Akole Taluka Education Society’s,

**Agasti Arts, Commerce & Dadasaheb Rupwate Science College, Akole.**

Tal. Akole, Dist. Ahmednagar (422 601)

**Department of Chemistry**

**Academic Year: 2018-19**

**Program Outcomes, Program Specific Outcomes & Course Outcomes for UG**

**Class: F. Y. B. Sc. Chemistry**

**Term- I**

**Course: 1) Physical & Inorganic Chemistry:**

The learner will be acquired with sound knowledge of **-**

1) Behavior of gases, ideal gas as a model system and its extension to real gases. The

 dependence of physical state on pressure, volume and temperature is being realized.

2) The existence of liquid state, comparison of its properties with other states is to be perceived.

 Liquid crystal are essentials in all common and research devices and instruments hence they

 are introduced briefly.

3)To solve problems regarding van der Waal’s and Critical constant and regarding P-V-T

 relations.

4) Theoretical basis of adsorption phenomena is integrated. Understanding dynamic nature of

 surface and its applications in catalysis and in dispersed phases will lead to new area of

 nanoscience.

5) Mathematical background required for derivations, depictions and problem solving. This

 chapter strengthens these aspects.

6) Normality, Molarity, Normal solution, Molar solution, equivalent weight, ppm, %w/v,

 %v/v & related problems.

7) Understand the concept of oxidation & reduction, oxidizing agent, reducing agent, redox

 reaction, oxidation number, Balance the equation by ion electron method & oxidation number

 method.

8) Calculation of Equivalent weight of oxidant & reductant.

**Course: 2) Organic & Inorganic Chemistry:**

The learner will be acquired with sound knowledge of **-**

1) The fundamental concepts which govern the structure, bonding, properties and reactivities of

 organic molecules such as covalent character, hybridization, bond angles, bond energies, bond

 polarities and shapes of molecules.

2) Drawing of organic molecules and arrow pushing concept.

3) Acid-base theories, pKa / pKb values for common organic acids and bases and factors

 Affecting strength of acids and bases.

4) Structural effects and their applications in determining strength of acids and bases.

5) The common and IUPAC names of alkanes, alkenes, alkynes and homocyclic, polycyclic

 Aromatic hydrocarbons.

6) Methods of preparation and chemical reactions of alkanes, alkenes, alkynes and homocyclic,

 polycyclic aromatic hydrocarbons.

7) Application of Huckel’s rule to different organic compounds to find out aromatic /non

 Aromatic characters.

8) Skeleton of long form of periodic table, Quantum numbers, Shells, sub-shells, types of orbital

 and their shapes, Afbau, Pauli’s exclusion principle and Hund’s rule, Block, group, periodic

 law and periodicity, Name, symbol, electronic configuration, trends and properties, Crown

 ether and cryptans, Separation of s-block elements with crown ethers.

9) Compounds of s-block elements: oxides, hydroxides, peroxides and superoxides.

10) Application of s-block elements: Industrial, biological and agricultural field.

**Term- II**

**Course: 1) Physical & Inorganic Chemistry:**

The learner will be acquired with sound knowledge of **-**

1)Atom being most important micro particle in construction of matter, modern developments of

 its structure is presented. The quantization of energy and duality of matter in this context is

 elaborated . Schrodinger equation is the basis of quantum chemistry that has been introduced

 for simplest system hydrogen atom.

2) Natural changes are understood with the help of second and third laws of thermodynamics.

 These laws are presented with the help of state function entropy. Entropy changes in various

 processes and under various conditions have been discussed.

3) Basic principle of overlapping of atomic orbital with specific shapes and sizes

4) Fundamental concepts of theories of overlapping of atomic orbitals.

5) Concept of hybridization and differentiation with overlap.

6) Application of non-bonded lone pairs in shape of molecule

7) Basic understanding of geometry and effect of lone pairs with examples

8) Concept of different types valence shell electron pairs and their contribution in bonding

**Course: 2) Organic & Inorganic Chemistry:**

The learner will be acquired with sound knowledge of **–**

1) The fundamental concepts which govern the structure, bonding, properties and reactivities of

 organic molecules such as covalent character, hybridization, bond angles, bond energies, bond

 polarities and shapes of molecules.

2) Drawing of organic molecules and arrow pushing concept.

3) Acid-base theories, pKa / pKb values for common organic acids and bases and factors

 affecting strength of acids and bases.

4) Structural effects and their applications in determining strength of acids and bases.

5) The common and IUPAC names of alkanes, alkenes, alkynes and homocyclic, polycyclic aromatic

 hydrocarbons.

6) Methods of preparation and chemical reactions of alkanes, alkenes, alkynes and homocyclic,

 polycyclic aromatic hydrocarbons.

7) Application of Huckel’s rule to different organic compounds to find out aromatic /non aromatic

 characters.

8) Structure, nomenclature, preparation and reactions of organic compounds.

9) The characteristic reactions of each functional group which can be used to identify and distinguish

 that compound from other compounds.

10) Predict the conversion of one functional group into other functional group involving one or more

 number of steps.

11) Conversion of the given compound into other compound containing more or less number of

 carbon atoms.

12) Prediction of possible products when reactants are given. In case there are more than one

 possible products, identify the major and minor products.

13) Suggest the possible reagents to bring about the given conversion.

**Term- I & II**

**Course: 3) Chemistry Practical:**

The learner will be acquired with sound knowledge of **-**

1) Preparation of solutions like normal & molar.

2) Handling of viscometer & eudiometer.

3) Volumetric analysis, hardness of water.

4) Inorganic & Organic qualitative analysis.

5) Organic techniques like- Thin layer chromatography, Crystallization, Distillation, Sublimation.

6) Organic preparation with purification & TLC techniques.

**Class: S. Y. B. Sc. Chemistry Semester- I**

**Course: 1) Physical & Analytical Chemistry:**

The learner will be acquired with sound knowledge of **-**

1) Concept of kinetics, terms used, rate laws, types of order, first order and second order

 reaction, Pseudo molecular reactions, Factors affecting on rate of reaction, Techniques of

 measurement of rate of reaction

2) Photochemistry, thermal and photochemical reactions, laws of photochemistry, quantum yield
 and it’s measurement, types of photochemical reactions and photophysical process, quenching
 and chemiluminence.

3) Distribution of solute amongst pair of immiscible solvents, distribution law and it’s

 thermodynamic proof, distribution law and nature of solute in solution state, Solvent

 extraction.

4) Analytical Chemistry, chemical analysis and its applications, Sampling, common techniques,
 instrumental methods and other techniques.

5) Meaning of error and terms related to expression & estimation of error, methods of expressing
 accuracy and precision, classification of errors, significant figures and computations,
 distribution of errors, mean and standard deviations, reliability of results.

6) Basic principles in qualitative analysis, meaning of common ion effect, Role of common ion
 effect and solubility product, different groups for basic radicals, group reagent and
 precipitating agents, interfering anions and its removal, separation for basic radicals, method
 of detection of acidic radicals.

7) Classification of compounds with different functional groups, different tests for detection of
 elements like C, H, (O), N, S & P, characteristic tests for different functional groups, different
 colour tests and the reactions, quantitative analysis of C, H by Liebig’s method, Kjeldahl’s
 method, Carius tube method, empirical and molecular formula.

**Course: 2) Organic & Inorganic Chemistry:**

The learner will be acquired with sound knowledge of **-**

1) Identify chiral center in the given organic compounds, Erythro, threo, meso,
 diasteroisomers, R/S configuration in compounds containing two chiral centers, Bayer’s strain

 theory, heat of combustion and relates stability of cycloalkanes, stability of cyclohexanes,

 draw the structure of boat and chair configuration of cyclohexane, draw axial and equatorial

 bonds in cyclohexane, draw structure of conformations of mono & disubstituted cyclohexanes,

 explain the stability of axial and equatorial conformation of monosubstituted Cyclohexanes.

2) Heterocyclic compounds, Huckel rule to predict aromaticity, synthetic route for preparation of

 various heterocyclic compounds, reactions of heterocyclic compounds.

3) Differentiate between ore and minerals, calcination and roasting and smelting & flux.

4) Physico-chemical principles involved in electrometallurgy, electrolysis of alumina and its

 refining, uses of Aluminum and its alloys, purification of bauxite ore.

5) Pyrometallurgy and its physico chemical principles, different reactions in the blast
 furnace, differentiate between properties of pig iron and wrought iron, principles of different

 methods for preparation of steel, merits and demerits of different methods.

6) Corrosion, types of corrosion, mechanism of corrosion, factors affecting corrosion, methods of

 prevention of metal from corrosion, meaning of passivity, different theories of passivity,

 Galvanising, Tinning, Electroplating from corrosion.

**Class: S. Y. B. Sc. Chemistry Semester- II**

**Course: 1) Physical & Analytical Chemistry (CH-221):-**

The learner will be acquired with sound knowledge of **-**

1) Free energy concepts, types and its variation, free energy change for chemical reaction and
 physical transition, free energy change for ideal gases, Gibb’s Helmholtz equations and its
 properties & significance, Van’t Hoff reaction isotherm and thermodynamic equilibrium
 constants, chemical and physical equilibrium, Clausius–Clapeyron equation and its

 applications.

2) Ideal and non ideal solutions and laws governing these solutions, interpretation of vapor

 pressure–composition diagram, interpretation of temperature composition diagram, distillation
 from temperature – composition diagram, Azeotropes ,partially immiscible liquids.

3) Meaning of equivalent weight, molecular weight, normality, molality, primary and

 secondary standards, different way to express concentrations of the solution, preparation of
 standard solution, solve numerical problems, calibrate various apparatus such as burette,
 pipette, volumetric flask, barrel pipette etc, types instrumental and non instrumental analysis.

4) Role of indicators, mixed and universal indicators, neutralization curves for various acid base
 titration, principle of complexometric precipitation and redox titrations, the definitions and
 difference between iodometry and iodimetry, standardization of sodium thiosulphate and
 EDTA, reactions between CuSO4 and Iodine and liberated I2 and Na2S2O3, choice of

 Suitable indicator, estimate copper from CuSO4 and available chlorine in bleaching powder,

 prepare standard silver nitrate solution, Mohr’s and Fajan’s method, determine the amount of

 halides separately and in presence of each other.

**Course: 2) Organic & Inorganic Chemistry (CH-222):-**

The learner will be acquired with sound knowledge of **-**

1) Concept of different reagents used in the one type of conversion, merits & demerits of
 different reagents, reagent based mechanisms**,** use of different hydrogen donors for
 hydrogenation.

2) Definitions and classification of heterocyclic compounds, use Huckel rule to predict
 aromaticity, suggest synthetic route for preparation of various heterocyclic compounds, write
 and complete various reactions of heterocyclic compounds, predict products.

3) Different type biomolecules, the role of biochemistry in the day to day life,the importance of
 biochemistry, carbohydrates, classify carbohydrates giving suitable examples, write and
 complete various reactions of glucose, optical activity in carbohydrates, Fischer projection
 and perspective formula with glyceraldehydes as reference compound, the principle in Killani
 Fischer synthesis, stereoisomerism in monosaccharide, structure of some common aldoses and
 ketoses, distinguish between diastereomers and epimers,write cyclic structure of glucose in
 Fischer, Haworth and chair form, the phenomenon of mutaroatation, the structure and bonding

 in maltose, lactose, cellobiose and sucrose, about polysaccharide, structures of starch and
 cellulose, classify the naturally occurring amino acids, the amphoteric nature of amino acids,
 the important reactions of α-amino acids, outline the formation of peptide bond, explain the
 hydrogen bonding in α-helical structure, the stability of -helical chain and their R-groups.

4) Position of d-block elements in periodic table,the general electronic configuration &
 electronic configuration of elements, trends in periodic properties of these elements w.r.t. size
 of atom and ions, reactivity, catalytic activity, oxidation state, complex formation ablility,

 colour, magnetic, properties, non-stoichiometry, density, melting point, boiling point.

5) M-C bond and to define organometallic compounds, organometallic chemistry, multiple
 bonding due to CO ligand, methods of synthesis of binary metal carbonyls, structure and
 bonding using valence electron count (18 electron rule), catalytic properties of binary metal

 carbonyls, uses of organometallic compounds in the homogenous catalysis.

6) Acids and bases according to Arrhenius theory Lowery- Bronsted concept,

 Lewis concept,merits and demerits of different theories of acids and bases, conjugate acid and
 base pairs, leveling effect of solvents, trends in the strength of hydracids, oxyacids, hard and
 soft acids, trends in the strength of hydra and oxyacids, rules governing the strength of
 oxyacids, properties of a solvent that determines their utility, some useful solvents, reactions
 in non-aqueous solvents like HF and NH3.

7) Toxic chemical in the environment, impact of toxic chemicals on enzyme, biochemical effect
 of Arsenic, Cd, Pb, Hg, biological methylation.

**Course: 3) Chemistry Practical:** **Semester- I & II**

The learner will be acquired with sound knowledge of **-**

1) Correlate theoretical and experimental knowledge.

2) Verify theoretical principles experimentally.

3) Interpret the experimental data.

4) Improve analytical skills.

5) Correlate the theory and experiments and understand their importance.

**Class: T. Y. B. Sc. Chemistry Semester- III**

**Course: 1) Physical Chemistry (CH-331) :**

The learner will be acquired with sound knowledge of **-**

1) Expression of the rate constant k for third order reaction, examples of third order reaction,
 characteristics of third order rate constant k, derivation for half-life period of third order

 Reaction and to show that half-life is inversely proportional to square of initial concentration

 of reactants, experimental determination of order of reaction by Integrated rate equation

 method, graphical method, Half-life method and Differential method, term energy of

 activation with the help of energy diagram, term temperature coefficient, effect of temperature

 on rate constant k, derivation of Arrhenius equation, graphical evaluation of energy of

 activation.

2) Ohm’s law and electrical units such as coulomb, Ampere, Ohm and Volt, meaning of specific
 resistance, specific conductance, cell constant and their units, cell constant, its theoretical and
 experimental determination, preparation of conductivity water, experimental determination of
 conductance, variation of specific and equivalent conductance of strong and weak electrolyte

 with, dilution, meaning of infinitely dilute solution, Kohlrausch’s law of independent

 migration of ions and its applications such equivalent conductance of weak electrolyte at zero

 conc., degree of dissociation (α ),ionic product of water, transport number of an ion, Hittorf’s

 rule, experimental determination of transport number by Hittorf’s and moving boundary

 method, drawbacks of Arrhenius theory, Debye-Huckel-Onsager Interionic Attraction theory,

 Asymmetry /Relaxation effect, electrophoretic effect, validity of Onsager equation, fugacity

 and activity concept, activity and activity coefficient of strong electrolyte, solve the numerical

 problems based on this topic.

3) Additive and constitutive properties, term specific volume, molar volume and molar

 refraction, meaning of electrical polarization of molecule, meaning of induced and orientation
 polarization, dipole moment and its experimental determination by temperature variation

 method, application of dipole moment for structure determination, nature of wave and its

 characteristic such as wavelength, wave number, frequency and velocity, Rotational /

 Microwave spectroscopy, derivation for rotational spectra for the transition from J to

 J+1,limitations of Rotational Spectra, vibrational Spectra, vibrational rotational spectra,

 Raman Spectroscopy.

4) Meaning and Types of equilibrium such as true or static, metastable and Unstable

 Equilibrium, meaning of phase, component and degree of freedom, derivation of phase rule,

 explanation of water system, description of the curve, Phase rule relationship and typical

 features, explanation of sulphur system : Description of the curve, Phase rule relationship and

 typical features, explanation of two component system curve : for silver-lead and Zinc-

 cadmium.

**Course: 2) Inorganic Chemistry (CH-332):**

The learner will be acquired with sound knowledge of **-**

1) The theories of covalent bond formation, assumptions and limitations of VBT, need of

 concept of MOT, LCAO principal and its approximation, formation of bonding and

 antibonding MO’s, shapes of s, p, d orbital, combinations of s-s, s-p, p-p and d-d orbital to

 form σ and π molecular orbitals, comparison of a) Atomic orbital and molecular orbital

 b) BMO and ABMO c) Sigma and pi MO’s d) VBT and MOT e) Comparison between BMO,

 ABMO and NBMO, MO energy level diagrams for homonuclear diatomic molecules having

 interactions between 2s and 2p orbitals and having no interactions between 2s and 2p orbitals

 : H2, H2+,He2+, Li2, Be2, B2, C2, N2, O2, O2+, O2-, O22-, F2, Ne2, shapes of molecular

 orbitals, bond order, energy and explanation on stability of the above molecule and ions, MO

 energy level diagrams for heteronuclear diatomic molecules: CO, NO, HCl, HF and

 calculations of bond order, energy and explain the stability of the molecules.

2) Coordination chemistry, different types of Ligands, chelating agents, chelate and stability of

 chelates and complexes, charge on complex ion and the oxidation number, the IUPAC name

 the co-ordination compound, application of co- ordination compounds in biology and

 chemistry.

3) Be able to draw the geometrical and optical isomerism of complexes, Choose the correct

 geometry for complexes with C.N. 4 and C.N. 6 with the help of Stereoisomerism, types of

 isomerism, stereoisomerism in complexes with C.N. 4 and C. N. 6, EAN rule and calculate

 EAN value of the complexes, Comment on EAN value and stability of complexes, merits and

 The demerits of Sidgwick’s theory, concept of hybridization, VB representation of tetrahedral,

 square planar, trigonal bipyramidal and octahedral complexes.

**Course: 3) Organic Chemistry (CH-333):**

The learner will be acquired with sound knowledge of **-**

1) Definition and types of organic acid and base, The pka and pkb concepts, Effect of

 temperature on pka/pkb, Comparison between strengths of acids/bases, acid-base catalysis

2) Draw different types of disubstituted cyclohexane in Chair form, distinguish between

 geometrical and optical isomerism, Stability, energy calculations with potential energy

 diagram and optical activity of these conformers.

3) Nucleophiles and leaving groups, Different types of nucleophilic substitution reactions,

 Inversion and racemization, kinetics, mechanism & stereochemistry of these reactions, SN1

 or SN2 reactions, SNi mechanism in presence and absence of pyridine, To predict product/s

 or supply the reagent/s for these reactions.

4) Different types of carbon-carbon unsaturated compounds, Orientation / rules in addition

 Reactions, structure of carbonyl group, Reactivity concept, Correct mechanism of addition

 reactions using different reagents, Types of some known addition reactions,

5) Elimination reactions, Different types of bases and leaving groups, Hoffmann and Saytzeff

 rule, E1 & E2 reactions.

6) Aromatic substitution reactions, Classification of directing groups, arenium ion and Ipso

 Substitution

**Course: 4) Analytical Chemistry (CH-334):**

The learner will be acquired with sound knowledge of **-**

1) Principles of common ion effect and solubility product, Formation of complex ion, Factors

 affecting on solubility of precipitation, Phenomenon of super saturation and precipitation

 formation, Meaning of co-precipitation and post precipitation, Choice of liquid for washing

 the precipitate, Precautions during filtration, drying and ignition of precipitate.

2) Methods of thermo gravimetric analysis, Principles of TGA and DTA, Types of TGA,

 Relation between TGA and DTA, Thermal equation of TGA, Different factors affecting TGA

 curve, Determination of calcium oxalate precursor, Applications of TGA, DTA and DSC.

3) Principles of Spectrophotometric analysis and properties of electromagnetic radiations

 Different Terms like absorbance, transmittance, and molar absorptivity, Mathematical

 Statement and derivation of Lambert’s Law and Beer’s Law, Different wavelength selectors

 and their importance , Instrumentation and working of single and double beam

 spectrophotometer, Additivity Principle, Different methods of color comparators.

4) Voltammetry and polarography as an analytical tool, construction, working, advantages and
 disadvantages of DME, different terms involved in Ilkovic equation, determination of Zn and

 Cd from the mixture, Significance of the different terms involved, Need of removal of

 dissolved oxygen from analyte solution.

5) Atomic absorption spectroscopy as an analytical tool, Measurement of absorbance of atoms by
 AAS, Interferences in atomic absorption spectroscopy, Applications and numerical problems

6) Emission spectroscopy as an analytical tool, Measurement of emission of atomic species,
 Different methods of analysis, Application and numerical problems.

**Course: 5) Industrial Chemistry (CH-335):**

The learner will be acquired with sound knowledge of **–**

1) Importance of chemical industry, Meaning of the terms involved, Comparison between batch

 And continuous process, Knowledge of various industrial aspects.

2) Various insecticides, Pesticides,. Fungicides, Rodenticides &biopesticides used in agriculture

 field with their synthesis and applications.

3) Concept of basic chemicals, their uses and manufacturing process, They should also know the
 physic chemicals principals involved in manufacturing process.

4) Introduction, occurrence, composition of petroleum, resources, processing of petroleum, other

 Properties, Fuels and eco-friendly fuels, use of solar energy etc.

5) Scope, Nutritive aspects of food constituents, Quality factors and their measurements, Food
 deterioration factors and their control ,Food preservation and Food additives.

6) Chemistry of starch, Manufacturing of industrial starch and its applications, Characteristics of
 some , food starches, Non-starch polysaccharides-cellulose-occurrence.

7) Learn importance of these industries, Manufacture of cement by modern methods, Definition

 of setting and hardening, Reinforced concrete.

**Course: 6) Nuclear Chemistry (CH-336A):**

The learner will be acquired with sound knowledge of **–**

1) The atom, elementary particles, sub-nucleons and the quarks, Classification of nuclides,

 isotopes, isobars, isotones and isomers, Nuclear stability on the basis of even-odd nature of Z

 and N, N/Z ratio, The binding energy, The nucleus, its size and shape, mechanical effects due

 to orbiting and spinning of nucleons, Magnetic quantum numbers, principal and radial

 quantum number.

2) The Shell model, Magic number, Salient features of shell model, Nuclear configuration, The

 liquid drop model, Semi-empirical mass equation.

3) Types of radioactive decay, decay kinetics and their general characteristics, Alpha decay, Beta

 decay and gamma decay, Nuclear isomerism, isomeric transitions, internal conversion, Auger

 effect.

4) Bethe’s notation, Different types of Nuclear reactions, Conservation in nuclear reaction,

 Excitation energy of compound nucleus

**Class: T. Y. B. Sc. Chemistry Semester- IV**

**Course: 1) Physical Chemistry (CH-341) :**

The learner will be acquired with sound knowledge of **-**

1) Electrochemical cell, Origin of EMF of electrochemical cell, Conventions used to represent

 electrochemical cell, Thermodynamic conditions of reversible cell, Explanations of reversible

 and irreversible electrochemical cell, reference electrode, Primary and secondary reference

 electrode Construction, representation, working and limitation of Standard hydrogen

 Electrode Construction, representation and working of Calomel and Silver –Silver Chloride

 Electrode, types of electrodes.

2) Atom its nucleus and outer sphere, Classification of nuclides with suitable examples such as

 isotope, isobar, isotone and isomers, Explanation of stability of nucleus through neutron to

 proton ratio, odd and even nature of proton and neutron, Mean binding energy, Conversion of

 mass into energy, Mass defect, Total and mean binding energy, Explanation of binding

 energy curve, Types of decay, Discovery of radioactivity, Decay kinetics, Relation of half-life

 with decay constant.

3) Distinguish between crystalline and amorphous solids / anisotropic and isotropic solid,

 Crystallography and laws of crystallography, Weiss and Millers Indices,

 Crystal system and their characteristics, Polymorphism /allotrophism,

 Distance between the planes for 100, 110 and 111 type of simple, body centered and face

 Centered cubic crystals, Bragg’s experiment

4) Concept of quantization, Atomic spectra, Wave particle duality, Uncertainty principle and its

 Physical significance, Derivation of time independent Schrodinger wave equation, Wave

 Function and its Interpretation, Well behaved function, Hamiltonian Operator, Particle in a

 box ( 1 and 3 dimensional), Degeneracy.

**Course: 2) Inorganic Chemistry (CH-342) :**

The learner will be acquired with sound knowledge of **-**

1) The term f-block elements, Inner transition elements, lanthanides, actinides, electronic

 configuration of lanthanides and actinides, Oxidation states of lanthanides and actinides and

 Common oxidation states, Separation lanthanides by modern methods, Lanthanide

 Contraction and effects of lanthanide contraction on post-lanthanides, Use of lanthanide

 elements in different industries, Transuranic elements, Preparation methods of transuranic

 elements, Nuclear fuels and their applications.

2) The meaning of metal & semiconductor, The difference between metal, semiconductor and

 insulator. Metallic bond on the basis of band theory, The energy band and energy curve, Draw

 (E) & N (E) curves, Explain the electrical conductivity of metals with respect to valence

 electrons. Explain the effect of temperature and impurity on conductivity of metals and

 semiconductors. Intrinsic and extrinsic semiconductor. The term valance band and conduction

 band, n and p type of semiconductors, Non-stoichiometry and semi conductivity, Insulators

 on the basis of band theory.

3) The nature of solids, Know the crystal structures of solids, Draw the simple cubic, BCC and

 FCC structures. Identify the C.N. of an ion in ionic solid, Identify the type of void, the effect

 of radius ratio in determining the crystal structure, Be able to define Pauling’s univalent

 radius and crystal radius.

4) The homogeneous catalysis, Give examples of homogeneous catalysts, Understand the

 essential properties of homogeneous catalysts-Give the catalytic reactions for Wilkinson’s

 Catalysis, Ziegler Natta Catalysis, Monsanto acetic acid synthesis, Give the brief account of

 homogeneous catalysis.

5) Understand the essential properties of heterogeneous catalysts, Give the catalytic reactions

 for oxidation, reduction and cyclization processes, Give the brief account of biodiesel

 synthesis using heterogeneous catalysis, Enlist the catalysts used for benzimidazole synthesis

**Course: 3) Organic Chemistry (CH-343) :**

The learner will be acquired with sound knowledge of **–**

1) Formation of carbanions, Possible mechanism of some known name reactions involving
 carbanions, Synthetic applications some reagents, To predict product/s or supply the reagent/s

 for these reactions.

2) Terms Disconnection, Synthons, Synthetic equivalence, Functional Group interconversion,

 Target Molecule, retrosynthesis, Various steps involved in the synthesis of some molecules.

3) Rearrangement reaction, Different types of intermediate in rearrangement reactions, To write

 mechanism of some named rearrangement reactions.

4) Spectroscopy, Different regions of electromagnetic radiations, Various terms used in

 Spectroscopy, The interaction of radiation with matter, Types of energy levels with

 Diagram, Brief idea about the advantages of spectroscopic methods.

5) UV Spectroscopy and Beer’s law, Different types of electronic excitations, Various terms

 used in UV spectroscopy, Effect of conjugation on UV band, To calculation of

 lambda max for dienes and enone systems, range of vision region, Applications of UV

 Spectroscopy.

6) The principle of PMR, Various terms used in PMR spectroscopy, TMS is used as a reference

 Compound, To distinguish compounds by PMR.

7) Terpenoids and alkaloids, Various methods of isolation/extraction of these natural products,

 Synthesis of Citral and Ephedrin by Barbier- Bouveault and Nagi methods, To determine the

 structure of above compounds by chemical methods.

**Course: 4) Analytical Chemistry (CH-344) :**

The learner will be acquired with sound knowledge of **–**

1) Principles of solvent extraction, Difference between KD and D, Various types of techniques of

 solvent extraction such as- (a) extraction (b) continuous extraction (c) counter current

 extraction.

2) Principle of chromatographic methods, Relation between theoretical plates and column

 Efficiency, Column Chromatography, TLC, Paper Chromatography.

3) Principle of GSC and GLC analysis, Separation mechanism involved in GSC and GLC

 Instrumentation- stationary phases, column types, detectors, Working of gas chromatographic

 Apparatus, Chromatogram and use in qualitative-quantitative analysis.

4) Liquid chromatography, Separation mechanism involved in adsorption and partition HPLC

 Instrumentation and working of HPLC, Applications of HPLC, Advantages of supercritical

 fluid chromatography

5) Principle and theory of electrophoresis, Different types of electrophoresis techniques

6) Nephelometry and Turbidimetry as an analytical tool, Measurement of turbidance,

 Applications.

**Course: 5) Industrial Chemistry (CH-345) :**

The learner will be acquired with sound knowledge of **–**

1) polymer, Degree of polymerization, Classification of polymerization reactions,

 Thermodynamic and transport properties of polymer, Commercial polymers and their

 importance, Biomedical polymers: implants, Contact lens and dental polymers,

2) Importance of sugar industry, Manufacture of direct, Consumption (plantation white) sugar

 with flow diagram, Cane juice extraction by various methods, Clarification by processes like

 carbonation, Sulphitation, Phosphatation, etc., Concentration of juice by using multiple effect

 evaporator system, Crystallization of sucrose by using vacuum pan.

3) fermentation process, Manufacturing of ethyl alcohol by using molasses, Food grains, fruits &

 Ethylene, Manufacturing of wine, beer, whisky, rum etc.

4) Chemistry of soap, Students should know about various cosmetics, Raw materials, Properties

 and various types of cosmetics used, Meaning of the terms detergent, Surfactants, emulsion

 and emulsifying agents, Wetting and non-wetting, Hydrophobic and hydrophilic nature,

5) Preparation of dye intermediates, Structural features of a dye; Classification of dyes,

 Structures and applications, Nitro, nitroso, Azo, heterocyclic, Phthalenes etc.

6) Action of drugs, Assay of drugs and factors affecting drug action, Metabolism of drugs,

 Chemical structures, Methods of production and pharmacological activity.

7) The students are expected to learn all the problems of pollution and deposal of waste of

 Various industries.

**Course: 6) Nuclear Chemistry (CH-346A) :**

The learner will be acquired with sound knowledge of **–**

1) Discovery of nuclear fission, The process of nuclear fission, The charge distribution, Fission

 Energy, Theory of nuclear fission.

2) The natural Uranium reactor, The breeder reactor, The four factor formula, Classification of

 Reactors, India’s Nuclear Energy programme.

3) Gaseous ionization and its applications, Principle and working of Scintillation Counters,

 Semiconductor detectors, Neutrondetectors.

4) The Probing by isotopes, Typical reactions involved in the preparation of radioisotopes,

 Szilard-Chalmer reaction, Analytical applications – Isotope Dilution Analysis, Neutron

 Activation Analysis, adiometric Titrations, Medical applications such as thyrodisis and

 Radioimmunoassay.

5) Biological effects of radiations, safety standards, safe working methods, Reprocessing of the

 nuclear waste and its management.

**Semester- III & IV**

**Practical Courses-**

**Course: 7) Physical Chemistry Practical:**

The learner will be acquired with sound knowledge of **–**

1) Principles of Chemical kinetics, Viscosity, Adsorption, Colorimetry, Refractometry, pH

 metry, Potentiometry, Conductometry etc.

2) Handling of above instruments.

3) Data analysis & drawing of graph.

4) Preparation of stock solutions, Normal, Molar solutions.

5) Standardization of instruments.

**Course: 8) Inorganic Chemistry Practical:**

The learner will be acquired with sound knowledge of **–**

1) Gravimetric & Volumetric analysis or estimations.

2) Principles & Handling of Colorimetry.

3) Qualitative analysis of inorganic salts.

4) Preparation of stock solutions, Normal, Molar solutions.

5) Preparation of Inorganic compounds.

**Course: 9) Organic Chemistry Practical :**

The learner will be acquired with sound knowledge of **–**

1) Separation of binary mixture & its analysis.

2) Organic estimations, preparations.

3) Purification- Recrystallization, Distillation, Separation methods- TLC.

4) Small scale preparations & its analysis.