

SARDAR PATEL UNIVERSITY

Syllabus for B. Sc. (Semester-III) Industrial Chemistry Vocational

Effective from Academic Year 2012-2013.

PAPER NO.	PAPER TITLES	CREDIT – HRS.
US03CICV01	UNIT PROCESSES	03 – 03
US03CICV02	FLUID MECHANICS & HEAT TRANSFER	03 – 03
US03CICV03	LABORATORY	03 -03
US03CPHY01	PHYSICS THEORY	03 – 03
US03CPHY02	PHYSICS THEORY	03 – 03
US03CPHY03	LABORATORY	
US03EGCH04	ORGANIC CHEMISTRY	02 – 02
US03EGCH05	BASIC ANALYTICAL CHEMISTRY	02 – 02

Sr. No.	Courses	Credits			Teaching Hours		
		Theory	Practical	Total	Theory	Practical	Total
1	Core courses (i)	12	06	18	12	12	24
2	Elective courses	04	--	04	04	--	04
3	Foundation	02	--	02	02	--	02
	Total			24	18		30

Note: Nomenclature of Subject of code: U S 03 C ICV 01

U=Undergraduate, S=Science Faculty, 03/04=Semester three/four, C=Core Course, F=Foundation Course, E=Elective course, ICV=Industrial Chemistry Vocational, PHY=Physics, GCH=General Chemistry, 01/02/03=Paper 01/02/03.

SARDAR PATEL UNIVERSITY

INDUSTRIAL CHEMISTRY VOCATIONAL SEMESTER-III

COURSE NO. : US03CICV01 (3 CREDITS, 70 MARKS)

TITLE: UNIT PROCESSES

Unit-1

Nitration : Introduction- Nitration agents, Continuous vs batch nitration, Kinetics and mechanism of nitration processes such as nitration of Paraffin hydrocarbons, Benzene to nitrobenzene and m- dinitrobenzene, Chlorobenzene to ortho and para nitrochloro benzene, Acetanilide to P- nitroacetanilide.

Amination: (A) By reduction : Introduction, Methods of reduction, Metal and acid, Catalyst sulfide, electrolytic , Metal and alkali sulfites, Metal hydrides, Sodium metal, concentrated caustic oxidation, Reduction, Reduction commercial manufacturing of aniline, m-nitroaniline. (B) By aminolysis : Introduction, Aminating agents, factors affecting.

Unit-2

Sulphonation: Introduction sulphonating agents, Chemical and physical factors in sulphonation , Kinetics and mechanism of sulphonation reaction, Commercial sulfonation of benzene, Hydrolysis, Batch vs continuous sulphonation.

Oxidation: Introduction- Types of oxidation reactions, Oxidizing agents, Kinetics and mechanism of oxidation of organic compounds, Liquid phase oxidation, Vapor phase oxidation, Commercial manufacture of benzoic acid, Phthalic anhydride, Acetic acid.

Unit-3

Halogenation: Introduction: kinetics of halogenation reactions, Reagents for halogenation, Halogenation of aromatic side chain and nuclear halogenation, Commercial manufacturerings: Chlorobenzene, Monochloro acetic acid.

Hydrogenation: Introduction kinetics, Catalysts for hydrogenation reactions, Hydrogenation of vegetable oil, Hydrogenation of acids and esters to alcohols, Catalytic reforming.

Unit-4

Esterification: Introduction, Hydrodynamics and kinetic of esterification reactions, Esterification by organic acids, by addition of unsaturated compounds, Esterification of carboxy acid derivatives, Commercial manufacture of ethyl acetate.

Hydrolysis: Introduction, Hydrolysis agents, Kinetics, thermodynamics and mechanism of hydrolysis.

Alkylation : Introduction, Types of alkylation, Alkylating agents, thermodynamics and mechanism of alkylation reactions, Manufacture of alkyl benzene.

REFERENCE BOOKS

Unit process in Organic synthesis, P. H. Groggins, Mcgraw- Hill Book Co., New York.

BACHLOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMSTER-III
COURSE NO.:US03CICVO2 (3 CREDITS, 70 MARKS)
TITLE: FLUID MECHANICS AND HEAT TRANSFER

UNIT-1:

Fluids and their Classification, Viscosity, Newtonian Fluids, Static pressure, Manometer, Mechanism of fluid flow, Types of flow, Continuity equation, Bernaulli's theorm, Friction factor and Friction head

UNIT-2:

Fluid moving machineries, Equipments, Pipes and pipe fittings, Pumps- classification and performance, Reciprocating and Rotary pumps, Centrifugal pumps, Blower, Compressors, Vacuum pump.

UNIT-3:

Modes of heat transfer, Flourier's law, Thermal conductivity, Thermal insulators, Steady state one dimensional heat conduction equation through plane wall, cylindrical wall, spherical wall and composite structure.

UNIT-4:

Heat transfer equipment, Types of heat exchanger, Shell and tube heat exchanger, Double pipe heat exchanger, Extended surface and Plate type heat exchanger.
Evaporators: Batch and continuous type, Capacity of evaporators.

REFERENCE BOOKS:-

1. Introduction to Chemical Engineering, Walter.L.Badger and Juline.T.Banchero (Mcgraw Hill books).
2. Unit operations of Chemical Engineering, Mccabe and Smith, (Mcgraw Hill books).
3. Unit operations (Volume I & II), (Nirali prakashan, Pune)
4. Chemical engineering (Volume I &II), J.M.Coulson & K.F.Richardson, (Asian Books pvt. Ltd, New Delhi)

INDUSTRIAL CHEMISTRY VOCATIONAL
SEMSTER-III
COURSE NO.:US03CICVO3 (3 CREDITS, 70 MARKS)
TITLE: LABORATORY

1. Preparation and estimation of organic compounds based on various unit process.
2. Instrumental methods of chemical analysis.
3. Organic spotting

BACHLOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-III
PAPER NO.: US03EGCH04 (2 CREDITS, 70 MARKS)
TITLE: ORGANIC CHEMISTRY

UNIT-1

FUNDAMENTAL ASPECTS IN ORGANIC CHEMISTRY

Hybridization, Sigma and pi bonds, Hydrogen bond, Inductive effect, Electronic effect, Resonance effect, Hyperconjugation, Steric effect, Acid and bases, Definition, Structure and stability of free radical, Carbocation, Carbanion and Benzene, Energy profiles.

UNIT-2

PHENOLS, ALCOHOLS, ETHERS AND EPOXIDES

Structure, Nomenclature, Preparation, Physical properties, Salts of phenol, Acidity of phenols, Reactions.

Alcohols- Structure, Classification, Nomenclature, Preparation, Physical properties, reactions, Alcohols as acids and bases, Synthesis using alcohols, Formation of 1,2-diols, Analysis of 1,2-diols, Oxidation cleavage of polyhydroxy alcohols.

Ethers- Structure, Nomenclature, Preparation, Physical properties, Reactions, Cyclic ethers. Epoxides- Preparation and reactions.

UNIT-3

ALDEHYDES, KETONES, CARBOXYLIC ACIDS AND THEIR DERIVATIVES

Structure, Classification, Nomenclature, Preparation, Physical properties, Nucleophilic addition reactions, Base promoted halogenation of ketones, Acid catalyzed halogenation of ketones.

Structure, Nomenclature, Preparation, Physical properties, Salts of carboxylic acids, Acidity of carboxylic acids, Effect of substituents on acidity, Reactions, reactions of acid chloride, Acid anhydrides, Amides and esters. Preparation of malic acid and tartaric acid from maleic acid, preparation of citric acid from glycerol.

UNIT-4

AMINES AND DIAZONIUM SALTS

Amines- Structure, Nomenclature, Preparation, Hoffman rearrangement, Physical properties, Salts of amines, Basicity of amines, Effect of substituents on basicity, reactions, Hoffman elimination, Analysis of amines, Phase transfer catalyst.

Diazonium salts- Synthesis, reaction and characteristics.

REFERENCE BOOKS

1 Organic Chemistry by M. K. Jain and S. C. Jain (Shoban Lal Nagin Chand & Co. Educational Publishers, Jalandhar).

2 Organic Chemistry by Robert T. Morrison and Robert T. Boyd (VIth Edition, Prentice Hall of India Pvt. Ltd. New Delhi)

3 Organic Chemistry by R. K. Bansal (Tata McGraw – Hill Publishing Co. Ltd. New Delhi)

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-III
PAPER NO.: US03EGCH05 (2 CREDITS, 70 MARKS)
TITLE: BASIC ANALYTICAL CHEMISTRY

Unit-1

Data Analysis: Analytical data evaluations: Errors, Accuracy and precision, Normal distribution curve, Mean and standard deviation, Comparison of results (students-t-test, f-test) paired t-test, Linear regression and correlation coefficient.

Unit-2

Titrimetric Methods of Chemical Analysis, General principle of titrimetry, Types of reactions in titrimetry, Standard solution, Basic requirements of titrimetry, Equivalence point and end point., Aqueous Acid Base Titrations. Concept of acid base titration, Titration curves, Acid-base indicators, Titration Feasibility and its applications., Non-aqueous Acid-base Titrations. Role and properties of solvents, Titrations in non-aqueous solvents.

Unit-3

Redox Titrations

Introduction, Redox systems, Redox potential, Nernst equation, Equilibrium constant, Titration curve & Feasibility, Redox indicators, Iodometric and iodimetric titrations., Complexometric Titrations: Introduction, Stability constant, Ways of detecting end point, Titration curves, Equilibrium involved in EDTA titration, Types of EDTA titrations, Titration of mixture; Selectivity, Masking and demasking, Metallochromic indicators, Applications.

Unit-4

Precipitation Titrations: Introduction, Feasibility and end point detection, Indicators, Volhard, Fajan and Mohr's methods, Factors affecting solubility of precipitates., Gravimetric Methods of Analysis: Principle of gravimetry, Requirements of precipitates, Formation and properties of precipitates, Coagulation & peptization, Co-precipitation and occlusion, Washing, drying and ignition of precipitates.

REFERENCE BOOKS

1. Analytical Chemistry: Principles-by J.H.Kennedy, Saunders college publishers, 2nd edition, 1990
2. Introduction to Chemical Analysis-by R.D.Braun, Mc-Graw Hill Book Co. 2nd edition 1995
3. Vogel's Textbook of Quantitative Chemical Analysis- by G.H.Jeffery, J.Mendham, R.C.Denney, 5th edition, 1998
4. Analytical Chemistry-by G.D.Christian, John Wiley & Sons, 3rd edition,
5. Quantitative Analysis-by R.A.Day, Prantice hall of India(P) Ltd., New Delhi, 6th edition, 1993
6. Modern Analytical Chemistry, By David Harvey, Mc Graw-Hill (USA).
7. Principles of instrumental analysis-by D.A.Skoog & F.J.Holler & T.A.Nieman Saunders college Publishers, 5th edition, 1998.

SARDAR PATEL UNIVERSITY

Syllabus for B. Sc. (Semester-IV) Industrial Chemistry Vocational

Effective from Academic Year 2012-2013.

PAPER NO.	PAPER TITLES	CREDIT – HRS.
US04CICV01	PLANT AUXILLIARIES	03 – 03
US04CICV02	INDUSTRIAL INSTRUMENTATION AND PROCESS CONTROL	03 – 03
US04CICV03	LABORATORY	03 – 03
US04CPHY01	PHYSICS THEORY	03 – 03
US04CPHY02	PHYSICS THEORY	03 – 03
US04CPHY03	LABORATORY	
US04EGCH05	INDUSTRIAL POLLUTION, IT'S CONTROL AND INDUSTRIAL SAFTY	02 – 02
US04EGCH06	INSTRUMENTAL METHODS OF ANALYSIS	02 – 02

Sr. No.	Courses	Credits			Teaching Hours		
		Theory	Practical	Total	Theory	Practical	Total
1	Core courses (i)	12	06	18	12	12	24
2	Elective courses	04	--	04	04	--	04
3	Foundation	02	--	02	02	--	02
	Total			24	18		30

Note: Nomenclature of Subject of code: U S 04 C ICV 01

U=Undergraduate, S=Science Faculty, 03/04=Semester three/four, C=Core Course, F=Foundation Course, E=Elective course, ICV=Industrial Chemistry Vocational, PHY=Physics, GCH=General Chemistry, 01/02/03=Paper 01/02/03.

SARDAR PATEL UNIVERSITY

BACHLOR OF SCIENCE INDUSTRIAL CHEMISTRY VOCATIONAL SEMESTER-IV

PAPER NO.: US04CICV01 (3 CREDITS, 70 MARKS)
TITLE: PLANT AUXILLIARIES

Unit 1:

Water- Impurities and hardness of natural water, Water for steam making and industrial processes, Boiler water treatments, Calculations on water treatments.

Unit 2:

Fuels-Classification, Advantages and disadvantages, Analysis of fuels, Heating media Air-Specification for industrial uses of air. Industrial applications of CO₂, O₂, N₂ and H₂ .

Unit 3:

Compression equipments, Reciprocating compressor, Work of single stage reciprocating compressor, Effect of clearance, Volumetric efficiency, Multistage compression, Refrigeration, COP & refrigerating effect, Industrial refrigerants, Carnot and other refrigeration cycles.

Unit 4:

Internal combustion engines and external combustion engine, Steam power plant, Its working and thermodynamic analysis, Otto engine and Diesel engine.
Steam boilers – Their classification, Steam generation, Conditions of steam, Steam table.

REFERENCE BOOKS

1. Chemistry of Engineering Materials by C. V. Agrawal (Tara Publication)
2. Introduction to Chemical Engineering Thermodynamics (IV edition) by J. M. Smith & Vanness, (McGraw-Hill Co.)
3. Chemistry in Engineering and Technology,(volume I & II) JC Kuriacose & J.Rajarah (Tata McGarw Hill).
4. Chemistry of Engineering Materials By Jain & Jain.(Dhanpairai Publishing Co.)
5. Shreve's Chemical Process Industries by George T. Austin (McGrow-Hill Publication, New Delhi)

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-IV (3 CREDITS, 70 MARKS)
PAPER NO.: US04CICV02
TITLE: INDUSTRIAL INSTRUMENTATION AND PROCESS CONTROL

Unit-1:

Concept of measurement and accuracy, Principle, Construction and working of temperature measuring instruments, Expansion thermometer, Thermoelectric temperature measurement, Resistance thermometer, Pyrometers.

Unit-2:

Pressure terms, Manometer, Bourdon pressure gage, Bellow type and Diaphragm type pressure gauge, Vacuum measurement, Calibration of pressure gage.

Level measurement: Direct and indirect type measurements, Density and viscosity measurement.

Unit-3:

Flow metering, Classification of instruments, Differential pressure and differential area meters, Open channel flow measurement.

Unit-4:

Control system, Terminology, Manual and automatic control, Closed loop and open loop control system, Process time lags, Modes of control action, Final control element.

REFERENCE BOOKS:

1. Industrial instrumentation by Donald. P. Eckman (Wiley eastern ltd).
2. Mechanical and Industrial measurement, R.K.Jain (Khanna publications)
3. Industrial Instrumentation and Process Control, kulkarni(Nirali Prakashan)
4. Process Instrumentation and control hand book- Douglas.M. caudisian (Mcgraw hill INC. New Delhi)
5. Instrumentation Technology (volume III) E.B.John.

INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-IV
PAPER NO.: US04CICV03 (3 CREDITS, 70 MARKS)
TITLE: LABORATORY

1. Analysis of natural and waste water.
2. Inorganic Qualitative Analysis. (Semi Micro)
3. Limit tests for heavy metals.
4. Calibration of instruments.
5. Different types of transducers.

BACHLOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-IV
PAPER NO.: US04EGCH05 (2 CREDITS, 70 MARKS)
TITLE: INDUSTRIAL POLLUTION, ITS CONTROL AND INDUSTRIAL SAFTY

Unit 1:

Atmosphere, Eco-System and Air Pollution, Sources and Effect of Air Pollutants, Green House Effect, Air Pollution control Technique.

Unit 2:

Water Pollution and its source, Types of water pollutants and their adverse effects, Waste water treatment, BOD and COD tests, Pesticide Pollution and sound pollution.

Unit 3:

Solid Waste Management, Collection and Disposal of solid waste, Radio activity and Radiation Pollution, Pollution Statutory limits.

Unit 4:

Industrial hazards, Safety consideration in chemical industries, Chemical, Electrical and mechanical hazards, Fire and explosion hazard, Health hazard, Laboratory Safety, Safety Practice, Factory acts.

REFERENCE BOOKS:

1. Environmental Chemistry, B. K. Sharma (Krishna Prakashan Media (P) Ltd., Meerut).
2. Environmental Pollution Control Engineering, C. S. Rao (Wiley Eastern Ltd., New Delhi)
3. Engineering Chemistry, Jain and Jain (Dhanpat Rai and Sons)
4. Introduction to Environmental Engineering and Science, G. M. Masters
5. Environmental pollution, H.N.DIX (J.W & Sons).
6. Chemical technology, Vol I, D.Venkateshwaraly (C.Chand & co)

BACHLOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-IV
COURSE NO.:US04EGCH06 (2 CREDITS, 70 MARKS)
TITLE: INSTRUMENTAL METHODS OF ANALYSIS

Unit-1:

pH metry: Introduction and determination of pH, applications. Potentiometric titrations: Introduction, Types of titrations, Advantages of potentiometric titrations. Conductometric measurements: Introduction, Some important laws, Definition and relations, Effect of dilution, Applications of conductance measurements, Types of titrations, Advantages and disadvantages.

Unit-2:

Chromatography: Introduction, Classification and application

Paper chromatography: Experimental details for qualitative analysis, Experimental details for quantitative analysis. Thin layer chromatography: Superiority of TLC over the other techniques, Experimental techniques, Limitations, Scope.

Column chromatography: Introduction, Experimental details, Theory of development, factors affecting column efficiency.

Unit-3:

HPLC and GC: Introduction, Instruments involved, Sampling methods, Experimental details and applications.

Unit-4:

Visible spectrophotometry and Colorimetry: Introduction, Theory of spectrophotometry and colorimetry, Deviation from Beer's Law, Instrumentation, Applications. Ultra Violet

Spectroscopy: Introduction, Origin and theory of ultraviolet spectra, Choice of solvent, instrumentation, Applications.

REFERENCE BOOKS

1. Instrumental methods of chemical analysis by Chatwal – Anand, Himalaya Publishing House.
2. Instrumental methods of chemical analysis by B.K. Sharma, Krishna Publication Media (P) Ltd., Meerut.
3. Organic spectroscopy by William Kemp, Macmillan Press Ltd., London.
4. Analytical chemistry by Gray D. Christian, 4th edition, Wiley & Sons, Inc.
5. Instrumental methods of analysis by Willard Merritt, Dean Settle, CBS Publishers & Distributors, New Delhi.
6. Principles of instrumental analysis by Skoog, Holler, Nieman, Thomson Asia Pvt. Ltd., Singapore.
7. Basic concept of analytical chemistry by S.M. Khopkar, New Age International Publishers.
8. Instrumental methods of chemical analysis by Galen W. Ewing, McGraw – Hill Book Company.

SARDAR PATEL UNIVERSITY

Syllabus for B. Sc. (Semester-V) Industrial Chemistry Vocational

Effective from Academic Year 2012-2013.

PAPER NO.	PAPER TTITLES	CREDIT - HRS.
US05CICV01	ORGANIC CHEMISTRY	03 – 03
US05CICV02	HEAVY AND FINE INORGANIC CHEMICALS	03 – 03
US05CICV03	TECHNOLOGY OF PETROLEUM AND PETROLEUM PRODUCTS	03 – 03
US05CICV04	INDUSTRIAL MANAGEMENT & ECONOMICS.	03 – 03
US05CICV05	PHARMACEUTICAL-I	03 – 03
US05CICV06	SEPARATION TECHNIQUES	03 – 03
US05CICV07	LABORATORY	02 – 04
US05CICV08	LABORATORY	02 – 04
US05CICV09	LABORATORY	02 – 04

Courses	Credits			Teaching Hours		
	Theory	Practical	Total	Theory	Practical	Total
Core courses	18	09	27	18	09	27

Note: Nomenclature of Subject of code: U S 05 C ICV 01

U=Undergraduate, S=Science Faculty, 05=Semester five, C=Core Course, ICV=Industrial Chemistry Vocational, 01/02/03...09 =Paper 01/02/03...09.

SARDAR PATEL UNIVERSITY

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V

PAPER NO.: US05CICV01 (3 CREDITS, 70 MARKS)
(ORGANIC CHEMISTRY)

UNIT: 1

Reaction Mechanisms: Types of mechanism. Reactive intermediates: Formation, Structure, Stability of carbocation, carbanion, free radical, benzyne and nitrene. Elimination reaction: mechanism and orientation, effect of changes in substrate. Addition Reaction: mechanism, orientation and reactivity. Aromatic substitution reaction (Electrophilic and Nucleophilic): mechanism, mono and di-substituted benzene – reactivity and orientation.

UNIT: 2

Reaction and Rearrangement: Friedel–Craft’s Reaction, Meerwein–Ponndorf–Verley Reduction, Aldol condensation, Diels–Alder Reaction.
Rearrangements: Introduction, Types of Molecular Rearrangement: Pinacol – Pinacolone Rearrangement, Benzilic Acid Rearrangement, Fries Rearrangement.

UNIT-3

Reagents of Synthetic Importance: Preparation and uses of Aluminiumisopropoxide, N-Bromosuccinimide, Lead tetra acetate, Lithium aluminium hydride, Osmium Tetraoxide, Sodium Borohydride and Selenium dioxide.

UNIT-4

Spectroscopy: Introduction, Theory, Instrumentation and Applications of Infrared (IR) Spectroscopy, Proton Nuclear Magnetic Resonance (NMR) Spectroscopy and Mass Spectroscopy.
Problems pertaining to the structure elucidation of organic compounds using UV, IR, Mass and PMR spectroscopy.

REFERENCE BOOKS

1. Organic Chemistry by M. K. Jain and S. C. Jain (ShobanLAINagin Chand & Co. Educational Publishers, Jalandhar).
2. Reaction Mechanism and reagents in Organic Chemistry. By Gurdeep R. Chatwal, Himalaya Publishing House. Delhi.
3. Organic Chemistry by Robert T. Morrison and Robert T. Boyd (VIth Edition, Prentice Hall of India Pvt. Ltd. New Delhi)
4. Organic Chemistry by R. K. Bansal (Tata McGraw – Hill Publishing Co. Ltd. New Delhi)
5. Spectroscopy of Organic Compounds, by P. S. Kalsi, New Age international Publications.

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V
PAPER NO.: US05CICV02 (3 CREDITS, 70 MARKS)
(HEAVY & FINE INORGANIC CHEMICALS)

UNIT-1

Synthetic nitrogen products – Ammonia, ammonium nitrate and ammonium sulphate, nitric acid,

Phosphorous chemical – phosphorus, phosphoric acid, ammonium phosphate, super – phosphate, triple superphosphate.

Industrial carbon – carbon black, manufacture of graphite and carbon, lime, gypsum, silicon, calcium carbide, silicon carbide.

UNIT-2

Fluorine, Bromine, Iodine, Inter-halogen compound. Sodium chloride, sodium sulphate, sodium sulphite, sodium thiosulphate.

Industrial catalysts – Raney nickel, other forms of nickel, palladium and supported palladium, copper chromate, vanadium, platinum based catalyst, titanium tetrachloride, and titanium dioxide.

UNIT-3

Fine and speciality chemicals – sodium carbonate, sodium bicarbonate, potassium dichromate, oxalic acid, perchloric acid, fehling solution, Karl-Fischer reagent, sodium borohydrate, sodium ethoxide, sodium methoxide and lithium aluminium hydride.

UNIT-4

Biochemical reagents: Ninhydrin, tetrazolium blue, 1,2-naphthaquinone – 4 – sulphonate manufacture of following fine chemicals.

Chromatographic materials and HPLC Solvents: Coating materials, precoating of plates, spectroscopy grade chemical. Methanol, ethanol, potassium bromide, carbon tetrachloride, Nujol, chloroform.

REFERENCE BOOKS

1. Chemical process industries, Shreve RN, McGraw Hill.
2. Introduction to material science and engineering, K M RELLS and T. COURTNEY, Wiley Eastern Pvt. Ltd. New Delhi.
3. Outline of Chemical Technology, G E. Dryden, East West Press, New Delhi.
4. Industrial Chemicals, Faith et. al. Wiley Interscience, New Delhi.

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V
PAPER NO.: US05CICV03 (3 CREDITS, 70 MARKS)
(TECHNOLOGY OF PETROLEUM AND PETROLEUM PRODUCTS)

UNIT -1

Introduction - Nomenclature Generic names, Trade names, Theories of Formation, Composition, Refining and Rectification process of Petroleum.

UNIT - 2

Manufacture of the following compounds: Methane, ethylene, acetylene.

Preparation of the following from methane, methanol, hydrogen cyanide, carbon disulphides.

UNIT – 3

Preparation of the following from ethylene. Ethyl chloride, ethanol, ethylene oxide, ethylene glycol, acetic acid, styrene, vinyl acetate.

Manufacture of the following compounds: From propylene: Isopropanol, Cumene, glycerine, acrylonitrile.

UNIT - 4

Manufacturing From C-4 hydrocarbons, Butadiene, isobutene, isobutane, butandionols.

Benzene, Toluene, xyelene, naphthalene, linear alkyl benzenes and their sulphonates. Various catalysts used in petrochemical industry, preparation, applications and selectivity.

REFERENCE BOOKS

1. Handbook of petroleum refining process R.A.Meyers, McGraw Hill, Book Com. New York.
2. From Hydrocarbons to petrochemicals, L.F. Hatch Gulf Publishing company, Houston.
3. Petrochemicals – The vise of an industry, Spitz, Willey.
4. Introduction to petroleum chemicals, M. Steiner, Pergaman Press.
5. Catalysts in petrochemcial refining, Trima.Billmeyer.
6. A Text on Petrochemicals by BhaskarRao (Khanna Publishers - New Delhi)
7. Modern Petroleum Refining Process by BhaskarRao (Oxford & IBH Publishing Co. Pvt. Ltd. – New Delhi)
8. Advanced Petrochemicals by Dr. G. N. Sarkar (Khanna Publishers)
9. Advanced Petroleum Refining by Dr. G. N. Sarkar (Khanna Publishers)
10. Chemicals from Petroleum by A. L. Waddam(ELBS edition, London.)
11. Shreve’s Chemical Process Industries by Austin (MacGrow- Hill Publication, New Delhi)

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V
PAPER NO.: US05CICV04 (3 CREDITS, 70 MARKS)
(INDUSTRIAL MANAGEMENT & ECONOMICS)

UNIT-1

Forms of legal ownership, Ideal form of an organization, Features, Advantages and Disadvantages of Sole Proprietorship, Partnership Organization, Co-Operative Organization, Joint stock companies and Joint Hindu family organization.

UNIT-2

Concept of scientific management in industry, Function of Management, Decision making, Planning, organizing, Directing and Control.

UNIT-3

Location of industry, Management of human resources selection, Incentives welfare and safety. Introduction to MIS, Functions of MIS, Problems with MIS, Knowledge requirements for MIS in seven areas. (GST, DSS, EIS, ES, 4GL, IT & MIS)

UNIT-4

Factors involved in project cost estimation, Methods employed for the estimation of capital investment, Capital information, Elements of cost accounting, interest and investment costs, Time value of money, Equivalence.

REFERENCE BOOKS

1. Fundamentals of Business organization and management by Y.K. Bhushan, Sultan Chand & Sons New Delhi
2. Business Administration & management by S.C. Saxena
3. Finance Management by I.M. Pandey
4. Marketing Management By Philip Kotler.
5. MIS by T. Lucey 8th Edition BPB Publication

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V
PAPER NO.: US05CICV05 (3 CREDITS, 70 MARKS)
(PHARMACEUTICALS-I)

UNIT-1

Historical background and development of pharmaceutical industry in India in brief.
Pharmacopeas - I.P. , B.P., U.S.P.,
Brief idea of Pharmaceutical Legislation, Drugs & Cosmetics Act-1940
Introduction to various types of formulation and routes of administration.

UNIT-2

Pharmaceutical Packaging: Introduction, package selection, packaging materials, packaging machinery, quality control of packaging materials.

Surgical dressings: Gauzes, bandages, sutures, ligatures. Detailed study of cat-gut with respect to manufacturing process, Sterilization, Quality control and uses.

Brief study of sterilizations.

Pharmaceutical quality control: Aseptic condition, sterility testing, pyrogenic testing, glass testing.

Flow properties of powders: Bulk density, tap density, true density, Porosity, Husanar's ratio, Carr's index, Angle of repose.

UNIT-3

Study of various types of pharmaceutical excipients: Glidants, lubricants, diluents, binders, coating agents, antioxidants, emulsifying agents, suspending agents, preservatives, colouring agents, flavouring agents, sweetening agents.

UNIT- 4

Phytopharmaceuticals:

Introduction and Plant Classification.

Crude drugs: cultivation, collection, storage of medicinal plants and brief idea about marketed preparations/formulations.

Evaluation of crude drugs: moisture content, extractive value, volatile oil content, foreign organic matter.

REFERENCE BOOKS

1. Martin's Physical Pharmacy and Pharmaceutical science, Fifth edition, By Patricle J Sinko, Indian edition, B.I. Publication.
2. Remington – The science and Practice of Pharmacy, 21st edition Vol. I and II, Indian Edition.
3. A Text book Pharmacognocny by S H Lachake, ATUL Prakashan.
4. Pharmaceutical packaging technology, by U K Jain, & D C Goopale. Pharma Med Press
5. Pharmaceutics – I by P V Kasture & S. A. Hasan, Nirali Prakashan.
6. Pharmaceutical Jurisprudence, by Girish K Jani, Atul Prakashan.
7. Physical Pharmaceutics (Part I) by Girish Jain, (page 358) Atul Prakashan.
8. Text Book of Physical Pharmaceutics by CVS subrahmanyam. Vallbh Prakashan, Delhi.
9. Text Book of Pharmaceutical Formulation by B M Mithal, Vallabh Prakashan. Delhi. (Chapter 10,11)

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V
PAPER NO.: US05CICV06 (3 CREDITS, 70 MARKS)
(SEPARATION TECHNIQUE)

Unit-1

Characterization, uses and selection of separation process - Distillation, types of distillation, McCabe Thiele method for calculating plates, Importance of reflux ration

Unit-2

Concept of mass transfer and mass transfer operation, Fick's law, gas absorption, equipment for gas-liquid separation, solvents for gas absorption, tower pickings, Liquid extraction.

Unit-3

Crystallization- methods of crystallization, batch and continuous crystallization, theory of crystallization, mechanism of crystallization, mass and enthalpy balance calculations, leaching.

Unit-4

Drying- classification of dryers, compartment dryer, tunnel dryer, rotary dryer, drum dryer, spray dryer, mechanism of drying

RECOMMENDED BOOKS

1. Introduction of chemical engineering, Bedger & Benchero (Mc Graw Hill)
2. Unit operation of chemical engineering, McCabe & Smith
3. Chemical engineering (Volume II) Calson & Richardson
4. Unit operation (Volume II) K. A. Gavhane

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V
PAPER NO.: US05CICV07 (2 CREDITS, 70 MARKS)
(LABORATORY – PREPARATION AND ESTIMATION OF ORGANIC COMPOUNDS)

Preparation of Intermediates and Drugs based on various Unit Process.

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INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V
PAPER NO.: US05CICV08 (2 CREDITS, 70 MARKS)
(LABORATORY- PETROLEUM)

As per ASTM testing of petroleum and petroleum products: Characteristics of Petrol, Kerosene, Diesel, Furnace Oil, with respect to Flash point, Viscosity, Surface Tension, Distillation Fractions.

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INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-V
PAPER NO.: US05CICV09 (2 CREDITS, 70 MARKS)
(LABORATORY - PHARMACEUTICAL)

Demonstration of various Pharmaceutical Packaging materials quality control tests of some materials. Aluminium strips, cartons, glass bottles.

Limits tests for chlorine, heavy metals, arsenic etc. of two representative bulk drugs.

Demonstration of various pharmaceutical products. Active ingredient analysis of few types of formulations representing different methods of analysis acidimetry, Alkalimetry, nonaqueous complexometry, Potentiometry, etc. of bulk drugs, complete I. P. Monograph of three drugs representing variety of testing methods.

SARDAR PATEL UNIVERSITY

Syllabus for B. Sc. (Semester-VI) Industrial Chemistry Vocational

Effective from Academic Year 2012-2013.

PAPER NO.	PAPER TITLES	CREDIT – HRS.
US06CICV01	DYES & INTERMEDIATES	03 – 03
US06CICV02	HEAVY AND FINE ORGANIC CHEMICALS	03 – 03
US06CICV03	POLYMER SCIENCE	03 – 03
US06CICV04	INDUSTRIAL MANAGEMENT & ECONOMICS - 2	03 – 03
US06CICV05	PHARMACEUTICAL-II	03 – 03
US06CICV06	SELECTED TOPICS	03 – 03
US06CICV07	LABORATORY	02 – 04
US06CICV08	LABORATORY	02 – 04
US06CICV09	LABORATORY	02 – 04

Courses	Credits			Teaching Hours		
	Theory	Practical	Total	Theory	Practical	Total
Core courses	18	09	27	18	09	27

Note: Nomenclature of Subject of code: U S 06 C ICV 01

U=Undergraduate, S=Science Faculty, 06=Semester five, C=Core Course, ICV=Industrial Chemistry Vocational, 01/02/03...09 = Paper 01/02/03...09.

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BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-VI
PAPER NO.: US06CICV01 (3 CREDITS, 70 MARKS)
(DYES & INTERMEDIATES)

UNIT: 1

Introduction, Classification of Dyes on the basis of mode of applications to the fibers and chemical constitution of the Dyes. Applications of Dyes to fibers, colour shades and fastness properties.

UNIT: 2

Chemistry of the following dyes with respect to general structural features and classification: Introduction, Classification and applications of Azo dyes, Acid dyes, Basic dyes and Mordant dyes.

Unit: 3

Introduction, classification and applications of Anthraquinone (VAT) dyes, Indigoid dyes. Disperse dye, Reactive dyes.

Unit: 4

Analysis and application of dyes and dye intermediates: Analysis of intermediates different methods used in the analysis. Nitrite value determination, coupling value, titanous chloride reduction, halogen content determination, etc.

REFERENCE BOOKS

1. LUBS Chemistry of synthetic dyes and pigments, R. E. Krieger Publishing Company.
2. Dyeing and Chemical technology of textile fibres, E. R. Trotman.
3. Development in the Chemistry and Technology of Organic Dyes, J. Driffths, Society of Chemicals Industry, Blackwell Scientific Publications.
4. The chemistry of Synthetic Dyes, K. Venkataraman, Academic Press, Vol. I-III.
5. The analytical Chemistry of Synthetic Dyes, K. Venkateraman, John Wiley, New York.
6. A Laboratory Course in Dyeing, C.H. Gites, The society of Dyes and Colourists.
7. The Dyeing of Synthetic polymers and acetate fibres, D.M. Nunn, Dyers Company Publishing Trust.
8. Dyes and Their Intermediates, H.A. Abrahert, Pergaman Press.
9. An introduction to synthetic Dyes, D.M. Rangnekar and P.P. Singh Himalaya Publication, Bombay.

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-VI
PAPER NO.: US06CICV02 (3 CREDITS, 70 MARKS)
(HEAVY AND FINE ORGANIC CHEMICALS)

UNIT-1

Fischer-tropsh synthesis- Examples, Chemicals derived from acetylene, propargyl alcohol, 1, 4-butanediol, acrylates, vinyl esters, vinyl chloride. Pyridine picolines, phenol, acetone, resorcinol, phthalic anhydride,

UNIT-2

Raw materials, flow chart, effluent management, kinetics and uses of Triphenyl phosphine, alkyl phosphates, Glycerol, sorbitol, melamine, formaldehyde, formic acid.

UNIT- 3

Chlorination of methane: Methyl chloride, dichloromethane, chloroform, carbon tetrachloride.

Ethanolamine, mono, di, and tri- ethanolamines, dialkylaminoethanols (dimethyl, diethyl).

UNIT-4

Alkylamines: Methylamine, ethylamine, di, tri - alkylamine (methyl, ethyl), butylamines, propyl amines

Specialty & industrial solvents: DMF, DMSO, Sulfolane, Alkylpyrrolidone, THF, Dibutyl ether, diethyl ether, dimethoxyethane, dioxane.

REFERENCE BOOKS

1. Applied Organic Chemistry, Kilner E. and Samuel.D.M.MacDonald and Evans Ltd.,
2. Unit process in Organic Synthesis. P.H. Groggine, McGraw Hill Kogakusin Ltd.
3. Heavy organic chemicals, A.J.Saite, Pargaon Press, U.K.

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-VI
PAPER NO.: US06CICV03 (3 CREDITS, 70
MARKS) (POLYMERS)

UNIT: 1

Introduction, General characteristics of polymers in comparison with common organic compounds. Nomenclature. Classification of polymers, Different types and method of Polymerizations.

UNIT: 2

Molecular weight and molecular weight distribution number, weight and viscosity average molecular weights of polymers. Methods of determining molecular weight, Practical significance of molecular weight distribution. Glassy state, Glass transition temperature (T_g), Factors affecting T_g, Crystallinity in polymers.

UNIT: 3

Thermosetting Polymers: Introduction, Synthesis, Chemistry, Properties and Applications of Phenol formaldehyde, Melamine formaldehyde resins, Polyurethanes, Epoxy resins, Grades of epoxy resins, Curing process and its importance with mechanism. Elastomers, Polybutadiene and Neoprene.

UNIT: 4

Detailed study of the following thermoplastic polymers with respect to Synthesis, Chemistry, Properties and Application Polyolefine Polyethelenes, LDPE, HDPE, Polypropylene, Polyvinyl chloride, Teflon, polystyrene.
Homopolymers, Copolymers such as SBR, ABS, SAN. Polyvinyl acetate and its modifications. Polyamides: Nylon-6 and Nylon-66.

REFERENCE BOOKS

1. Textbook of Polymer Science, John Wiley and Sons, D.D. Deshpande.
2. Physical Chemistry of Macromolecules. Vishal Publications, New Delhi 1985
3. Polymer Science V. R. Gowarikar N.V. Vishwanathan and J. Sreedhan, Wiley Eastern Ltd., 1986.

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-VI
PAPER NO.: US06CICV04 (3 CREDITS, 70 MARKS)
(INDUSTRIAL MANAGEMENT & ECONOMICS-2)

UNIT-1

Basic concept of Economics, Demand and Supply, Elasticity of Demand and Supply, Concept of Profit and Revenue, Concept of Equilibrium and Margin, Introduction to Micro and Macro Economics, Economies in production, Economics in management, Economies in finance.

UNIT-2

Depreciation methods of determining depreciation, Taxes, selecting some aspects of marketing, Pricing policy, Profitability, Criteria, Economics of selecting alternatives, Variation of cost with capacity, optimum batch sizes, Production scheduling etc.

UNIT-3

Entrepreneurial decision: Launching a new enterprise, ownership organization decision, Expansion of existing business.

Scale of operation and size of firm: Measure of size, Factors determining size of business, optimum size of business unit, force determining optimum size. Weakness of large firms.

UNIT – 4

Material management, Inventory Management: Meaning, Importance, Techniques and Inventory Controls. Quality Control: Meaning, Importance, Total Quality Control and Total Quality Management Case Study on TQC and TQM

REFERENCES BOOKS

1. Essentials of Inventory Management, by Max Muller, AMACOM
2. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
3. Quality Control and Applications by Housen & Ghose
4. MIS by T. Lucey 8th Edition BPB Publication

BACHELOR OF SCIENCE\
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-VI
PAPER NO.: US06CICV05 (3 CREDITS, 70 MARKS)
(PHARMACEUTICAL-II)

UNIT-1

Drugs, pro-drugs, biotransformation of drugs, routes of drugs administration and dosage forms, drug binding, drug toxicity, drug addiction, some important terms used in chemistry of drugs, biological and medical terms used in the study of drugs, distinctive definition. Classification of drugs, relation of chemical structure and chemical activity.

UNIT-2

The study of life saving drugs: Introduction, classification, properties and uses of followings. Sulfadruugs, Antipyretics and analgesics, Antifungal and Antiinflammatory drugs .

UNIT-3

Vitamins and Hormones:

Introduction, origin of vitamins, classification of vitamins and deficiency disease. Hormones- Adrenaline, Thyroid gland hormone and sex Hormone.

UNIT- 4

Microorganisms: Structure, classification, Growth and Usefulness.

Fermentation: General principle of fermentation process and product processing.

Manufacturing of Penicillin, Tetracyclins and Vit-B₁₂

REFERENCE BOOKS

1. Organic chemistry of Drugs synthesis, Daniel Lednice and L.A. Mitsouhar, Wiley Interscience.
2. An introduction to synthetic Drugs, P.P.Singh and D.W.Rangnekar, Himalaya Publication, Bombay.
3. Synthetic Drugs by Gurdeep R. Chatwal (Himalaya Publishing House).
4. Principles of medicinal chemistry, W.O.Foye: Lea and Febigen, Publication, Philadelphia.
5. Text book of organic medicinal and pharmaceutical chemistry Milson, Gisvold, Derge, Lippinett Toppan.

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-VI
PAPER NO.: US06CICV06 (3 CREDITS, 70 MARKS)
(SELECTED TOPICS)

Unit-1

Development of project, evolution of process, plant design factor, process design, choice of process, engineering flow diagram

Selection of process equipments and materials, chemical reactors, plant layout

Unit-2

Surface chemistry and interfacial phenomena, absorption, Sols, Gels, emulsions, Aerosols, surfactants, catalysis and catalyst, industrially important catalyzed reaction

Unit -3

Advanced separation techniques – ion exchange- resins and equipments, membrane separation process, ultra-filtration, reverse osmosis, electro-dialysis

Unit-4

Automatic control system terminology, manual and automatic control, feed forward & feedback control system, process time lags, control action & types of control action, final control element

RECOMMENDED BOOKS

1. Chemical engineering plant design, Vibrant & Dryden (McGrow hill publication)
2. Chemical engineering (volume II) Colulson & Richardson
3. Mechanical and Industrial measurement, R. K. Jain (Khanna Publishers)
4. Plant design and economics for chemical engineering, Peter & Pimmerhours
5. Unit operations of chemical engineering, McCabe & Smith.

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-VI
PAPER NO.: US06CICV07 (2 CREDITS, 70 MARKS)
(LABORATORY-DYES AND INTERMEDIATE)

Analysis of intermediates: Nitrite titrations, Diazocoupling, titanous chloride titration, estimation of Cu, Ni, Cr, etc. Dyeing: Dyeing of various dyes on cotton. Evaluation of the fastness properties of dyes with respect to light, washing and sublimation. Preparation of various class of dyes.

BACHELOR OF SCIENCE
INDUSTRIAL CHEMISTRY VOCATIONAL
SEMESTER-VI
PAPER NO.: US06CICV08 (2 CREDITS, 70 MARKS)
(LABORATORY-POLYMERS)

Determination of Acid value, Iodine number, Saponification value, Melting point and softening point of epoxy resin and Hydroxyl value. Synthesis of polymers and resins like Novalak Phenol formaldehyde, Resol Phenol formaldehyde, Urea formaldehyde, Melamine formaldehyde, Glyptalresin, Saturated and Unsaturated polyester. Cellulose Acetate, Cellulose Nitrate, Polysulfone rubber and analysis of the above (viscosity, M.P., Mol. Wt. determination). Identification of polymers by simple physical and chemical tests. Analysis of raw materials phenols, formaldehyde, urea, melamine, epichlorhydrin.

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SEMESTER-VI
PAPER NO.: US06CICV09 (2 CREDITS, 70 MARKS)
(LABORATORY-PHARMACEUTICALS)

Quantitative Organic Analysis: Estimation and Analysis of intermediates and finished Drugs. Identification of raw drugs by TLC and Paper chromatography method for identification.