

Sardar Patel University
Syllabus for B. Sc. (Semester-VI) Industrial Chemistry
Effective from Academic Year 2020-2021

Courses	Course Code	Title Of Paper	Credit
Core courses-I	US06CICH21	Synthetic Dyes and Pharmaceuticals	04
Core courses-II	US06CICH22	Polymer Technology	04
Core courses-III	US06CICH23	Business Organization & Management	04
Core courses-IV	US06CICH24	Process control for Heat & Mass Transfer Operations	04
Practical	US06CICH25	Practical (All Core Courses)	06
Discipline Specific Elective	US06DICH26	Specialty Chemical Industries - II	02
Discipline Specific Elective	US06DICH27	Industrial Safety & Hygiene - II	02

Courses	Course Code	Credit	Marks			
			External	Exam Time	Internal	Total
Core courses – I	US06CICH21	04	70	3 Hrs	30	100
Core courses - II	US06CICH22	04	70	3 Hrs	30	100
Core courses – III	US06CICH23	04	70	3 Hrs	30	100
Core courses - IV	US06CICH24	04	70	3 Hrs	30	100
Practical	US06CICH25	06	105	12 Hrs	45	150
Discipline Specific Elective (Any One)	US06DICH26 US06DICH27	02	50	2 Hrs	--	50

Note: Nomenclature of Subject of code: U S 05 C ICH 21: U=Undergraduate, S=Science Faculty, 05=Semester three/four, C=Core Course, D= Discipline Specific Elective, ICH=Industrial Chemistry, ICV=Industrial Chemistry Vocational. 21...22... = Paper number.



BACHELOR OF SCIENCE
Industrial Chemistry – Sardar Patel University
Semester-VI
PAPER NO.: US06CICH21
TITLE: Synthetic Dyes and Pharmaceuticals
(04 Credits, 4 Hours; 70 External Marks & 30 Internal Marks)
(Effective from June 2020)

Unit 1: Dyes: Introduction, Theory of colors, Classification of dyes, Chemistry of Azo, Anthraquinone, Reactive and Disperse dyes.

Unit 2: Application of synthetic dyes of various fabrics and Fastness properties. Analysis of dyes and dye intermediates: Nitrite value, Coupling value, Titanous chloride reduction, Halogen content determination and estimation of Cu, Ni and Cr.

Unit 3: Drugs: Introduction, 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. Account of Sulfa drugs, Antipyretics and analgesics drugs.

Unit 4: Vitamins, Hormones, Antibiotics, Antitubercular, Antifungal and Antiinflammatory drugs: Introduction, classification and synthesis and study of selected drugs.

REFERENCE BOOKS:

1. Synthetic Dyes by Gurdeep R. Chatwal (Himalaya Publishing House).
2. Synthetic Drugs by Gurdeep R. Chatwal (Himalaya Publishing House).
3. Organic Chemistry by M K Jain and S C Sharma., (SHOBANLAL NAGIN CHAND & CO.)
4. Handbook of Synthetic Dyes & Pigments by K. M. Shah, (Multi-tech Publishing Co.)



BACHELOR OF SCIENCE
Industrial Chemistry – Sardar Patel University
Semester-VI
PAPER NO.: US06CICH22
TITLE: Polymer Technology
(04 Credits, 4 Hours; 70 External Marks & 30 Internal Marks)
(Effective from June 2020)

Unit-1

A Brief history of polymer, Classification and nomenclature of polymers, chemistry of polymerization and Polymerization methods.

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

Raw material, manufacture, properties and application of PF, UF, MF, PU, Epoxy resins.
Raw material, manufacture, properties and application of PE, PP, polycarbonates, PTFE, PVC, PS, PVA.

Unit-4

Fiber – Natural and synthetic fiber, nylon, polyester and Rayon.
Rubber – Natural and synthetic rubbers, Polyisoprene, Butadiene, Neoprene, SBR and Thiokol.
Specialty Polymer – polyimides and related specialty polymers, ionic polymers, polyaryletherketones, Specialty polyolefins, Inorganic Polymers, liquid-crystal polymers, Conductive polymers.

REFERENCE BOOKS

1. Shreve's Chemical Process Industries by Austin (MacGrow- Hill Publication, New Delhi)
2. Riegel's Hand Book of Industrial Chemistry by James A Kent (CBS Publishers & Distributors - New Delhi)
3. Polymer Science by V. R Gowariker, N. V. Viswanathan, JayadevSreedhar, Wiley Eastern. (New Age International (P) Ltd., New Delhi)
4. Polymer Science and Technology of Plastics and Rubbers by PremamoyGhosh (Tata McGraw-Hill Publishing Co. Ltd., New Delhi)
5. Polymer Science and Technology, by Joel R Fried, PHI.



BACHELOR OF SCIENCE
Industrial Chemistry – Sardar Patel University
Semester-VI
PAPER NO.: US06CICH23
TITLE: Business Organization & Management
(04 Credits, 4 Hours; 70 External Marks & 30 Internal Marks)
(Effective from June 2020)

Unit: 1

Forms of legal ownership, Ideal form of an organization, Feature, Advantages and disadvantages of Sole proprietorship, Partnership, Co-operative.
Joint Hindu Family Organization and Joint Stock Company. Entrepreneurship decision, Launching of a new enterprise, Principle of management.

Unit: 2

Function of management I. Planning, Directing and Decision making.
Function of management II. Staffing, control, organization.

Unit: 3

Financial management (source of finance, working and fixed capital). Interest and Depreciation, Taxes and Insurance.
Marketing management (core concepts of marketing), Pricing policy, Break Even Analysis, Profitability criteria and selection of alternatives.

Unit: 4

Project cost estimation, Plant location, Inventory management (methods for calculating economic order quantity), Welfare and Safety.
Development of the project, evaluation of a process, choice of process, plant design factors, selection of process equipment and materials, reactors, plant layout.

REFERENCE BOOKS

1. Fundamentals of Business Organisation and Management by Y. K. Bhusan (Sultan Chand & Sons – New Delhi)
2. Business Administration and Management by S. C. Saksena (Sahitya Bhawan – Agra).
3. Business Organisation and Management by Shukla M C, (S. Chand & Co.).
4. Principle and Practice of Management by V S P Rao and P S Narayana. (Konark Publishers PVT LTD)
5. Organisation and Management by R D Agrawal. (Tata McGraw Hill New Delhi)
6. Principle and Practice of Management by L M Prasad. (S. Chand & Co.).
7. Finance Management by I. M. Pandey (Vikas Publishing House Pvt. Ltd. – New Delhi)
8. Marketing Management by Philip Kotler. (Prentice Hall of India Pvt. Ltd. – New Delhi)
9. Plant Design Economics for Chemical Engineers by Peter and Timmerhouse. (McGraw-Hill, Inc. – New Delhi)
10. Chemical Engineering Plant Designing By Vilbrandt & Dryden (McGraw-Hill Co.).



BACHELOR OF SCIENCE
Industrial Chemistry – Sardar Patel University
Semester-VI

PAPER NO.: US06CICH24

TITLE: Process control for Heat & Mass Transfer Operations
(04 Credits, 4 Hours; 70 External Marks & 30 Internal Marks)

(Effective from June 2020)

Unit 1: Concept of measurement and accuracy, Principle, construction and working of temperature measuring instruments, Expansion thermometer, Thermo-electric temperature measurement, Resistances thermometers, Pyrometers. Pressure Terms, Bourden pressure gauge, Bellow type and Diaphragm type pressure gauge, Vacuum measurement, Calibration of pressure gage, Direct and indirect method of level measurement, Sp. Gravity scales, Density and sp. Gravity measurement, Viscosity measurement.

Unit 2: Flow measurement – classification of instruments, Differential pressure and differential area meters, Open channel flow measurement.

Control system, Terminology, Manual and automatic control, Open and closed loop control, Process time lags, Modes of control actions, Final Control Element.

Indicators, Recorders, Control panels and Control center, instrumentation diagram, Pneumatic and electrical transmission system.

Unit 3: Modes of heat transfer, Fourier's law, Thermal conductivity, Thermal insulators, Resistance in series and parallel, Heat flow through Sphere and Cylinder, Natural and forced convections.

Natural and forced convections, Heat Transfer equipment, Types of Heat Exchanger, Shell and Tube Heat Exchanger, Double Pipe heat Exchanger, Extended surface and plate type heat exchanger.

Unit 4: Distillation- volatility and relative volatility, Boiling point diagram and equilibrium diagram, Types of distillation, Mass and enthalpy balance calculations, Calculation of number of theoretical plates, Mc-Cabe Thiel method, Importance of reflux ratio, Steam distillation, Equipment's of Distillation.

Drying, Classification of dryers, Compartment dryer, Tunnel dryer, Rotary dryer, Drum dryer, Spray dryer etc., Types of moisture, Theory of drying. Evaporation- batch and continuous type evaporators, Multiple effect evaporator, Capacity of evaporator, Accessories of evaporator.

REFERENCE BOOKS:

1. Industrial Instrumentation by Donald P Eckman (Wiley Estern Ltd.)
2. Mechanical & Industrial Measurement by R. K. Jain (Khanna Publishers)
3. Industrial Instrumentation & Process Control by Kulkarni (NiraliPrakashan – Pune)
4. Process Instrumentation & Control Handbook – Douglass M Considine. (McGraw-Hill, Inc., New Delhi)
5. Instrumentation Technology(volume iii)E.B. John
6. Unit Operations : Volume I & II, by K. A. Gavhane (NiraliPrakashan- Pune)
7. Introduction to Chemical Engineering by Walter L Badger and Juline T Banchemo (McGraw-Hill Book Co.)
8. Unit Operation of Chemical Engineering by Warreh L Mc Cabe&Jullian C Smith (McGraw-Hill Book Co.)
9. Chemical Engineering (volume I & II) by J. M. Coulson & K. F. Richardson (Asian Books Pvt. Ltd., New Delhi).



BACHELOR OF SCIENCE
Industrial Chemistry – Sardar Patel University
Semester-VI
SUBJECT CODE: US06CICH25
TITLE: Practical (All Core Courses)
(06 Credits, 12 Hours; 50 External Marks-105, Internal Marks-45)
(Effective from June 2020)

Part: I (02 Credits, 04 Hours, 35 External 15 Internal marks)

Preparation of intermediates and dyes from different groups., Analysis and estimation of dyes., TLC of intermediates, Paper Chromatography of Dyes., Dyeing: Dyeing of the following dyes on cotton – Direct, Azoics, Acid, on wool and silk 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. Identification of raw drugs (TLC method).

Part: II (02 Credits, 04 Hours, 35 External 15 Internal marks)

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. % purity determination of formalin, Benzoyl peroxide & Hydrogen peroxide. Determination of acid value, Saponification value and Hydroxyl value

Part: III (02 Credits, 04 Hours, 35 External 15 Internal marks)

Study of types of distillation-Simple distillation, Rectification, Steam distillation, 2. Study of yield of crystallization with seeding and without seeding, 3. To generate Mier's super saturation curve, 4. Study on evaporation with respect to temperature and surface area, 5. Study of boiling point depression, 6. Study of adsorption behavior, 7. Study of humidity parameter using DBT-WBT method and dew point method, 8. Calibration of industrial instruments.

Book review report writing and its submission cum presentation. A case study on selected management area of chemical industry visited.



BACHELOR OF SCIENCE
Industrial Chemistry – Sardar Patel University
Semester-VI
SUBJECT CODE: US06DICH26
TITLE: Specialty Chemical Industries - II
(02 Credits, 2 Hours; 50 External Marks)
(Effective from June 2020)

Unit -1

Introduction detergents, principal group of synthetic detergent, Classification of surface-active agent, Anionic detergents, Non-ionic detergents, Additives, sub regulators, Binders, Biodegradability of surfactants, Ecofriendly detergents containing enzymes, Ecofriendly detergents-Zeolites, Detrimental effect of detergent, Manufacturing of Shampoos.

Unit-2

Introduction of Explosive and Toxic chemical Industries, Classification of Deflagrating, Characteristics of explosive, Nitrocellulose, Di-nitrobenzene, Tri-Nitrobenzene, Tri-Nitro toluene, Picric acid, Ammonium picrate or explosive, Nitroglycerin and dynamite, Gun powder, RDX

Unit-3

White pigments, White lead, Electric method, Characteristic of pigment, use of pigment, Titanium dioxide, mordant chlorine method, Physical property of TiO_2 Ultramarine blue, Cobalt blue, Red lead, Synthetic iron oxide pigment, Green pigment, Chrome green, Yellow pigment, Black pigment, Tonner.

Unit-4

Classification of paint, Distemper, Manufacturing of paint, Setting of paint, Good paint, Important of PVC, Paint failure, Emulsion paint, constituent of emulsion paint, Latex paint, Luminescent paints, paint remover, Application of paint and Varnishes, Raw material, Manufacturing of Varnishes, enamels, Gloss finisher.

REFERENCE BOOKS

1. Environmental Chemistry by B.K. Sharma, H.Kaur (GOEL Publishing House, Meerut)
2. Environmental Engineering by Howard S. Peavy, Donald R. Rowe, George Tchobanoglous (McGRAW-HILL INTERNATIONAL EDITOR)
3. Water Pollution by V.P. Kudesia (Pragatiprakashan)
4. Environment pollution control engineering by C S Rao (New Age International (P) Limited)



BACHELOR OF SCIENCE
Industrial Chemistry – Sardar Patel University
Semester-VI
SUBJECT CODE: US06DICH27
TITLE: Industrial Safety & Hygiene - II
(02 Credits, 2 Hours; 50 External Marks)
(Effective from June 2020)

UNIT-1

Safety in chemical industries

Place of chemical industries in society, statutory provisions, Types of chemical hazard & its control, General safety precautions.

UNIT-2

Process Hazard & its control, Utility Hazard & its control, safety transportation of chemicals, Checklist of Routine inspections chemical factories, Types of tests, certificates & Records. Permits for vessel entry.

UNIT-3

Occupational health

Industrial hygiene & occupational health, occupational health hazard, adverse health effect & its control, Types and limits of radiation, Dangerous properties of chemicals and their health effects, Routes of entry & its toxic effects, Evaluation of health hazards, Sampling analysis in gas.

UNIT-4

Safety management

Concept of management, elements of management & principles, safety management & its responsibilities, safety organizations, department & Programme, safety education & training

REFERENCE BOOKS

1. Fundamental of industrial safety & Health –volume-1 by Dr. K.U.Mistry
2. Fundamental of industrial safety & Health –volume-2 by Dr. K.U.Mistry

