayer-Villiger reaction.

b) Aromatic acids: General methods of preparation and general properties – Study of: Benzoic acid, benzoyl chloride, benzamide; aminobenzoic acids, salicylic acid, cinnamic acid, phthalic acid, phthalic anhydride and phthalimide.

UNIT III POLYNUCLEAR HYDROCARBONS AND HETEROCYCLES 18 Hrs

a) Polynuclear hydrocarbons: *Isolated systems*: Preparation and properties of diphenyl and diphenylmethane. *Condensed systems*: Naphthalene, anthracene and phenanthrene: structure, preparation, properties and uses.

b) Heterocyclic compounds: Chemistry of furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline and indole.

UNIT IV DYES AND TAUTOMERISM

a) Dyes: Definition – theory of colour and constitution - classification of dyes according to their structure and applications. Preparation of following dyes:

- i. Azo dyes: Methyl orange, congo red and Bismark brown.
- ii. Triphenylmethane dyes: Malachite green, rosaniline and crystal violet.
- iii. Phthalein dyes: Phenolphthaleine and fluorescein.
- iv. Vat dye: Indigo.

b) Tautomerism: Definition – Keto-enol; phenol-keto; nitroso-oxime; imine-enamine tautomerism.

UNIT V SPECTROSCOPY

Introduction – Electromagnetic radiations – Electromagnetic spectrum.

UV-Visible spectroscopy: Introduction - types of electronic transition – absorption laws – chromophoric and bathochromic shift – hypsochromic shift – calculation of λ max for dyes and polyenes only.

IR spectroscopy: Introduction – modes of vibration – overtone and combination bands – effect of hydrogen bond – finger print region – block diagram of FT-IR instrument – absorption range of different functional groups - IR spectra of *cis*, *trans* cinnamic acid, *o*- and *p*-nitro phenol, 2-phenylpropionaldehyde, cyclic ketones.

NMR spectroscopy: Introduction – chemical shift – shielding's and deshielding effects – factors affecting chemical shift – solvents effect – number and splitting of signals – coupling constants – NMR spectra of ethanol and anisole.

Text Book(s):

1. Bhal, B.S. and Arun Bahl, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi, 2004.
2. Morrison, R. T., Boyd, R. N. Organic Chemistry, 6th Edition, Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Jain, M. K. and Sharma, S. C. Modern Organic Chemistry, Vishal Publishing Co, Jalandhar, Delhi, 4th edition, 2013.
4. Kalsi, P. S. Spectroscopy of Organic Compounds, 6th edition, New Age International Publishers, 2009.
5. Sharma, Y. S. Elementary spectroscopy, S. Chand & Company Ltd. 2005.

Reference Books:

1. Tewari, K. S., Mehrotra, S. N., and Vishnoi, N. K. Text book of Organic Chemistry, Vivas Publishing House Pvt Ltd. 1998.
2. Soni, P.L., , Text book of Organic Chemistry, Sultan Chand and Co. Ltd., New Delhi, 1998.
3. John R. Dyer, Application of Absorption Spectroscopy of Organic Compounds 3rd edition, ELBS, 1987.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U6CME3

COURSE TITLE : Inorganic Chemistry - II

QN.NO : 8626

TIME : 3 Hours

MAX.MARKS :75

UNIT I TRANSITION ELEMENTS-I (d-BLOCK ELEMENTS)

a) Group IV- Extraction, properties and uses of titanium and thorium. Important compounds-TiO₂, TiCl₄, ThO₂, ThCl₄, Thorium oxydichloride, Thorium nitrate and Thorium Sulphate.

b) Group V- Extraction, properties and uses of Vanadium, Multivalency of vanadium. Important compounds – VCl₂, VCl₄, V₂O₅, Ammonium vanadate and hexafluorovanadium(III).

c) Group VII- Important compounds MnO₂, KMnO₄, Mn₂O₇ and Mn(OH)₂.

UNIT II TRANSITION ELEMENTS –II.

Group VI- Metallurgy of W, U and Cu. Comparative account of Cu, Ag, Au. Preparation, Chemical reaction and uses of the following compounds: Sodium nitroprusside, potassium ferrocyanide, potassium ferricyanide, FAS (Ferrous ammonium sulphate), Cobalt nitrate, hexamine cobaltic chloride, NAS (Nickel ammonium sulphate), Bis(dimethylglyoximato)nickel(II), PtCl₄, chloroplatinic acid, Types of Platinum -spongy platinum, Platinum black, Platinum asbestos, Colloidal Platinum.

UNIT III f-BLOCK ELEMENTS

The lanthanide series- electronic configurations. Oxidation states, spectral and magnetic properties, lanthanide contraction - causes and consequences of lanthanide contraction - Extraction of lanthanides from monazite sand-separation of lanthanides by fractional crystallization, solvent extraction. Ion exchange methods

Actinides: The actinide series – Sources – Transuranic elements – preparation – Electronic configuration – properties: Oxidation states – Ionic radii – colour of ions – formation of complexes – comparison of actinides with lanthanides. Extraction of Uranium from pitchblende and thorium from monazite.

UNIT IV INTRODUCTION TO COORDINATION CHEMISTRY

Introduction – types of ligands, nomenclature, Chelates and its applications .Werner’s theory –merits & demerits, Types of isomerism – structural, geometrical and optical isomerism. Effective atomic number rule. Valence bond theory – Introduction, Hybridisation, sp³, dsp², dsp³, d²sp³ & sp³d² - merits & demerits.

UNIT V BONDING IN CO-ORDINATION COMPOUNDS.

Crystal Field theory: Introduction, crystal field splitting in octahedral, tetrahedral & square planar arrangement of ligands - Spectro chemical series - ligand field effect and colour, crystal field stabilization energy and its application - Tetrahedral Vs Octahedral Complexes - John-Teller distortion and its consequences.

Carbonyls: 18 electron rule-Bonding in carbonyls-Preparation and structure of $\text{Ni}(\text{CO})_4$, $\text{Fe}(\text{CO})_5$ and $\text{Cr}(\text{CO})_6$

Text Book(s):

1. Madan, R.D., Modern Inorganic Chemistry, Sultan Chand and Co. Ltd., New Delhi, 2005.
2. Puri, B.R., & Sharma. L.R., Principles of Inorganic Chemistry, Shoban Lal and Nagin Chand & Co., Jalandar, 1989.

Reference Books:

1. Malik, Tuli & Madan, R.D., Selected Topics in Inorganic Chemistry, S. Chand & Co., New Delhi, 1988.
2. Huheey, J.E., Inorganic Chemistry, Harper Collins College Publishers, 1993.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U6CMC8

COURSE TITLE : Physical Chemistry -II

QN.NO : 8627

TIME : 3 Hours

MAX.MARKS :75

UNIT I ELECTROCHEMISTRY – I

Electrolytic conduction – Faraday’s law of electrolysis – conductivities of ions-specific, equivalent and molar conductance – measurements of conductance of electrolytes – variation of conductance with dilution – equivalent conductance at infinite dilution – Kohlrausch’s law of independent migration of ions and its applications – Transference number and its determination by moving boundary method- applications of conductance measurements – conductometric titrations.

Theories of weak and strong electrolytes – Ostwald dilution law – Debye-Huckel theory of strong electrolytes – Activity coefficients of electrolytes – ionic strength – Debye-Huckel limiting law.

UNIT II ELECTROCHEMISTRY – II

Concept of electrochemical cells – cell diagram and terminology – convention regarding signs of cell emf – calculation of cell emf from single electrode potential – standard emf of the cell – Nernst equation – reversible and irreversible cells – thermodynamics and electromotive force – calculation of ΔG , ΔH , ΔS and K for cell reactions – single electrode potential and cell emf measurements of single electrode potential – type of electrodes-reference electrode – calomel electrode – standard electrode potential – electrochemical series – experimental determinations of cell emf – Weston cadmium cell – types of electrochemical cells – commercial cells – primary and secondary cells – dry cell – lead storage cell – Ni-Cd cell – H_2O_2 fuel cell.

UNIT III PHOTOCHEMISTRY

Definition of photochemical reactions – comparative study of thermal and photochemical reactions – laws of photochemistry – Lambert and Beer law – Growhtus-Draper law- Stark-Einstein law – quantum efficiency and its determinations – consequence of light absorption by atoms and molecules – Jablonski diagram – photophysical process – fluorescence, phosphorescence and other deactivating processes – photochemical processes – kinetics of photochemical reactions – gaseous reactions – Hydrogen-halogen reactions (Formation of HCl and HBr and decomposition of HI) – Photochemical equilibrium – flash photolysis – photosensitization, Chemiluminescence – bioluminescence.

UNIT IV IONIC EQUILIBRIUM

Acid and bases – Arrhenius concept – Lewis concept – Lowry Bronsted concept – ionic product of water – ph scale – Common ion effect – buffer solution – acid buffer- basic buffer – calculation of ph of buffer – Henderson’s Hasselbalch equation – Hydrolysis of salts – salts of weak acid & strong base – salt of weak base & strong acid – salt of weak acid weak base – Theory of acid – base indicator – action of phenolphthalein – action of methyl orange – solubility product – applications.

P.T.O.

UNIT V SPECTROSCOPY & GROUP THEORY

a) Spectroscopy - Introduction – electromagnetic radiation – molecular spectra – types of molecular spectra – rotational spectra – rigid rotor – selection rule – IR spectra – selection rule – Hook's law – simple Harmonic oscillator – mode of vibrations in H₂O and CO₂ – electronic spectra – Franck condon principle – ¹H NMR spectra – principle – chemical shift – spin-spin splitting – applications to simple molecules.

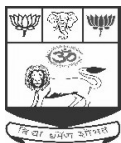
b) Group theory: Definition – group – symmetry – element symmetry operations – principles of simple group – examples – point group for H₂O and NH₃.

Text Book(s):

1. Glasstone, S., "Thermodynamics for Chemists", First Edition (Reprint), van Nostrand & Co., New York, 2005.
2. Rajaram, R. and Kuriacose, J.C., "Thermodynamics", Second Edition, S. Chand and Co., New Delhi, 1993.
3. Rajaram, R. and Kuriacose, J.C., "Kinetics and Mechanism of Chemical Transformation", First Edition, Macmillan India Ltd., New Delhi, 2006.
4. Mc Quarrie, D.A. and Simon, J.D., "Physical Chemistry- A Molecular Approach", First South Asian Edition, Viva Books Pvt. Ltd., New Delhi, 2011.
5. Banwell, C.N. and Mc Cash, E.M. "Fundamental of Molecular Spectroscopy", Fifth Edition, Mc Graw Hill Education (India) Pvt., Ltd., New Delhi, 2013.

Reference Books:

1. Kapoor, K.L., "A Text Book of Physical Chemistry", Volumes 2 & 5, Fourth Edition, Macmillan India Ltd., New Delhi, 2011.
 2. Laidler, K.J. "Chemical Kinetics" Sixth Edition, Pearson Education, New Delhi, 2011.
 3. Ball, D. W., "Physical Chemistry", First Indian Edition, Cengage Rearing India Pvt., Ltd., New Delhi, 2009.
 4. Mortimer, R.G., "Physical Chemistry", Third Edition, Academic Press – An imprint of Elsevier, London, 2009.
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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011

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RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry

COURSE CODE : 17U6CSM4

**COURSE TITLE : Analytical and
Biochemistry**

QN.NO : 8630

TIME : 3 Hours

MAX.MARKS :75

UNIT I CHROMATOGRAPHY

Introduction, classification – principles and applications of: paper, thin layer, column, gas and high performance liquid chromatography (HPLC).

UNIT II DRUG DESIGN

Drug design – A rational approach: Introduction – analogues and prodrugs – Concept of lead: narcotic, antipyretic analgesics and antirheumatic drugs – Factors affecting drug design – Drug design: the method of variation – Drug design through disjunction and conjunction.

UNIT III ERROR ANALYSIS-I

Significant figures – rules for identifying significant figures - Errors – Definition – Absolute and relative error – Types of errors: Determinant and indeterminant errors – Precision – Definition – Expression of precision: Average deviation from the mean, standard deviation and relative standard deviation – variance, co-efficient of variance, correlation co-efficient.

UNIT IV ERROR ANALYSIS-II

Accuracy: Definition – Difference between precision and accuracy – Statistical treatment of analytical data – confidence limits – Rejection of experimental data – Q test – F test – t test.

UNIT V ATOMIC ABSORPTION SPECTROSCOPY

Introduction – Principle of AAS – Difference between atomic absorption and atomic emission – advantages and instrumentation of AAS – Applications: Qualitative and quantitative treatment, determination of metallic elements in medical, food and blood serum.

Text Book(s):

1. Gopalan. R., Subramanian. P.S. Rengarajan. K, Elements of Analytical Chemistry, Vikas Publishing House Pvt. Ltd., New Delhi, 2010..
2. Chatwal and Anand, Instrumental methods of chemical analysis, Himalaya Publishing House, Mumbai, 1998.
3. Morrison, R.T., and Boyd, R.N., Organic Chemistry, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th edition, 1999.
4. Ashutosh Kaur, Medicinal Chemistry, 1st edition, 1998.
5. Jayashree Gosh, Pharmaceutical Chemistry, 1st edition, 1996.

Reference Books:

1. Skoog, West and Holler, Fundamental of Analytical Chemistry.
2. Verma. R.M. Analytical Chemistry, CBS Publishers & Distributors, 2008.

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RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc.,

COURSE CODE : 17U6CAC4

COURSE TITLE : Ancillary Chemistry – IV QN.NO : 8631

TIME : 3 Hours

MAX.MARKS :75

UNIT I THERMODYNAMICS

Scope - Terminology used in thermodynamics - Thermodynamic properties - Zeroth law of thermodynamics - First law thermodynamics. Limitation of first law of thermodynamics. Need for the II law of thermodynamics – Spontaneous and non-spontaneous processes - Entropy - Gibb's free energy - Third law of thermodynamics.

UNIT II ELECTROCHEMISTRY

Introduction – Difference between metallic conductor and electrolytic conductor - Faraday's law of electrolysis – specific resistance – specific conductance – Equivalent conductance – Molar conductance.

Electrochemical cell – electrode potential – standard – Hydrogen electrode - EMF – determination. Reference electrodes – calomel electrode – Nernst equation.

UNIT III COLLOIDS

Colloidal state of matter – various types – Sols – dialysis – electro osmosis – electrophoresis. Emulsion – types of emulsions with examples. Gels: classification and preparation by cooling of sols, double decomposition and by change of solvents. Application of colloids in the following fields: foods, medicine, industrial goods, rubber plating, chrome tanning, Cottrell precipitator and detergent action of soap.

UNIT IV ALKALOIDS

Definition, extraction of alkaloids and general properties structure and biological actions of Conine, Piperine and Nicotine. Extraction of piperine from pepper.

UNIT V TERPENOIDS & DYES

Introduction - Isoprene rule - Classification and occurrence - isolation - Structure and source of Citral, Geraniol and Menthol. (Structural discussion and synthesis are not expected).

Definition and classification- preparation of Methyl Orange, Bismark brown, crystal violet and Malachite green.

Reference books:

- 1 Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
- 2 I.L. Finar, “Organic Chemistry”, Vol. I and II, 6thedn., ELBS, Singapore, 1994.
- 3 Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 20U1CMC1

COURSE TITLE : General Chemistry – I

QN.NO : 10901

TIME : 3 Hours

MAX.MARKS : 75

DEPARTMENT OF CHEMISTRY				CLASS: I B.Sc. Chemistry		
SEM	Course type	Course Code	Course Title	Time	Maximum	Question Number
I	Part-III- Core	20U1CMC1	General Chemistry – I	3 hrs	75 marks	10901

Course Objectives: The objective of this course is to make the student

1. To classify the organic compound based on the different functional groups and illustrate IUPAC nomenclature of organic compounds
2. To predict hybridization and geometry of organic molecule
3. To discuss the electronic effects on physical properties of organic compounds
4. To outline the basic concept on dissociation of bonds, formation and stability of intermediates
5. To categorize bonding and properties of chemical bonds based on the bonds present in it

UNIT-I: Fundamentals in Organic chemistry

Classification of organic compounds - IUPAC system of nomenclature of common organic compounds (upto C-10) - cycloalkanes and aromatic compounds- Naming of organic compounds with one functional group/ two functional groups/heterocyclic compounds containing one and two hetero atoms present in five/six membered rings - calculation of empirical and molecular formulae – definitions and problems - basics in isomerism- Hybridization and geometry of molecules (sp , sp^2 , sp^3) (methane, ethane, ethylene and acetylene) - sigma and pi bonds – Multiple bonds and their characteristics -bond angle, bond length, bond strength of C-H and C-C bonds.

UNIT-II: Basic concepts of Organic compounds-I

Bond polarity of some important bonds (C-C, C-O, C-N, C=C, C-Cl, C=O, H-H, O-H, N-H and S-H bonds -dipole moment of simple organic molecules-- Van der Waal's interactions-Hydrogen bonds-Inter & Intra molecular forces in organic compounds and their effects on physical properties-Electron displacement in organic compounds - Inductive effect- Electromeric effect-Resonance- Resonance theory–Delocalization - vinylic and allylic system- Resonance effect –Hyper conjugation- steric effect - steric overcrowding - steric inhibition of resonance - steric relief (with examples).

UNIT-III: Basic concepts of Organic compounds-II

Dissociation of bonds - Homolysis and Heterolysis – Types of reagent-Free radicals- Carbocation, Carbanion – carbene – Nitrene – structure, geometry and stability of these intermediates-Electrophiles and Nucleophiles - Types of organic reactions - Basic ideas of nucleophilic, electrophilic addition substitution and Elimination reactions (elementary idea with examples) –Energy consideration.

P.T.O.

UNIT-IV: Acid Base Chemistry

Theories of acids and bases – Arrhenius, Bronsted - Lowry theory proton donor - acceptor system. Theory of solvent system, Lewis-electron dot system and: pH of strong and weak acid solutions. Buffer solutions. Henderson equations. Preparation of acidic and basic buffers. Relative strength of acids and bases from K_a and K_b values

Non-aqueous solvents: Classification of solvents – General properties of ionizing solvents chemical reactions. Water, liquid ammonia, liquid SO_2

UNIT-V: Chemical bonding-I

Types of chemical bonds -Ionic bond – illustration of the formation of ionic bond (NaCl, MgO, CaF_2 , Al_2O_3 only) Properties of ionic compounds-factors favoring the ionic compounds- ionization potential – electron affinity – electronegativity – Lattice energy – Born-Haber Cycle – Polarizing power and Polarizability – Partial ionic character from electronegativity. Transition from ionic to covalent character and vice versa – Covalent character of ionic compounds – Fajan's rules – Covalent bond – structure and bonding of homo and heteronuclear molecules (HF , H_2O , NH_3 , O_2 and N_2 only)–Hydrogen bonds in H_2O and NH_3 molecules- Vander Waals forces – ion dipole-dipole interaction- London forces.

Books for Study

1. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, 22nd edn, S Chand & Company, 2016.
2. R. T. Morrison, R. N. Boyd and S.K. Bhattacharjee, Organic chemistry, 7th edn, Pearson Education Asia, 2010
3. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Visal Publishing Co, 2015.
4. R. D. Madan, Modern Inorganic Chemistry, 3rd edn, S. Chand & Company Ltd., Reprint 2014.

Books for Reference

1. I. L. Finar, Organic Chemistry Vol-1& 2, 6th edn, Pearson Education Asia, 2004.
2. P.L. Soni, Text book of Inorganic Chemistry, 20th edn, Sultan chand & Sons, 2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rd edn, New Delhi, Shoban Lal Nagin Chand & Co., 1993.

Web Resources

1. <https://nptel.ac.in/courses/104106119/>
2. <https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/syllabus/>
3. <https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1>

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar
4. Quiz through ICT- Mode

Course Learning Outcome: After successful completion of this course, the student will be able

	CLO statement	Knowledge level
CLO1	To explain organic compounds and its classification with various functional groups	K2
CLO2	To apply IUPAC nomenclature concept to name organic compounds	K3
CLO3	To Find the hybridization and geometry of organic compounds and predict the influence of Electronic effects on the stability of the organic molecules	K3
CLO4	To identify the geometry and stability of organic intermediates formed by homolytic and heterolytic cleavages	K4
CLO5	To apply knowledge about the common themes running through ionic covalent and hydrogen bonding	K3

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

P.T.O.

PSO and CLO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CLO1	3	2		3	2		
CLO2	3	2		3	2		
CLO3	3	2		3	2		
CLO4	3	2		3	2		
CLO5	3	2		3	2		

3-Advance application; 2-Intermediate level;1-Basic level

Blue Print
Mapping with Course Learning Outcomes(CLOs)

S. No.	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1 &K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
3	CLO 3	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
4	CLO 4	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 20U1CMC1

COURSE TITLE : General Chemistry – I

QN.NO : 10902

TIME : 3 Hours

MAX.MARKS : 75

DEPARTMENT OF CHEMISTRY				CLASS: I B.Sc. Chemistry		
SEM	Course type	Course Code	Course Title	Time	Maximum	Question Number
I	Part-III-Core	20U1CMC2	General Chemistry – II	3 hrs	75 marks	10902

Course Objectives: The objective of this course is to make the student

1. To explain the theories of various atomic models, shape of orbitals, and importance of different quantum numbers
2. To discuss the basic concepts of quantum theory and importance of operators
3. To classify the elements based on the atomic numbers in the periodic table and study the knowledge on classification of elements based on atomic number study the factors affecting properties of elements across the periodic table
4. To compare the hybridization and shapes of simple inorganic molecules based on VB and MO and VSEPR theories

Unit-I: Atomic Structure

Introduction to Atomic structure-Rutherford, Bohr, Sommerfeld concepts and its drawbacks- Bohr's model of hydrogen atom-Atomic orbitals and shapes of s, p and d orbitals - Quantum numbers- Principal, Azimuthal, Magnetic and Spin quantum numbers and their significance - Pauli's exclusion principle – Hund's rule- Aufbau Principle, (n+1) rule- Stability of half-filled and completely filled orbitals- inert pair effect.

Unit-II: Introduction to quantum mechanics

Planck's quantum theory - Photoelectric effect, Compton effect-Wave particle duality, de Broglie equation-Davisson –Germer Experiment-Heisenberg uncertainty principle - Eigen function and Eigen value.

Unit-III: Quantum Chemistry

Wave functions and its physical properties -Normalization and Orthogonal function- The significance of the wave function ψ – interpretation of ψ^2 - Postulates of Quantum mechanics - Operators-Hamiltonian, Hermitian and Laplacian -Schrodinger's time independent wave equation. (1D box)

Unit-IV: Periodic properties

Periodic properties – classification of elements as s, p, d and f-block elements – variation of atomic volume – atomic and ionic radii – ionization potential – electron affinity and electro negativity along period and groups – variation of metallic characters - Factors affecting the periodic properties. Periodic table anomalies and variations in atomic radius, ionic radius, electronic configuration, , electron affinity and electro negativity, ionization energy and metallic character of elements along the group and periods and their influences on stability, colour, coordination number, geometry, physical and chemical properties.

Unit-V: Chemical bonding-II

VSEPR Theory – Principles and hybridization- sp , sp^2 , sp^3 sp^3d and sp^3d^2 -Shapes of simple inorganic molecules ($BeCl_2$, BF_3 , $SiCl_4$, PCl_5 , SF_6 , IF_7 , H_2O , NH_3 , XeF_6) – MO Theory – Bonding and anti-bonding molecular orbitals – Applications of MO theory H_2 , He, N_2 , O_2 , HF and CO molecules – Comparison of VB and MO Theories.

Books for Study

1. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rdedn, New Delhi, ShobanLalNagin Chand & Co.,1993.
2. R. D. Madan, Modern Inorganic Chemistry, 3rdedn, S. Chand & Company Ltd., Reprint2014.
3. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd.2000
4. P.L. Soni, Text book of Inorganic Chemistry, 20thedn, Sultan chand& Sons,2000
5. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical hemistry.47thedn, Vishal Publishing Co. 2017.

Books for Reference

1. S. P. Banerjee, Advanced Inorganic Chemistry, 2ndedn, Vol- and 2, ArunabhaSen, Books and Allied (P) Ltd., Kolkata,2017.
2. G.M.Barrow, Physical Chemistry, 6thedn, McGraw-Hill Inc., US,1996.

Web Resources

1. <https://www.khanacademy.org/science/chemistry/chemical-bonds#hybridization-and-hybrid-orbitals-chemistry>
2. <https://ocw.mit.edu/courses/chemistry/5-04-principles-of-inorganic-chemistry-ii-fall-2008/syllabus/>

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar
4. Quiz through ICT- Mode

Course outcome: After successful completion of this course, the student will be able

CLOs	CLO Statement	Knowledge level
CLO1	To interpret atomic models, various quantum numbers and comparing stability of orbitals various orbitals	K2
CLO2	To organize basic concepts of quantum mechanics and the difference between classical and wave mechanics.	K3
CLO3	To apply operators to solve simple eigen values problems and approximation methods used in solving molecular energy.	K3
CLO4	To develop concept of trends in periodic properties and its variation to rationalize the nature of the bonding in substances.	K3
CLO5	To develop the structure and types of bond in inorganic molecules using VB and MO theories.	K4

P.T.O.

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CLO1	3	2		3			
CLO2	3	2		3			
CLO3	3	2		3			
CLO4	3	2		3			
CLO5	3	2		3			

3-Advance application; 2-Intermediate level;1-Basic level

Blue Print**Mapping with Course Learning Outcomes(CLOs)**

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K 3	2	K1&K2	1	K2	2 (K2&K2)	1(K3)
5	CLO 5	Up to K 4	2	K1&K2	1	K2	2 (K4&K4)	1(K4)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Allied Chemistry – I
TIME : 3 Hours

COURSE CODE : 20U1CAC1
QN.NO : 10903
MAX.MARKS :75

<i>DEPARTMENT OF CHEMISTRY</i>				<i>CLASS: I B.Sc. Botany, Zoology, Microbiology & Biotechnology</i>		
SEM	Course type	Course Code	Course Title	Time	Maximum	Question Number
I	Part-III Allied	20U1CAC1	Allied Chemistry – I (For I Botany& Zoology)	3 hrs	75 marks	10903

Course Objectives: The objectives of this course are to make the student

1. To explain the various atomic models and rules for writing electronic configuration
2. To discuss the types of chemical bonds, classification of organic compounds and organic reactions
3. To classify organic compound based on its functional groups
4. To predict the adsorption process and its applications
5. To examine the types of catalysis and its applications

UNIT-I: ATOMIC STRUCTURE

Introduction to structure of atom- Fundamental particles - proton, neutron and electron - Rutherford and Niels Bohr's model of an atom and their defects - Sommerfeld's modification of atomic structure, quantum numbers – Orbitals: shapes of *s*, *p* and *d* orbitals. - Pauli's exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle - Heisenberg's uncertainty principle.

UNIT-II: CHEMICAL BONDING

Types of chemical Bonds – electrovalent(ionic), covalent, co-ordinate covalent, metallic and Hydrogen bonding.Characteristics of electrovalent and covalent compounds. Valence Bond Theory - Types of overlapping (*s-s*, *s-p* and *p-p* overlapping), Sigma and pi bonds, Hybridization- *sp*, *sp*²and *sp*³ hybridization in acetylene, ethylene& methane only.

UNIT-III: INTRODUCTION TO ORGANIC CHEMISTRY

Importance of organic compounds in daily life – Classification of organic compounds. Functional groups – definition – Various functional groups - General formula and examples for the following: Alcohols, Alkyl Halide, Carbonyl compounds (aldehyde and ketone), Carboxylic acids and Amines. Types of organic reactions – Substitution, Addition and Elimination reactions (examples only, not mechanism)

UNIT-IV: SURFACE CHEMISTRY

Definition of adsorption, occlusion, absorption, adsorbent, and adsorbate – Types of adsorption: Physisorption and chemisorption – differences between Physisorption and Chemisorption – various applications of adsorptions – Factors influencing adsorption process- nature of gases, nature of adsorbent, influence of temperature and pressure.

UNIT-V: CATALYSIS

Definition, Characteristics of catalysts - Types of catalyst (Homogeneous catalysis and heterogeneous catalysis) – Acid and base catalysis – Enzyme catalysis with example only: positive catalysis, negative catalysis and auto catalysis – catalytic promoters – catalytic poison-. Intermediate compound formation theory.

Books for Study

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S. and Arun Bahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. Sathya Prakash, Tuli, Basu & Madan, 1999, Advanced Inorganic Chemistry. Vol. II, 17th Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi.
4. Puri, B.R., Sharma, L.R., 1989, Principles of Inorganic Chemistry, Shobhan Lal Nagin Chand and Co., Jalandar.

Books for Reference

1. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.
2. Sharma, B.K., 1989, Polymer Chemistry, Goel Publishing House, Meerut.
3. Mukhopathyay, R. and Datta, S., Engineering Chemistry, New Age international PVL, Publishers, New Delhi.
4. Sharma, B. K., Industrial chemistry, Goel Publishing House, 1994

Web Resources

1. <https://byjus.com/jee/atomic-structure/>
2. [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_\(Physical_and_Theoretical_Chemistry\)/Atomic_Theory/Atomic_Structure](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Atomic_Theory/Atomic_Structure)
3. <https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/syllabus/>
4. [https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1,](https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1)
5. <https://byjus.com/jee/surface-chemistry/>, <http://www.ncert.nic.in/ncerts/l/lech105.pdf>
6. <https://byjus.com/chemistry/catalysis/>

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar
4. Quiz through ICT- Mode

Course Learning Outcomes: After successful completion of this course, the student will be able

CLOs	CLO Statement	Knowledge level
CLO1	To discuss atomic models, and occupancy of electrons on various quantum levels.	K2
CLO2	To develop the overlapping of orbitals and hybridization of simple molecules	K3
CLO3	To find the importance of organic compounds in daily life and to describe the types of organic reactions	K3
CLO4	To inspect the types of adsorption and factors affecting the process	K4
CLO5	To the characteristics of catalyst and to explicate the types of catalysis	K3

P.T.O.

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	PSO 8	PSO 9
CLO1	1						3		
CLO2	1						2		3
CLO3	1						2		3
CLO4	1								3
CLO5	1						3		2

3-Advance application;2-Intermediate level;1-Basic level

Blue Print

Mapping with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1& K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
4	CLO 4	Up to K4	2	K1&K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 3	2	K1&K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011

(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)

RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry

COURSE CODE : 20U2CMC3

COURSE TITLE : General Chemistry-III

QN.NO : 10906

TIME : 3 Hours

MAX.MARKS :75

Course Objectives: The objective of this course is to make the student

1. to explain the preparation and properties of aliphatic compounds
2. to outline the importance of aliphatic hydrocarbons
3. to discuss the synthesis, reactions and stability of alicyclic compounds
4. to identify the significance of alicyclic compounds
5. to discuss the gas laws, various types of molecular velocities and explain the behavior of real gas

Unit-I: Aliphatic Compounds-I

Alkanes - preparations, physical properties, reactions, reactions with radical mechanism for substitution reaction - cracking - Alkenes: Preparation from alcohol, haloalkane, dihaloalkanes and alkynes - reactions of alkenes - mechanisms involved in addition of hydrogen, halogen, hydrogen halide, hypohalous acid, water, hydroboration, hydroxylation, ozonolysis and epoxidation - peroxide effect - allylic substitution, oxidation by KMnO_4 and polymerization.

Unit-II: Aliphatic Compounds-II

Application in the synthesis of following molecules - *cis* and *trans* 2-butene, propanal and 1-methyl cyclohexanol. Alkynes: preparation, reactions - addition of hydrogen, halogen, hydrogen halide, water, HCN, CH_3COOH , hydroboration - dimerisation and cyclisation - acidity of terminal alkynes.

Unit-III: Alicyclic Compounds-I

Cycloalkanes: Preparation (small, medium & large ring compounds) - reactions - cycloaddition, dehalogenation, pyrolysis of calcium salt of dicarboxylic acid - Wurtz reaction- stability of cycloalkanes - Baeyer's strain theory. Cycloalkenes: Preparation and reactions of cycloalkenes.

Unit-IV: Alicyclic Compounds-II

Alicyclic compounds-Preparation of conjugate dienes - reactions - 1,2 and 1,4 addition, polymerization and Diels-Alder reaction - Application in the synthesis of following molecules: *trans* 2-chlorocyclopentanol, *trans*-2 methylcyclopentanol, *cis* and *trans* 1,2 cyclohexanediol, cyclohexene

Unit-V: Gaseous State

Ideal gas: Kinetic theory of gases - derivation of gas laws – Maxwells distribution of molecular velocities - Types of molecular velocities - Expansivity and compressibility – collision diameter – collision frequency – collision number - mean free path. Behaviour of real gas – Deviation from ideal behaviour - van der Waals' equation of state – Virial equation of state – critical constants of gas.

Books for Study

1. ArunBahl and B.S. Bahl, A Text Book of Organic Chemistry, 22ndedn, S Chand & Company, 2016.
2. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Vishal Publishing Co, 2015.
3. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, 47th edition, Vishal Publishing Co, 2016.

Booksfor Reference

1. K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry, 4th edition, Vikas Publishing House Pvt. Ltd, 2017.
2. I.L. Finar, Organic Chemistry Vol-1& 2, 6thedn, Pearson Education Asia, 2004.
3. Bhupinder Mehta and Manju Mehta, Organic Chemistry, 2nd edition, PHI Learning Pvt. Ltd, 2015.
4. N. Tewari, Advanced Organic Reaction Mechanism, 3rd Edition, Books &Allied (P) Ltd, 2011.
5. N. Kundu and S.K. Jain Physical Chemistry, S. Chand & Company Ltd.2000.

Web Resources

1. <https://nptel.ac.in/courses/104/106/104106119/>
2. [https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_\(Petrucci_et_al.\)/26%3A_Structure_of_Organic_Compounds/26.1%3A_Organic_Compounds_and_Structures%3A_An_Overview](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_(Petrucci_et_al.)/26%3A_Structure_of_Organic_Compounds/26.1%3A_Organic_Compounds_and_Structures%3A_An_Overview)
3. <https://brilliant.org/wiki/structural-representations-of-organic-compounds/>

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar/Assignment
4. Quiz through ICT- Mode

Course Learning outcomes: After successful completion of this course, the student will be able

	CLO statement	Knowledge level
CLO1	To prepare and study the properties and reactions of aliphatic compounds.	K3
CLO2	To apply aliphatic compounds for the synthesis of various molecules	K3
CLO3	To organize the knowledge on synthesis, reactions, and importance of alicyclic compounds.	K4
CLO4	To explain the behavior of gases	K2
CLO5	To solve the problems regarding molecular velocities.	K3

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO - 1	PSO - 2	PSO - 3	PSO - 4	PSO - 5	PSO - 6	PSO - 7
CLO1				3		2	2
CLO2				3		3	3
CLO3				3		3	3
CLO4	3						
CLO5	3						

3-Advance application; 2-Intermediate level;1-Basic level

Blue Print

Mapping with Course Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 3	2	K1& K2	1	K1	2 (K3&K3)	1(K3)
2	CLO 2	Up to K 3	2	K1& K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 4	2	K1& K2	1	K2	2 (K4&K4)	1(K4)
4	CLO 4	Up to K 2	2	K1& K2	1	K2	2 (K1&K1)	1(K2)
5	CLO 5	Up to K 3	2	K1& K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

Distribution of Section-wise Marks with K Levels

K Levels	Section A & B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	9	10	--	19	15.83	42%
K2	11	10	10	31	25.83	
K3	-	20	30	50	41.67	42%
K4	-	10	10	20	16.67	16%
Total marks	20	50	50	120	100.00	100%

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PROGRAMME : B.Sc., Chemistry

COURSE CODE : 20U2CMC4

COURSE TITLE : General Chemistry-IV

QN.NO : 10907

TIME : 3 Hours

MAX.MARKS :75

Course Objectives: The objective of this course is to make the student

1. to explain the basic knowledge on the physical properties of liquids
2. to classify the thermotropic liquid crystals
3. to discuss the chemistry of s - block elements and its complexes
4. to design the theory behind the volumetric analysis and to develop the knowledge in the principles of concentration, primary and secondary standards
5. to outline the basic metallurgical processes and gain knowledge on the various refining methods

Unit-I: Liquid State

Liquid state: Physical properties – vapour pressure – Trouton’s rule – surface tension – Effect of temperature on surface tension – capillary rise method - viscosity – effect of pressure and temperature – refraction – refractive index – specific and molar refraction. Liquid crystals: Vapour pressure temperature diagram – thermography – classification of thermotropic liquid crystals – nematic, smectic and cholesteric liquid crystals with examples.

Unit-II: s-block elements

Position of hydrogen in the periodic table, General characteristics of s – block elements – Compounds of s-block metals – oxides, hydroxides, peroxides, superoxide’s-preparation and properties – oxo salts – carbonates – bicarbonates – nitrates – halides and polyhalides. Anomalous behavior of Li and Be – physical and chemical properties of Be – Uses – physical and chemical properties of Mg– Uses-biological importance of sodium and potassium.

SLT - Complexes of s-block metals - complexes with crown ethers - Organometallic compounds of Li and Be.

Unit-III: Principles of Volumetric Analysis

General principle: Types of titrations. Requirements for titrimetric analysis. Concentration systems: Molarity, molality formality, normality, wt%, ppm, milliequivalence and millimoles - problems. Primary and secondary standards, criteria for primary standards, preparation of standard solutions, standardization of solutions. Limitations of volumetric analysis, endpoint and equivalence point. Neutralisation-titration curve, theory of indicators, choice of indicators. Use of phenolphthalein and methyl orange. Metal ion indicators. Problems based on titrimetric analysis.

Unit-IV: Metallurgy-I

Occurrence of metals –basic metallurgical operations and metallurgy process – General methods involved in extraction of metals- concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process. Extraction processes– Chemical reduction – electrolytic reduction – metal displacement.

Unit-V: Metallurgy-II

Refining methods - Zone refining – van Arkel de Boer methods – electrolytic refining – ion exchange method – muffle furnace – Extraction of the following metals: Be, Mg and Al.

Books for Study

1. R. Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, 47th edition, Vishal Publishing Co, 2016.
2. R. Puri and L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, ShobanLalNagin Chand and Co, 1990.
3. R. D. Madan, Modern Inorganic Chemistry, 3rdedn, S. Chand & Company Ltd., Reprint, 2014.

Books for Reference

1. N. Kundu and S.K. Jain, Physical Chemistry, S. Chand & Company Ltd.2000.
2. G.M. Barrow, Physical Chemistry, 6th edn, McGraw-Hill Inc., US, 1996.
3. A.I. Vogel, A Textbook of Quantitative Inorganic Analysis, ELBS and Longman London, 1975.
4. S.M. Khopkar, Basic Concepts of Analytical Chemistry New Age International Publisher, 2009.
5. W. U. Malik, G. D. Tuli, and R. D. Madan: Selected Topic in Inorganic Chemistry, S. Chand & Company Ltd, New Delhi, 1998.
6. P. L. Soni, Mohan Katyal, Text book of Inorganic Chemistry, 20th Edition, Sultan Chand & Sons, New Delhi,2007.

Web Resources

1. <https://en.wikipedia.org/wiki/Liquid>
2. <https://www.britannica.com/science/metallurgy>
3. <https://www.coursehero.com/file/p4nk7p5/1-The-basic-principles-of-volumetric-analysis-are-given-as-below-1-The-one/>
4. <https://www.vedantu.com/chemistry/volumetric-analysis>

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar/Assignment
4. Quiz through ICT- Mode

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PROGRAMME : B.Sc.,

COURSE CODE : 20U2CAC2

COURSE TITLE : Allied Chemistry-II

QN.NO : 10908

TIME : 3 Hours

MAX.MARKS :75

Course Objectives: The objectives of this course are to make the student

1. To understand the modern concepts of acids and bases
2. To study the classification and properties of saccharides
3. To recognize about the basic ideas of amino acid and proteins
4. To learn the different types of fertilizers used for plant growth
5. To know about polymers, corrosion and its prevention

UNIT-I: ACIDS AND BASES

Modern concepts of acids and bases – Arrhenius concept, Bronsted-Lowery concept- Lewis concept – relative strength of acids- relative strength bases –concept of pH – common ion effect – applications - buffer solutions – definition - theory of buffer action and applications – Henderson’s Equation - strength of solutions – normality- molarity – molality.

UNIT-II: CARBOHYDRATES

Monosaccharides: Definition – classification of carbohydrate – monosaccharides – properties and uses of glucose and fructose – configuration of glucose – mutarotation

Disaccharides: Sucrose – manufacture – properties and uses – distinction between sucrose, glucose and fructose.

Polysaccharides: Starch – Structure, properties and uses.

UNIT-III: AMINO ACIDS AND VITAMINS

Amino acids – Definition, general methods of preparation, properties and uses of Glycine and Alanine.

Proteins – Definition, classification, general properties – colour reactions (Xanthoproteic test, Ninhydrin test and Millon’s test) and relationship of amino acid with proteins.

Vitamins: Definition, classification, sources, function and deficiency of vitamins A, B-complex {(Thiamine (B1), Riboflavin (B2), Niacin (B3)} C, D, E and K (structure and synthesis not expected).

UNIT-IV: FERTILIZERS

Plant Nutrient – Macro and micro nutrients -role of various elements in plant growth-classification – natural fertilizer and chemical fertilizer – nitrogenous, phosphatic and potash fertilizers – functions of the following:

Nitrogenous fertilizers: ammonium sulphate, urea.

Phosphatic fertilizers: super phosphate of lime, triple super phosphate of lime.

Potash fertilizers: potassium sulphate, potassium chloride, potassium nitrate.

UNIT-V: INDUSTRIAL CHEMISTRY

(i) POLYMERS

Introduction: Definition of monomer and polymers – classification of polymers based on micro structures (chemical and geometrical). General methods of preparation, properties and uses of the following polymers: polyethylene, poly vinyl chloride and phenol-formaldehyde resins.

ii) CORROSION AND PREVENTION

Definition – Types of corrosion – chemical and electrochemical corrosion– factors affecting corrosion process- nature of metal (position in galvanic series, purity of metal, relative area of corrosion, nature of surface film) - nature of environment (temperature, humidity, impurity, pH) – corrosion control - cathodic protection – sacrificial anodic protection - corrosion inhibitors.

Books for Study

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S. and Arun Bahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. Sathya Prakash, Tuli, Basu & Madan, 1999, Advanced Inorganic Chemistry. Vol. II, 17th Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi.
4. Puri, B.R., Sharma, L.R., 1989, Principles of Inorganic Chemistry, Shobhan Lal Nagin Chand and Co., Jalandar.

Books for Reference

1. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.
2. Sharma, B.K., 1989, Polymer Chemistry, Goel Publishing House, Meerut.
3. Mukhopathyay, R and Datta, S, Engineering Chemistry, New Age international PVL, Publishers, New Delhi.
4. Sharma, B. K., Industrial chemistry, Goel Publishing House, 1994

P.T.O.

The Academic Council, The Madura College (Autonomous): 26th August 2020

Corrected Copy

Web Resources

1. <https://byjus.com/jee/atomic-structure/>
2. [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_\(Physical_and_Theoretical_Chemistry\)/Atomic_Theory/Atomic_Structure](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Atomic_Theory/Atomic_Structure)
3. <https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/syllabus/>
4. [https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1,](https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1)
5. <https://byjus.com/jee/surface-chemistry/>, <http://www.ncert.nic.in/ncerts/l/lech105.pdf>
6. <https://byjus.com/chemistry/catalysis/>

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry

COURSE CODE : 20U3CMC5

COURSE TITLE : General Chemistry - IV

QN.NO : 10911

TIME : 3 Hours

MAX.MARKS :75

Objectives: *The objective of this course is to make the student*

- (i) *To know about aromaticity, aromatic electrophilic substitution and synthesis of some important aromatic compounds.*
- (ii) *To understand the nature of colloids materials*
- (iii) *To understand the basic of first law of thermodynamics and the law of thermochemistry*
- (iv) *To understand the characteristics of elements of Group III A and IV A and the chemistry of silicones*
- (v) *To provide the detailed chemistry about p-block elements especially Nitrogen and Oxygen family.*

Unit	Description	Hours	K-level	CLO
I	Aromatic Compounds Aromaticity - definition - Huckel's rule - consequence of aromaticity - stability, carbon-carbon bond lengths in benzene ring, resonance energy - Comparison of aromaticity of benzenoid and non benzenoid system - Aromatic electrophilic substitution - general pattern of the mechanism involving σ and π complexes, mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction - Energy profile diagrams - Activating and deactivating substituents - orientation in mono substituted benzenes - reactions of aromatic side chain - halogenation and oxidation - Methods of preparation and chemical reactions of alkyl benzenes, naphthalene.	15	K4	CLO-1
II	Colloids Colloids : Definition, Distinguishing characteristics of solutions, colloids and suspensions - Types of colloidal dispersions - Optical properties - Tyndall effect - Kinetic properties - Brownian motion - Electrical properties - Helmholtz and diffuse double layers - electro kinetic or zeta potential - electrophoresis and its applications. Coagulation - methods of coagulation - Hardy Schultz law - Hofmeister series - Protective colloids - protective action - gold number - applications - Emulsions - classification and preparation, Gels - preparation and properties thixotropy, syneresis and imbibition. Applications of colloids.	15	K3	CLO-2
III	First law of Thermodynamics and its applications System-surrounding - Intensive and extensive variables; state and path functions; isolated, closed and open systems - First law of thermodynamics - mathematical form - Heat capacity and its relation between C_p and C_v . Isothermal process: Calculations of w , q , dE and dH for the reversible expansion of ideal gases under isothermal and adiabatic conditions. Joule-Thomson effect - derivation of Joule-Thomson coefficient for ideal gases and real gases, inversion temperatures (T_i). Variation of enthalpy change of reaction with temperature (Kirchhoff's equation). - Hess's law of constant heat of summation.	15	K2	CLO-3
IV	p-block elements - Boron and Carbon family General characteristics of elements of Group III A - Extraction of Boron - Physical and chemical properties of Boron - Diagonal relationship between Boron and Aluminium; Boron and Beryllium - compounds of boron : Borax, Boric acid, Diborane and its structure, Boron nitride - Extraction of Al - Physical and Chemical properties -	15	K3	CLO-4

	uses – compounds of aluminium : Al_2O_3 , $AlCl_3$. General characteristics of elements of Group IV A – Allotropic forms of carbon : Diamond and Graphite – oxides of carbon - preparation of Silicon – Physical and chemical properties of Si – Uses – Oxides of silicon – structures of silicates. Chemistry of silicones – Manufacture of glass – types of glasses.			
V	p-block elements – Nitrogen and Oxygen family General characteristics of elements of V A Group – Preparation of nitrogen – Physical and chemical properties of nitrogen – anomalous behavior of nitrogen with rest of the family members – uses – compounds of nitrogen: hydrazine, hydroxylamine, nitric acid – nitrogen cycle. Preparation of phosphorus – Physical and chemical properties of phosphorus – uses – compounds of phosphorous: PH_3 , PCl_3 , PCl_5 , $POCl_3$, – Nitrogen fertilizers : Urea, Ammonium nitrate – Phosphorous fertilizers: super phosphate of lime, Triple super phosphate – Oxides of nitrogen and Phosphorous – oxoacids of nitrogen and phosphorus – ozone - oxides : acid oxides, basic oxides, neutral oxides, amphoteric oxides, peroxides, sub oxides – sulfur compounds. Anomalous behavior of oxygen.	15	K3	CLO-5

Books for study:

1. R. D. Madan, Modern Inorganic Chemistry, 3rd revised edition., S. Chand & Company Ltd., Reprint 2014.
2. Arun Bahadur B.S. Bahl, A Text Book of Advanced Organic Chemistry, 2nd edn, S Chand & Company, 2016.
3. Puri, Sharma and Pathania, Principles of Physical Chemistry.

Books for reference:

1. K. S. Tewari and N. K. Vishnoi, A Text Book of Organic Chemistry, 4th edition, Vikas Publishing House Pvt Ltd, 2017.
 2. I. L. Finar, Organic Chemistry Vol-1&2, 6th edn, Pearson Education Asia, 2004.
 3. Sp. Banerjee, Advanced Inorganic Chemistry, 2nd Edition, 1st Volume, Arunabha Sen, Books and Allied (P) Ltd., Kolkata, 2017.
- P.T.O.
4. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Visal Publishing Co, 2015.
 5. N. Tewari, Advanced Organic Reaction Mechanism, 3rd Edition, Books & Allied (P) Ltd, 2011.
 6. J. Rajaram and J.C. Kuriacose, Chemical Thermodynamics, Pearson Education, New Delhi, 2013.

Web resources:

1. <https://www.toppr.com/guides/chemistry/the-p-block-elements/group-13-elements-boron-family/>
2. <https://www.brightstorm.com/science/chemistry/the-periodic-table/boron-family-carbon-family-nitrogen-family/>
3. <https://www.khanacademy.org/science/chemistry/states-of-matter-and-intermolecular-forces/mixtures-and-solutions/v/suspensions-colloids-and-solutions>

Rationale for nature of the course

This course will enable the students to enrich the understanding capacity in fundamental principles of Aromatic electrophilic substitution reactions, alkyl benzenes, significance of first law of thermodynamics, understand the chemistry of p-block elements, colloidal substances.

Activities having direct bearing on Skill development/Employability/Entrepreneurship

The basic study of aromaticity, aromatic electrophilic substitution helps the students to understand the aromatic nature of organic compounds. The concept of Tyndall effect, Brownian effect were explained by doing small experiments and chart work. The applications of colloids explained by doing chart work. Through the study of Thermodynamics the student gain the knowledge of thermal effects of reactions.

Pedagogy

- Chalk-Talk Class room Activities
- group Discussion
- seminar
- Quiz through ICT- Mode

Lesson Plan

Unit	Descriptions	Hours	Lecture Mode
I	Aromatic Compounds		
	Aromaticity - definition - Huckel's rule - consequence of aromaticity - stability, carbon- carbon bond lengths in benzene ring, resonance energy. - Comparison of aromaticity of benzenoid and non benzenoid system	3	BB
	Aromatic electrophilic substitution - general pattern of the mechanism involving σ and π complexes, mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction.	4	BB/PPT
	Energy profile diagrams - Activating and deactivating substituents - orientation in mono substituted benzenes.	4	BB
	Alkanes, alkenes, alkynes, (upto C-10) cycloalkanes, and aromatic compounds. reactions of aromatic side chain - halogenation and oxidation - Methods of preparation and chemical reactions of alkyl benzenes, naphthalene.	4	BB/PPT
II	Colloids		
	Colloids : Definition , Distinguishing characteristics of solutions, colloids and suspensions - Types of colloidal dispersions.	4	BB/PPT/Animated Videos
	Optical properties-Tyndall effect- Kinetic properties - Brownian motion.	3	BB/PPT/Animated Videos
	Electrical properties-Helmholtz and diffuse double layers - electrokinetic or zeta potential - electrophoresis and its applications.	4	BB/PPT
	Coagulation - methods of coagulation - Hardy Schultz law - Hofmeister series -Protective colloids - protective action - gold number - applications- Emulsions - classification, preparation, Gels - preparation and properties thixotropy, syneresis and imbibition. Applications of colloids.	4	BB/PPT/Animated Videos
III	First Law Of Thermodynamics And Its Applications		
	System-surrounding-Intensive and extensive variables; state and path functions; isolated, closed and open systems.	2	BB/PPT
	zeroth law of thermodynamics. First law of thermodynamics-mathematical form- Heat capacity and its relation between C_p and C_v . Isothermal process:	2	BB/PPT
	Calculations of w , q , dE and dH for the reversible expansion of ideal gases under isothermal and adiabatic conditions. Joule- Thomson effect.	3	BB/PPT/
	derivation of Joule- Thomson coefficient for ideal gases and real gases, inversion temperatures (T_i).	3	BB
	Transition from ionic to covalent character and vice versa - Covalent character of ionic compounds -Fajan's rules.	2	BB/PPT
	Variation of enthalpy change of reaction with temperature (Kirchoff's equation). Hess's law of constant heat of summation- Bond energy and its calculations.	3	BB/PPT/
IV	p-block elements - Boron and Carbon family		

	General characteristics of elements of Group III A – Extraction of Boron - Physical and chemical properties of Boron.–Diagonal relationship between Boron and Aluminium; Boron and Beryllium.	3	BB/PPT
	Compounds of boron : Borax, Boric acid, Diborane and its structure, Boron nitride.	3	BB/PPT
	Extraction of Al – Physical and Chemical properties - uses – compounds of aluminium: Al ₂ O ₃ , AlCl ₃ .	3	BB/PPT
	General characteristics of elements of Group IV A – Allotropic forms of carbon : Diamond and Graphite –oxides of carbon preparation of Silicon – Physical and chemical properties of Si – Uses.	4	BB/PPT
	Oxides of silicon – structures of silicates. Chemistry of silicones.	1	BB/PPT
	Manufacture of glass – types of glasses –ceramics.	1	BB/PPT
	p-block elements–Nitrogen and Oxygen family		
	characteristics of elements of V A Group – Preparation of nitrogen – Physical and chemical properties of nitrogen - anomalous behavior of nitrogen with rest of the family members-uses.	3	BB/PPT/Animated Videos
	compounds of nitrogen : hydrazine, hydroxylamine, nitric acid – nitrogen cycle. Preparation of phosphorus – Physical and chemical properties of phosphorus – uses	4	BB/PPT
	Electronic effects - inductive effect, resonance effect - drawing of resonance structures - conditions for resonance - stability of resonance structures,	3	BB/PPT/Animated Videos
V	compounds of phosphorous: PH ₃ , PCl ₃ , PCl ₅ , POCl ₃ . Nitrogen fertilizers : Urea, Ammonium nitrate – Phosphorous fertilizers: super phosphate of lime, Triple super phosphate – Oxides of nitrogen and Phosphorous – oxoacids of nitrogen and phosphorus, ozone.-oxides: acidic oxides, basic oxides, neutral oxides, amphoteric oxides, peroxides, sub oxides - sulfuryl compounds. Anomalous behavior of oxygen.	5	BB/PPT/Animated Videos
Total Hours		75	

BB-Block board/Chalk and Talk

PPT-Power point presentation

After successful completion of this course, the students will be able to

CLOs	CLO statement	Knowledge level
CLO-1	Analyze the knowledge of aromaticity, its orientation, reactivity towards electrophilic substitution reactions.	Up to K4
CLO-2	Apply chemistry of colloids, properties and its application on emulsion material	Up to K3
CLO-3	Describe concepts in thermodynamics, different thermodynamic quantities such as heat and work and how they are measured, related or transformed from one to the other	Up to K2
CLO-4	Organize outline the chemistry of p-block elements, specifically Boron and Carbon family its extraction, properties and importance of silicate in glass industries	Up to K3

CLO-5	Organize chemistry of p-block elements- Nitrogen , phosphorous Oxygen and sulphur family.	Up to K3
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PO and CLO Mapping

	PO-1	PO-2	PO-3	PO-4	PO-5
CLO-1	1	3	2	2	2
CLO-2	1	3	2	2	2
CLO-3	1	3	1	2	2
CLO-4	1	3	2	1	2
CLO-5	1	3	2	1	2

PLO and CLO mapping

	PLO-1	PLO-2	PLO-3	PLO-4	PLO-5	PLO-6	PLO-7
CLO-1	3	3	-	3	-	1	-
CLO-2	3	3	-	3	-	1	-
CLO-3	3	3	-	3	-	1	-
CLO-4	3	3	-	3	-	1	-
CLO-5	3	3	-	3	-	1	-

**Learning Outcome Based Education(LOBE) &Assesment
Formative Examination I & II -Blue Print
Articulation Mapping - K Levels with Course Outcomes (CLOs)**

Sl. No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLOx	Up to K2/K3	2	K1& K2	2	K1,K2	2 (K2&K2)	1(K2/K3)	
2	CLOy	Up to K3/K4	2	K1& K2	1	K2	2 (K3&K3)	2 (K3, K3/ K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

- K1- Remembering and recalling facts with specific answers
 K2- Basic understanding of facts and stating main ideas with general answers.
 K3- Application oriented- Solving Problems
 K4- Examining, analysing, presentation and make inferences with evidences

Learning Outcome Based Education (LOBE) & Assessment
Summative Examination -Blue Print
Articulation Mapping - K Levels with Course Outcomes (CLOs)

S. No.	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 4	2	K1 &K2	1	K2	2 (K4&K4)	1(K4)
2	CLO 2	Up to K 3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
4	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1- Remembering and recalling facts with specific answers
 K2- Basic understanding of facts and stating main ideas with general answers
 K3- Application oriented- Solving Problems
 K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise marks with K-levels

K levels	Section A (No choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42
K4	-	-	10	10	20	16.67	16
Total Marks	10	10	50	50	120	100.00	100

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc., Chemistry
COURSE TITLE : Industrial Chemistry
TIME : 3 Hours

COURSE CODE : 20U3CSM1
QN.NO : 10913
MAX.MARKS :75

Objectives: *The objective of this course is to make the student*

- (i) *To impart the knowledge about the different kinds of fuels and principles of combustion*
- (ii) *To learn types of cracking in petroleum products and synthetic petrol*
- (iii) *To aware about non-petroleum products*
- (iv) *To gain basic knowledge of fireworks, explosive*
- (v) *To enable the students to understand various protective coating methods*

Unit	Description	Hours	K-Level	CLO
I	Fuels and Combustion Introduction, Classification of fuels, Characteristic of good fuel, Calorific fuel, Determination of Calorific value of solid fuel by Bomb Calorimeter – Determination of calorific value of gaseous fuel, boy’s gas calorimeter, Theoretical calculation of calorific value, Combustion, calculation of air qualities.	6	K2	CLO-1
II	Petroleum Products Fractional distillation of crude petroleum, Cracking, Definition and classification and types of cracking:, fixed bed catalytic cracking, moving bed catalytic cracking, Synthetic petrol – polymerization, Bergius method, Octane number, Knocking and Anti-knocking number, Gasoline, Reforming, Cetane number.	6	K3	CLO-2
III	Non Petroleum Products Manufacture of power alcohol from lignocellulose, natural gas, coal gas, oil gas, synthetic gas, producer gas and water gas.	6	K3	CLO-3
IV	Fireworks and Explosives Fireworks, Definition-Composition of fireworks Principle behind explosion of Fireworks and safety measure of fire works Explosives, definition, characteristics of good explosive, classification of explosive, precaution during storage of explosive, manufacture of some important explosive – Mercury fulminate, (TNT), Nitro glycerine, PETN	6	K4	CLO-4
V	Protective Coatings Introduction, Metallic coatings – Electro plating, Definition, Characteristics, Factors influencing electro plating, General Methods of Electroplating – Electro plating of copper and nickel- Organic coating, paint – Definition Requisites of Good paint, Constituents and their role in paints, formulation of paints, disadvantageous of paint film	6	K2	CLO-5

Books for Study:

1. P. Kannan, A. Ravikrishnan, Engineering Chemistry, Sri Krishna Hitech Publishing Company, 10th edition, 2013.
2. O. P. Vermani, A. K. Narula: Industrial Chemistry, Galgotia Publications Pvt. Ltd., NewDelhi, 2000.
3. M.G. Arora, M. Singh, Industrial Chemistry, Anmol Publications, 1st edition, Reprint 2004.

Books for Reference:

1. P. C. Jain, M. Jain, Engineering Chemistry, Dhanpat Rai & Sons, Delhi. 16th edition, 2018.
2. B.K. Sharma - Industrial Chemistry – (Goel Publishing House, Meerut) 2000.
3. S. S. Dara: A Textbook of Engineering Chemistry, S. Chand & Company Ltd. New Delhi, 2000.
4. Gavhane, K. A. Chemical reaction engineering-I, NiraliPrakashan publications, 17th edition, 2016.
5. S. Chawla, Theory and practices of engineering chemistry– Dhanpat Rai & Co, 2008
6. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi 2000.

Web Resources:

1. https://www.lkouniv.ac.in/site/writereaddata/siteContent/202004132159500424ranvijay_engg_Fuels.pdf
2. https://stannescet.ac.in/cms/staff/qbank/CSE/Notes/CY8151-Engineering%20Chemistry-1908708516-unit_4.pdf
3. [https://hithaldia.in/faculty/sas_faculty/Dr_Gora_Das/Class%20Notes%20\(CH-101%20&CH-201\)%20Module-5%20\(Industrial%20Chemistry\).pdf](https://hithaldia.in/faculty/sas_faculty/Dr_Gora_Das/Class%20Notes%20(CH-101%20&CH-201)%20Module-5%20(Industrial%20Chemistry).pdf)
4. <https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod2.pdf>
5. <https://www.erforum.net/2016/01/engineering-chemistry-by-jain-and-jain-pdf-free-ebook.html>
6. <https://nptel.ac.in/content/storage2/courses/103103029/pdf/mod2.pdf>

Rationale for Nature of the course

This course should enable the students to get exposure about industries of Petroleum and Non-Petroleum products,. Further students to know principles of combustion and gain the basic knowledge about Fireworks, Explosives and know about the various types of corrosion and their basic prevention techniques

Activities having direct bearing on Skill development/ Employability/Entrepreneurship

The Students observing the various industrial operation and capable of correlating those process with basic principle and The Techniques studied in this course .Finally They have been asked to prepare and submit the summary of Report which comprise of what they observe, understand and Analyse

Pedagogy

- Chalk-Talk class room activities
- Group Discussion
- Seminar/Assignment
- Quiz through ICT- Mode

Lesson Plan

Unit	Descriptions	Hours	Lecture Mode
I	FuelsandCombustion		
	Introduction, Classification of fuels, Characteristic of good fuel, Calorific fuel, Determination of Calorific value of solid fuel by Bomb Calorimeter .	2	BB
	Determination of calorific value of gaseous fuel, boy's gas calorimeter,	2	BB/PPT
	Theoretical calculation of calorific value, Combustion, calculation of air qualities.	2	BB
II	PetroleumProducts		
	Fractional distillation of crude petroleum, Cracking, Definition and classification and types of cracking:, fixed bed catalytic cracking, moving bed catalytic cracking,	3	BB/PPT/
	Synthetic petrol – polymerization, Bergius method, Octane number, Knocking and Anti-knocking number, Gasoline, Reforming, Cetanenumber	3	BB/ PPT
III	Non-PetroleumProducts		
	Manufacture of power alcoholfrom lignocelluloseand natural gas.	2	BB
	Manufacture of coal gas and oil gas	2	BB/PPT
	Manufacture of synthetic, gas producer gas and water gas.	2	BB
IV	Fireworks and Explosives		
	Fireworks, Definition-Composition of fireworks Principle behind explosion of Fireworks and safety measure of fireworks	2	BB/PPT
	Explosives, definition, characteristics of good explosive, classification of explosive, precaution during storage of explosive.	2	BB/PPT
	Manufacture of some important explosive – Mercury fulminate, (TNT), Nitro glycerin,PETN	2	BB/PPT
V	ProtectiveCoatings		
	Introduction, Metallic coatings – Electro plating, Definition, Characteristics, Factors influencing electro plating	2	BB/PPT/Animated Videos
	General Methods of Electroplating – Electro plating of copper and nickel- Organic coating	2	BB/PPT/Animated Videos
	Paint – Definition Requisites of Good paint, Constituents and their role in paints, formulation of	2	BB/PPT/Animated Videos

paints, disadvantageous of paint film		
Total Hours	30	

BB-Block board/Chalk and Talk

PPT-Power point presentation

CLOs	CLO statement	Knowledge level
CLO1	Learning classification of fuels and calorific value	Up to K2
CLO2	Know cracking of petrol and synthetic petrol preparation	Up to K3
CLO3	Study the manufacture of non-petroleum products	Up to K3
CLO4	Understand the basic principle fireworks, explosive and propellants	Up to K4
CLO5	Gain the knowledge of various coating methods	Up to K2

PO and CLO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	1	2	2	2	3
CLO2	1	1	1	2	3
CLO3	1	1	1	2	3
CLO4	1	1	1	2	3
CLO5	1	2	1	2	3

PSO and CLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO1	3	1	2	1	2	2	1
CLO2	1	1	1	1	1	2	1
CLO3	2	1	1	1	1	2	1
CLO4	1	1	1	1	1	2	1
CLO5	2	1	2	1	1	2	1

3-Advance application;

2-Intermediate level;

1-Basic level

Learning Outcome Based Education(LOBE) & Assessment

Formative Examinations I & II -Blue Print

Articulation Mapping - K Levels with Course Outcomes (CLOs)

Sl. No	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)	Total
			MCQs		Short Answers				
			No. of Questions	K- Level	No. of Questions	K- Level			
1	CLOx	Up to K2/K3	2	K1& K2	2	K1,K2	2 (K2&K2)	1(K2/K3)	
2	CLOy	Up to K3/K4	2	K1& K2	1	K2	2 (K3&K3)	2 (K3, K3/ K4)	
No. of Questions to be asked			4		3		4	3	14
No. of Questions to be answered			4		3		2	2	11
Marks for each question			1		2		5	10	
Total Marks for each section			4		6		10	20	40

Learning Outcome Based Education(LOBE) & Assessment

Summative Examination -Blue Print

Articulation Mapping - K Levels with Course Outcomes (CLOs)

S. No.	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1 & K2	1	K2	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
3	CLO 3	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)

4	CLO 4	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
5	CLO 5	Up to K 2	2	K1 & K2	1	K2	2 (K1&K1)	1(K2)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

Distribution of Section-wise Marks with K Levels

K levels	Section A (No choice)	Section B (No choice)	Section C (Either/or)	Section D (Open choice)	Total Marks	% of marks without choice	Consolidated
K1	5	4	10	-	19	15.83	42
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42
K4	-	-	10	10	20	16.67	16
Total Marks	10	10	50	50	120	100.00	100

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THE MADURA COLLEGE (Autonomous), MADURAI – 625 011
(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : NME - Chemistry
COURSE TITLE : Applied Chemistry
TIME : 3 Hours

COURSE CODE : 20U3CNM1
QN.NO : 10914
MAX.MARKS :75

Objectives: *The objective of this course is to make the student*

- (i) *To learn environmental management and planning*
- (ii) *To study about the hardness of water and their removal*
- (iii) *To know role of fertilizer in plant growth*
- (iv) *To learn how to make soap, detergents and insecticides*
- (v) *To understand fuels and classification*

Unit	Description	Hours	K-Level	CLO
I	ENVIRONMENTAL POLLUTION Definition – Causes, effect and control measures of air pollution (Greenhouse effect, Global warming, acid rain) - water pollution – Causes, effect and control measure.	6	K2	CLO-1
II	WASTE TREATMENT/MANAGEMENT Classification – Solid waste disposal, Solid waste management – Waste water treatment (domestic process – aerobic process – industrial process – Electrolysis process)	6	K2	CLO-2
III	AGRICULTURE Definition: Nutrition for plants - role of various elements in plant growth- natural and chemical fertilizer- preparation and uses of urea, NPK, super phosphate of lime and potash	6	K2	CLO-3
IV	SOAPS, DETERGENTS & INSECTICIDES Soaps and detergents: Preparation and types – cleansing action of soap. Insecticides: Definition, classification according to their action- preparation and uses of DDT, BHC and Bordeaux mixture.	6	K2	CLO-4
V	FUELS Introduction – classification of fuels – characteristics of good fuel – calorific value of a fuel – Gaseous fuels - advantages of gaseous fuel – composition of coal gas, LPG, Bio gas and gobar gas.	6	K2	CLO-5

Books for Study:

1. Environmental Chemistry seventh edition A.K. De, New age international publishers, 2007.
2. Industrial Chemistry, B.K. Sharma, GOEL Publishing House, Meerut, 1997.

P.T.O.

Books For reference:

1. Engineering Chemistry 15th Edition, Jain, Jain - Dhanpath Rai publishing company (PVL), New Delhi.
2. Fundamental concepts of Applied Chemistry, J. Ghosh, S. Chand Limited, Nagpur, 2006.
3. Advanced Organic Chemistry, Bhal, B.S. and Arun Bahl, 2004, S. Chand and Co. Ltd, New Delhi.

Web Resources:

1. <https://en.wikipedia.org/wiki/Pollution>
2. https://www.geo.lu.lv/fileadmin/user_upload/lu_portal/projekti/gzzf/zinas/8.LECTURE-Environmental_pollution.pdf
3. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/103107081/lec11.pdf
4. http://eacharya.inflibnet.ac.in/data-server/eacharya-documents/55daa452e41301c73a2cb5ac_INFIEP_208/798/ET/lec%20-%205.pdf
5. <https://www.svce.ac.in/departments/chemistry/CITM/CY%206251/Engg.%20Chem.%20%20%20%20II%20word/Unit%20V%20-%20Fuels%20&%20Combustion.pdf>

Rationale for Nature of the course

This course offers students a theoretical understanding of experiential learning programs and illustrative how experiential learning programs are used in day today life environmental pollution, waste water treatment process different types of fertilizers used for plant growth, preparation and various types of soaps, detergents and insecticides, introduction, classification and characterization of fuels.

Activities having direct bearing on Skill development / Employability / Entrepreneurship

The basic study of diary chemistry helps the students to understand create awareness causes and control of water and air pollution. They should know about the importance of waste treatment and water purification. The students can easily understanding need of fertilizers for the growth of plants. And also, they should learning cleaning action of soap and detergent and action of insecticides. Finally the students can able to study the calorific value of fuels and composition of gases fuels

Pedagogy

- Chalk-Talk class room activities
- Group Discussion
- Seminar/Assignment
- Quiz through ICT- Mode

Lesson Plan

Unit	Descriptions	Hours	Lecture Mode
I	ENVIRONMENTAL POLLUTION		
	Definition – Causes, effect and control measures of air pollution.	2	Chalk and talk, Group discussion/ Animated Videos
	Greenhouse effect, Global warming, acid rain	2	
	Water pollution – Causes, effect and control measure.	2	
II	WASTE TREATMENT/MANAGEMENT		
	Waste classification – Solid waste disposal, Solid waste management	2	PPT, Chalk and talk, Group discussion/ Animated Videos/BB
	Waste water treatment – domestic process	2	
	Waste water treatment – aerobic process – industrial process – Electrolysis process	2	
III	AGRICULTURE		
	Definition: Nutrition for plants - role of various elements in plant growth	2	PPT, Chalk and talk, Group discussion/ Animated Videos/BB
	Natural and chemical fertilizer	2	
	Preparation and uses of fertilizer - urea, NPK, super phosphate of lime, potash	2	
IV	SOAP, DETERGENTS & INSECTICIDES		
	Preparation of soap – Type of soap	1	PPT, Chalk and talk, Group discussion/ Animated Videos/BB
	Detergents – classification of detergents (cationic anionic) - cleansing action of soap.	2	
	Definition, classification according to their action preparation and uses of DDT	2	
	Preparation and uses of BHC, Bordeaux mixture	1	
V	FUELS		
	Introduction – classification of fuels – characteristics of good fuel	2	PPT, Chalk and talk, Group discussion/ Animated Videos/BB
	Calorific value of a fuel - Gaseous fuels - advantages of gaseous fuel	2	
	Composition of coal gas, LPG, Bio-gas and gobar gas.	2	
Total Hours		30	

BB-Block board/Chalk and Talk, PPT-Power point presentation

Course Learning outcome: After successful completion of this course, the student will be able

On the successful completion of the course, students will be able to

CLOs	CLO Statement	Knowledge level
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CLO1	Create awareness causes and control of water and air pollution	Up to K2
CLO2	Know the importance of waste treatment and water purification	Up to K2
CLO3	Understanding need of fertilizers for the growth of plants	Up to K2
CLO4	Understand the cleaning action of soap and detergent and action of insecticides	Up to K2
CLO5	Know the calorific value of fuels and composition of gases fuels	Up to K2

PO and CLO Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2	3	1	3
CLO2	3	3	3	-	-
CLO3	3	-	3	1	3
CLO4	3	-	3	-	-
CLO5	3	-	3	-	1

3-Strongcorrelation

2-Mediumcorrelation

1-WeakCorrelation

PLO and CLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO1	3	3	1	-	-	3	-
CLO2	1	2	1	-	-	3	-
CLO3	1	2	1	-	-	3	-
CLO4	1	2	1	-	-	3	-
CLO5	1	2	1	-	-	3	-

3-Advance application;

2-Intermediate level;

1-Basic level

Learning Outcome Based Education (LOBE) & Assessment

Formative Examination - I & II -Blue Print

Articulation Mapping - K Levels with Course Outcomes (CLOs)

S. No.	CLOs	K- Level	Section A		Section B (Either/or Choice)	Section C (Open Choice)
			Short Answers			
			No. of Questions	K- Level		
1	CLO x	Up to K 2	2	K1, K1	2 (K2 &K2)	1(K1)
2	CLO y	Up to K 2	3	K1, K1,K1	2 (K2 &K2)	2(K1, K1)
No. of Questions to be asked			5		4	3
No. of Questions to be answered			5		2	2
Marks for each question			2		5	10
Total Marks for each section			10		10	20

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Learning Outcome Based Education (LOBE) & Assessment

Summative Examination – Blue Print

Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (open Choice)
			Short answers		(Either/or Choice)		
			No. of Questions	K- Level	No. of Questions	K- Level	
1	CLO 1	Up to K 2	1	K1	2	(K2&K2)	1(K1)
2	CLO 2	Up to K 2	1	K1	2	(K2&K2)	1(K1)
3	CLO 3	Up to K 2	1	K1	2	(K2&K2)	1(K1)
4	CLO 4	Up to K 2	1	K1	2	(K2&K2)	1(K1)
5	CLO 5	Up to K 2	1	K1	2	(K2&K2)	1(K1)
No. of Questions to be asked			5		10		5
No. of Questions to be answered			5		5		3

Marks for each question	2		7		10
Total Marks for each section	10		35		30

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers.

Distribution of Section-wise marks with K-levels

K Levels	Section A (No Choice)	Section B (Either / or)	Section C (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	10		50	60	46	46
K2	-	70		70	54	54
Total marks	10	70	50	130	100	100

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(AFFILIATED TO MADURAI KAMARAJ UNIVERSITY)
RE-ACCREDITED (3rd Cycle) WITH “A” GRADE BY NAAC

PROGRAMME : B.Sc.,

COURSE CODE : 20U3CAC1

COURSE TITLE : Allied Chemistry – II

QN.NO : 10915

TIME : 3 Hours

MAX.MARKS :75

Course Objectives: *The objectives of this course are to make the student*

- (i) *To explain the various atomic models and rules for writing electronic configuration*
- (ii) *To discuss the types of chemical bonds, classification of organic compounds and organic reactions*
- (iii) *To classify organic compound based on its functional groups*
- (iv) *To predict the adsorption process and its applications*
- (v) *To examine the types of catalysis and its applications*

Unit	Course Contents	Hours	K-Level	CLO
I	Introduction to structure of atom- Fundamental particles - proton, neutron and electron - Rutherford and Niels Bohr's model of an atom and their defects - Sommerfeld's modification of atomic structure, quantum numbers – Orbitals: shapes of <i>s</i> , <i>p</i> and <i>d</i> orbitals. - Pauli's exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle - Heisenberg's uncertainty principle.	12	K2	CLO-1
II	Types of chemical Bonds – electrovalent (ionic), covalent, coordinate covalent, metallic and Hydrogen bonding. Characteristics of electrovalent and covalent compounds. Valence Bond Theory - Types of overlapping (<i>s-s</i> , <i>s-p</i> and <i>p-p</i> overlapping), Sigma and pi bonds, Hybridization- <i>sp</i> , <i>sp</i> ² and <i>sp</i> ³ hybridization in acetylene, ethylene & methane only.	12	K4	CLO-2
III	Importance of organic compounds in daily life – Classification of organic compounds. Functional groups – definition – Various functional groups - General formula and examples for the following: Alcohols, Alkyl Halide, Carbonyl compounds (aldehyde and ketone), Carboxylic acids and Amines. Types of organic reactions – Substitution, Addition and Elimination reactions (examples only, not mechanism)	12	K3	CLO-3
IV	Definition of adsorption, occlusion, absorption, adsorbent, and adsorbate – Types of adsorption: Physisorption and chemisorption – differences between Physisorption and Chemisorption – various applications of adsorptions – Factors influencing adsorption process- nature of gases, nature of adsorbent, influence of temperature and pressure.	12	K3	CLO-4
V	Definition, Characteristics of catalysts - Types of catalyst (Homogeneous catalysis and heterogeneous catalysis) – Acid and base catalysis – Enzyme catalysis with example only: positive catalysis, negative catalysis and auto catalysis – catalytic promoters – catalytic poison-. Intermediate compound formation theory-adsorption isotherm.	12	K3	CLO-5

Books for study:

1. Puri, B.R., Sharma, L.R. and Pathania, M.S., 2004 (41stEdn.), Principles of Physical Chemistry, S.N. Chand and Co., New Delhi.
2. Bhal, B.S. and ArunBahl, 2004, Advanced Organic Chemistry, S. Chand and Co. Ltd., New Delhi.
3. Sathya Prakash, Tuli, Basu & Madan, 1999, Advanced Inorganic Chemistry. Vol. II, 17th Revised Edition, S. Chand and Co. Ltd., Ram Nagar., New Delhi.

Books for reference:

1. Morrison, R.T., and Boyd, R.N., 1999, Organic Chemistry, Prentice-Hall of India, Pvt. Ltd., New Delhi.
2. Sharma, B.K., 1989, Polymer Chemistry, Goel Publishing House, Meerut.
3. Mukhopathyay. R and Datta. S, Engineering Chemistry, New Age international PVL, Publishers, New Delhi, 2007

4. Sharma, B. K., Industrial chemistry, Goel Publishing House, 1994

Web Resources:

1. <https://byjus.com/jee/atomic-structure/>
2. [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_\(Physical_and_Theoretical_Chemistry\)/Atomic_Theory/Atomic_Structure](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Atomic_Theory/Atomic_Structure)
3. [https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1,](https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1)
4. <https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/syllabus/>
5. <https://byjus.com/jee/surface-chemistry/>, <http://www.ncert.nic.in/ncerts/l/lech105.pdf>
6. <https://byjus.com/chemistry/catalysis/>

Rationale for Nature of the course

The basic knowledge and concept of atom models and shape of orbitals in molecules. The concept of valence bond theory, Hybridization will help the student to understand the structure of molecules. To understand the reaction mechanism and its pathway to ensure the knowledge of organic reactions. To comprehend the concept of surface chemistry, application and catalysis involved in various reactions.

Activities having direct bearing on Skill development / Employability / Entrepreneurship

To comprehend the basic ideas of atom models and particle present in it. To enable the basic knowledge of organic reactions and its pathway. To know the shape, size, bond angle and geometry of the molecules based on hybridisation concept. To enable the study of adsorption and its isotherms and applicable catalyst in various chemical reactions.

Pedagogy

Chalk and Talk, PPT, Quiz, Group discussion, Seminar, Interaction, Problem solving

Lesson plan:

Unit	Descriptions	Staff Name	Hours	Lecture Mode
I	ATOMIC STRUCTURE			
	Introduction to structure of atom- Fundamental particles - proton, neutron and electron	-	1	PPT, Chalk and talk, Quiz and Group discussion
	Rutherford and Niels Bohr's model of an atom and their defects	-	2	
	Sommerfeld's modification of atomic structure, quantum numbers	-	1	
	Orbitals: shapes of s, p and d orbitals. .	-	4	
	Pauli's exclusion principle - Hund's rule of maximum multiplicity - Aufbau principle - Heisenberg's uncertainty principle	-	4	
II	CHEMICAL BONDING			
	Types of chemical Bonds – electrovalent(ionic), covalent	-	1	PPT, Chalk and talk, Quiz and Group discussion
	co-ordinate covalent, metallic and Hydrogen bonding	-	2	
	Characteristics of electrovalent and covalent compounds	-	1	
	Valence Bond Theory - Types of overlapping (s-s, s-p and p-p overlapping), Sigma and pi bonds	-	3	
	Sigma and pi bonds	-	2	
Hybridization- sp , sp^2 and sp^3 hybridization in, acetylene, ethylene & methane only.	-	3		
III	INTRODUCTION TO ORGANIC CHEMISTRY			
	Importance of organic compounds in daily life – Classification of organic compounds	-	1	PPT, Chalk and talk, Quiz and Group discussion
	Functional groups – definition – various functional groups	-	2	
	General formula and examples for the following: Alcohols, Alkyl Halide, Carbonyl compounds (aldehyde and ketone)	-	4	
	Carboxylic acids and Amines. Types of organic reactions – Substitution	-	3	
	Addition and Elimination reactions (examples	-	2	

	only, not mechanism)			
IV	SURFACE CHEMISTRY			
	Definition of adsorption, occlusion, absorption	-	2	PPT, Chalk and talk, Quiz and Group discussion
	adsorbent, and adsorbate – Types of adsorption	-	2	
	Physisorption and chemisorption – differences between Physisorption and Chemisorption	-	4	
various applications of adsorptions – factors influencing adsorption process- nature of gases, nature of adsorbent, influence of temperature and pressure.	-	4		
V	CATALYSIS			
	Definition, Characteristics of catalysts - Types of catalyst	-	1	PPT, Chalk and talk, Quiz and Group discussion
	(Homogeneous catalysis and heterogeneous catalysis) – Acid and base catalysis	-	4	
	Enzyme catalysis with example only: positive catalysis, negative catalysis	-	3	
	auto catalysis – catalytic promoters	-	2	
catalytic poison-. Intermediate compound formation theory- adsorption isotherm.	-	2		
Total Hours			60	

Courselearning Outcomes

On the successful completion of the course, students will be able to

CLOs	CLO Statement	Knowledge level
CLO1	To discuss atomic models, and occupancy of electrons on various quantum levels.	Up to K2
CLO2	To illustrate the overlapping of orbitals and hybridization of simple molecules	Up to K4
CLO3	To find the importance of organic compounds in daily life and to describe the types of organic reactions	Up to K3
CLO4	To inspect the types of adsorption and factors affecting the process	Up to K3
CLO5	To identify the characteristics of catalyst and to explicate the types of catalysis	Up to K3

POs and COs Mapping

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2	2	1	1
CLO2	3	2	1		1
CLO3	3	2	2	1	
CLO4	3	2	1	2	1
CLO5	3	2	1	1	2

PLOs and CLOs Mapping (Department of Mathematics)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8
CLO1	1	-	-	-	-	-	-	-
CLO2	1	-	-	-	-	-	-	-
CLO3	1	-	-	-	-	-	-	-
CLO4	1	-	-	-	-	-	-	-
CLO5	1	-	-	-	-	-	-	-

3-Advance application;

2-Intermediate level;

1-Basic level

PLO and CLO Mapping (Department of Physics)

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7
CLO1	3						
CLO2	3						
CLO3	3						
CLO4	3						
CLO5	3						

3-Advance application;

2-Intermediate level;

1-Basic level

Learning Outcome Based Education (LOBE) & Assessment
Formative Examinations I & II – Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

Units	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO x	Up to K 2/K3	2	K1& K2	2	K1,K2	2 (K2&K2)	1(K2/K3)
2	CLO y	K3/K 4	2	K1& K2	1	K2	2 (K3&K3)	2(K3, K3/K4)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each question			1		2		5	10
Total Marks for each section			4		6		10	20

- K1-Rememberingandrecallingfactswithspecificanswers
K2-Basicunderstandingoffactsandstatingmainideaswithgeneralanswers
K3-Applicationoriented-SolvingProblems
K4-Examining,analysing,presentationandmakeinferenceswith evidences

Learning Outcome Based Education (LOBE) & Assessment
Summative Examination – Blue Print
Articulation Mapping-K Levels with Courses Learning Outcomes (CLOs)

S. No.	CLOs	K- Level	Section A		Section B		Section C (Either/or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K- Level	No. of Questions	K- Level		
1	CLO 1	Up to K 2	2	K1 & K2	1	K2	2 (K1&K1)	1(K2)
2	CLO 2	Up to K 4	2	K1 & K2	1	K2	2 (K4&K4)	1(K4)
3	CLO 3	Up to K 3	2	K1 & K2	1	K1	2 (K2&K2)	1(K3)
4	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K 3	2	K1 & K2	1	K2	2 (K3&K3)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30

- K1-Rememberingandrecallingfactswithspecificanswers
K2-Basicunderstandingoffactsandstatingmainideaswithgeneralanswers
K3-Applicationoriented-SolvingProblems
K4-Examining,analysing,presentationandmakeinferenceswith evidences

Distribution of Section-wise Marks with K Levels

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either / or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	--	19	15.83	42%
K2	5	6	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42%
K4	-	-	10	10	20	16.67	16%
Total marks	10	10	50	50	120	100.00	100%