



**Yogi Divine Society inspired,
Sarvodaya Kelavani Samaj managed,
Shree Manibhai Virani and Smt. Navalben Virani Science College, Rajkot**

(Autonomous)
Affiliated to Saurashtra University, Rajkot
Re-Accredited at 'A' Level by NAAC
STAR college Scheme & Status by MST-DBT
UGC- College with Potential for Excellence (CPE)
UGC-DDU KAUSHAL Kendra
GAAA – Highest Grade A-1 by KCG, Government of Gujarat
GPCB-Government of Gujarat approved Environment Audit Center
UGC-Autonomous College

DEPARTMENT OF CHEMISTRY

B. Voc. Pharm. Analysis & QA

**B. Voc. Pharm. Analysis & QA
SEMESTER – III**

BVPAQA-301	Industrial Analysis
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Unit-I: Chemistry & analysis of Oil, fat and wax

Crude oil composition, types of oils, physical and chemical properties of oils and fats, physical and chemical refining, bleaching, deodorization, partial hydrogenation and Vanaspati. Waxes: occurrence, types of waxes, isolation and purification of waxes, composition and industrial applications, Analytical tests: for oils, fats and waxes

Unit-II: Polymer analysis

Introduction and classification of polymers, types of polymerization, Characterization: Molecular structure, chemical tests, thermal method, T_g, molecular weight, distribution, stability. M.Wt. Determination: Atomic weight, mole concept, M.Wt. in colloids, M.Wt. of polymers, method of determining M.Wt., Chemical & Physical methods.

Unit-III: Petroleum Analysis

Petroleum – definition and composition, Carbon residues, Asphaltene content, density (specific gravity), light hydrocarbons, metallic constituents, salt content, Sulphur content, viscosity, pour point, water & sediment, wax content, miscellaneous tests.

Unit-IV: Water Analysis – Part A

Physical examination of water: pH, temperature, total dissolved solid, suspended solid, acidity, alkalinity, conductivity, colour, taste, odor, turbidity, density, hardness of water.

Water-V: Water Analysis – Part B

Nonmetallic inorganic constituents: chloride, sulphate, sulphide, fluoride, phosphate, sulphur, nitrate, nitrite, carbon dioxide, ammonia, cyanide.

Mineral ion: calcium, magnesium, iron, sodium, silver, zinc, manganese.

Toxic ion: lead, mercury, arsenic, beryllium, cadmium, chromium, copper, selenium.

Reference Books:

1. A Textbook of Polymers – Vol I & II, M. S. Bhatnagar, S. Chand Publication
2. Polymer Science, G. Govariker, New Age International
3. Handbook of Petroleum Analysis, James Speight, Wiley International
4. Instrumental Analysis, H H Willard, CBS Publishing Co.
5. Handbook of Water Analysis, Third Edition, Leo M.L. Nollet, Leen S. P. De Gelder, CRC Press, ISBN 9781439889640

**B. Voc. Pharm. Analysis & QA
SEMESTER – III**

BVPAQA-302	Fundamental Biochemistry
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Unit-I: Biomolecules

1. Biomolecules & the Cell: Introduction, types & constitution of cell, Integration of cellular function: apoptosis.
2. Role of minerals & water in life cycle, macrominerals, microminerals, additional important elements.

Unit-II: Lipids

Introduction, classification, function of lipids, fatty acids, essential fatty acids, purity, analysis of fats & oils, introduction & examples of triglycerols, phospholipids, glycolipids, steroids.

Unit-III: Protein & Amino Acids

Introduction, composition, standards & non-standard amino acids, structure & classification of amino acids, selenocysteine, structure of protein, classification of protein, some biological important peptides.

Unit-IV: Carbohydrates

Introduction, classification, structure of glucose, reaction of monosaccharides, overview of glycosides, disaccharides, homopolysaccharides, heterosaccharides, glycoproteins

Unit-V: Enzymes

Introduction, nomenclature, classification, chemical nature, properties, factors affecting enzyme activity, active site, enzyme inhibition, coenzyme, enzyme catalysis, unit of enzyme activity, non-protein enzymes, application & diagnostic importance of enzymes.

Reference Books:

1. Biochemistry, U. Satyaprakash & U. Chakrapani, Books & Allied (P) Ltd.
2. Biochemistry, Akhilesh Sharma, RBSA Publishers
3. Textbook of Biochemistry – Fourth Edition, S. P. Singh, CBS Publishers & Distributers
4. Fundamentals of Biochemistry, A C Deb, New Central Book Agency (P) Ltd.

B. Voc. Pharm. Analysis & QA
SEMESTER – III

BVPAQA-303	Pharmaceutical Organic Chemistry- I
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Unit-I: Fundamental Concepts of Organic Chemistry

Types of chemical bonds, patterns of bond cleavages, Types of reagents – electrophiles & nucleophiles, Reactive intermediates – carbocation, carbanion and free radicals, Types of reactions – Addition reaction and Substitution reaction involving S_N^1 , S_N^2 , E^1 , E^2

Unit-II: Open-chain and Cyclic Hydrocarbons

IUPAC Nomenclature of Branched and unbranched hydrocarbons, classification of carbon atom, method of formation, physical properties and chemical reactivity. Cyclopropane ring-banana bond, Markownikoff's rule, polymerization of alkynes.

Unit-III: Arenes & Aromaticity

Nomenclature of benzene derivatives, structure of benzene – molecular formula & Kekule structure, Aromaticity: the Huckel rule, Aromatic electrophilic substitution reactions, general mechanism.

Unit-IV: Carboxylic Acid & Derivatives

Nomenclature, structure, physical properties, acidity of C.A., acid strength & factors affecting, preparation and reaction of C.A., HVZ reaction, preparation of acid derivatives, physical properties of acid derivatives, esterification and hydrolysis.

Unit-V: Carbonyl Compounds Aldehyde & Ketone

Nomenclature & structure of carbonyl group, synthesis of aldehydes and ketones, reaction and specific mechanism of carbonyl compounds, physical properties, tautomeric isomerism.

Reference Books:

1. Chemistry for Degree Students – First Year, Dr. R. L. Madan, S. Chand & Co. Ltd.
2. Chemistry for Degree Students – Second Year, Dr. R. L. Madan, S. Chand & Co. Ltd.
3. Chemistry for Degree Students – Third Year, Dr. R. L. Madan, S. Chand & Co. Ltd.
4. The language of Chemistry or Chemical Equations, G. D. Tuli & P. L. Soni, S. Chand & Co. Ltd.
5. Principles of Organic Chemistry, Peter R. S. Murray, CBS Publications

**B. Voc. Pharm. Analysis & QA
SEMESTER – III**

BVPAQA-304	Unit Operations- II
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Unit-I: Distillation

Introduction, boiling point, driving force, equilibrium stage, vapour- liquid equilibrium, boiling point diagram, Raoult's law, Dalton's law, relative volatility, differential distillation, flash distillation, fractionating column, McCabe-Thiele method, reflux ratio, azeotropic distillation, extractive distillation, types of plate, packed column, types of packing

Unit-II: Crystallisation

Introduction, solubility curve, super saturation, crystal formation, method of super saturation, The Mier's super saturation theory, yield of crystallisation process classification of crystalliser-agitated tank crystalliser, Swenson-walker crystalliser, vacuum crystallisers, material balance of crystalliser, enthalpy balance

Unit-III: Evaporation

Introduction, concentration, foaming, scale, temperature sensitivity, material of construction, performance of tubular evaporator, boiling point elevation, types of evaporator-jacked pan evaporator, horizontal tube evaporator, long tube vertical evaporator, forced circulation evaporator, multi effect evaporator.

Unit-IV: Drying

Introduction, Free moisture, Bound moisture, Drying curve, Equipments, Tray dryer, Rotary dryer, Flash dryer, Fluid bed dryer, Drum dryer, Spray dryer.

Unit-V: Mixing

Introduction, mixing of solid-solid, solid-liquid system and its equipments.

Reference:

1. Industrial Chemistry, Reggel, Reinhold Publication.
2. Unit Operations in chemical Engineering, McCabe & Smith, McGraw Hill Book Comp.
3. Unit Operations I & II, D.D. Kale Pune Vidyarthigriha Prakashan-Pune.
4. Industrial chemistry by B.K. Sharma.
5. Outline of chemical technology, G.E. Dryden; East West press New Delhi.
Introduction to material science and engineering, K.M. Rells, T. Courtney and J. Wulff; Wiley eastern private limited, New Delhi

B. Voc. Pharm. Analysis & QA
SEMESTER – IV

BVPAQA-401	Pharmaceutical Engineering
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Unit-I: Basic chemical calculation

Basis of calculation, equivalent weight , normality , molarity , molality , weight percent , volume percent , mole percent , mole fraction , weight fraction, ideal gas law , gas constant , partial pressure , dalton's law , amagat's law , relationship between partial pressure , mole fraction of component gas to total pressure, rault's law,henry's law

Unit-II: Material balance with and without chemical reaction

Classification of material balance process, material balance of distillation, evaporation, absorption, extraction, drying, filtration, mixing/blending, crystallisation

Stoichiometry co-efficient, ratio, proportion, limiting and excess reagent, conversion, yield, selectivity

Unit-III: Recycle operation

Recycle ratio, combined feed ratio, purge ratio, recycle process for drying, reactor, evaporator, crystalliser, filter, calciner

Unit-IV: Energy balance

Energy, energy balance off closed system , relationship between C_v and C_p , mean molal heat capacities of gases , heat capacity of gaseous mixture , heat of reaction , heat of formation, standard heat of formation , heat of combustion , hess's law , heat of reaction from heat of formation , heat of reaction from heat of combustion , adiabatic process , phase change operation , heat balance during phase change , heat of solution

Unit-V: Combustion

Solid liquid and gaseous fuel, calorific value, air requirement

B. Voc. Pharm. Analysis & QA
SEMESTER – IV

BVPAQA-402	Food & Beverages Analysis
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Unit-I: Chemistry & Composition of milk

Composition and nutritive value of milk, determination of moisture and total solid in milk, determination of fat in milk, definition and determination of carbohydrate, protein (casein), lipid(phospholipids), vitamins , mineral and pigment in milk.

Unit-II: Fundamentals of food analysis

Definition, importance, structure, functional properties and analysis of carbohydrate protein, amino acid, lipid and fiber in food.

Unit-III: Fundamentals of beverages analysis

Chemical component of tea, coffee, cocoa, chocolate and soft drinks, chemical analysis of soft drinks (carbohydrate, acidity, sweetener, antioxidant, colour, alcohol, fragrance, etc), analysis of tea (tannis), chemical analysis of coffee (caffeine).

Unit-IV: Fundamentals of Oil & Fat analysis

Introduction, properties of oil and fat, classification of oil and fat, determination of iodine value, acid value, saponification value, Reichert-Meissl value, peroxide value and rancidity of oil. Identification and determine the purity of oil.

Unit-V: Milk-product analysis

Chemical component of milked product like ghee, butter, cheese, pannier, ice cream, curd, yogurt, etc. Chemical analysis of total solid and fat in milked product

B. Voc. Pharm. Analysis & QA
SEMESTER – IV

BVPAQA-403	Pharmaceutical Organic Chemistry- II
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Unit-I: Organic Compounds of Oxygen: Alcohol, Phenol & Ether

Nomenclature and classification, structure and bonding, Physical Properties, preparation, chemical reactions, test for identification.

Unit-II: Organic Compounds of Nitrogen: Amines, Nitroalkanes and Nitroarenes

Amines: Nomenclature, classification, stereochemistry of amines, basicity of amines, preparation, chemical reactivity, test for identification separation of primary, secondary and tertiary amine mixture. Nitroalkanes: Preparation, reduction in different media, picric acid.

Unit-III: Aryl & Alkyl Halides

Nomenclature, classification, method of preparation, substitution reaction of alkyl halides, polyhalogen compounds: chloroform, carbon tetrachloride, application & preparation of DDT and BHC.

Unit-IV: Heterocyclic Compounds

Introduction to five and six member heterocycles, nomenclature, structure and aromatic characteristic of pyrrole, furan, thiophene and pyridine, preparation and reactions of heterocycles, fused heterocycles and heterocycles with more than one heteroatom.

Unit-V: Stereochemistry of Organic Compounds

Concept of isomerism, types of isomerism. **Optical isomerism:** elements of symmetry, molecular chirality, enantiomers, properties of enantiomers, meso compounds, relative and absolute configurations, introduction and example of geometric isomerism and conformational isomerism, difference between configuration and conformation.

Reference Books:

1. Chemistry for Degree Students – First Year, Dr. R. L. Madan, S. Chand & Co. Ltd.
2. Chemistry for Degree Students – Second Year, Dr. R. L. Madan, S. Chand & Co. Ltd.
3. Chemistry for Degree Students – Third Year, Dr. R. L. Madan, S. Chand & Co. Ltd.
4. The language of Chemistry or Chemical Equations, G. D. Tuli & P. L. Soni, S. Chand & Co. Ltd.
5. Principles of Organic Chemistry, Peter R. S. Murray, CBS Publications

B. Voc. Pharm. Analysis & QA
SEMESTER – IV

BVPAQA-404	Pharmaceutical Technology-I
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Unit-I: Size reduction and size separation

Size reduction: Objective, factors affecting, methods of size reduction, hammer mill, ball mill, fluid energy mill, disintegrator. Size separation: introduction, shifting technique, official standard of powders, sedimentation technique, cyclone separator – construction and working.

Unit-II: Homogenization and Filtration

Liquid & powder mixing, mixing of semisolids, Silverson mixer-homogenizer, planetary mixer, triple roller mill, colloid mill and hand homogenizer, double cone mixer. Filtration: theory of filtration, filtration media, selection of filter aids, filter press, sintered filters, filter candles, metafilter.

Unit-III: Extraction Techniques

Galenicals, origin and introduction, percolation and maceration, their modification, continuous hot extraction, application and preparation of tinctures and extracts.

Unit-IV: Cosmeticology and cosmetic preparations

Fundamentals of cosmetic science, formulation, preparation and packaging of cosmetics for skin - Sunscreen, moisturizers, cold cream, and vanishing cream, hair - Shampoo and conditioners, dentifrice- powders, gels, paste and manicure preparations like- nail polish, lipsticks, eye lashes, brief introduction to cosmaceuticals, baby care products, shaving cream, hygienic products

Unit-V: Packing and storage of pharmaceuticals

Introduction, desirable features of containers, types of containers, materials for container – glass and plastics, closer materials, merits and demerits of materials used, introduction to aerosol packaging.

Reference Books:

1. Pharmaceutics-I, PV Kasture, SR Parekh, SB Gokhale, SA Hasan, Nirali Prakashan
2. Pharmaceutics-II, PV Kasture, SR Parekh, SB Gokhale, SA Hasan, Nirali Prakashan
