

Industrial Chemistry

POST GRADUATE DEGREE STANDARD

UNIT 1.1

Industrial Chemical Process :

Criteria for Process selection - techniques and reagents - consideration of yield, raw materials, processes, by-products - waste disposal and environmental impacts - products competition.

UNIT 1.2

Unit Operations:

Equipment and appliances used in major chemical Industries - size reduction ,filtration, centrifugation, membrane separation - settling, flotation, drying and crystallization, distillation, adsorption and extraction.

UNIT 1.3

Unit Processes:

Stoichiometric Principles, materials and energy balances, nitration, sulphonation, halogenation, esterification, saponification, animation and hydrogenation

UNIT 1.4

Water quality requirements for industries:

Sources, quality parameters - pH, acidity, alkalinity, total dissolved solids, hardness, chloride, sulphate, iron, manganese and silica - permissible limits for various industries, water treatment - lime - soda, zeolite, ion exchange and reverse osmosis methods.

UNIT 1.5

Industrial pollution and abatement:

Environmental pollution - causes and types, water pollution - measurement of turbidity, colour, DO,BOD and COD, discharge standards, waste water treatment - primary and secondary treatments, advanced oxidation technologies - ozonation and photodegradation, air pollution - sources and causes, monitoring and control devices, solid waste management, disposal of hazardous wastes.

UNIT 1.6

Inorganic heavy chemicals:

Chloralkali industry - membrane cell technology, sulphuric acid - contact process, ammonia - Haber process, sodium carbonate - Solvay process.

UNIT 1.7

Silicate Industries:

Refractories - properties and requirements, classification, manufacture of silica, magnestic and carborandum, abrasives - natural and synthetic abrasives - corundum, diamond, boron carbide, Portland cement - raw materials, manufacture, analysis of cement, lime and gypsum, ceramics - raw materials, manufacture by dry and wet processes, cements, manufacture of glass.

UNIT 1.8

Fertilizers and agrochemicals:

Manufacture of nitrogenous, phosphorous and potassic fertilizers, mixed fertilizers, insecticides, pesticides and fungicides.

UNIT 1.9

Metallurgical Processes:

Methods of ore beneficiation, extraction of titanium, vanadium, thorium, tungsten, powder metallurgy, speciality alloys - tool alloys , fuse alloys and bearing alloys

UNIT 1.10

Industrial gases:

Production and uses of hydrogen, oxygen, nitrogen, argon, LPG, acetylene, carbon dioxide, water gas and producer gas.

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UNIT 2.1

Petrochemicals:

Petroleum refining - process outline, fuels from petroleum - cracking, alkylation, isomerisation, lubricants, petrochemical raw materials.

UNIT 2.2

Coal Chemicals:

Coal varieties, analysis of coal - proximate and ultimate analysis, calorific value, combustion calculations, distillation of coal, coking methods, metallurgical coke, liquid fuels from coal - hydrogenation methods.

UNIT 2.3

Oils, Soaps and detergents:

Fats and Oils - analysis and composition, extraction of oils - pressing, rendering and solvent extraction, bleaching and refining. Soaps - raw materials and manufacture. Detergents - Classification and application, raw materials and manufacture, enzyme and zeolite based detergents, biodegradable detergents.

UNIT 2.4

Paper and pulp industries:

Manufacturing of pulp and paper - raw materials, mechanical and chemical pulping methods, bleaching, fillers and sizing agents, colouring, paper boards and laminates.

UNIT 2.5

Fermentation industries:

Anaerobic fermentations - alcohol fermentation, aerobic fermentation - factors influencing yield, production of penicillin, tetracycline, lysine, glutamic acid, lactic acid, citric acid and enzymes, brewing industry.

UNIT 2.6

Explosive and Propellants:

Chemical explosive - preparation of dynamite, TNB, PETN, Cyclonite, plastic explosives, gelatin, cordite and seismic explosives, propellants - manufacture of liquid and solid propellants - hydrazine, incendiaries and smoke screens.

UNIT 2.7

Plastics:

Classification, Manufacture and application of LDPE, LLDPE, HDPE, PVC, PS, PMMA, ABS, teflon and bakelite, compounding of plastic, moulding techniques - compression, injection, transfer, extrusion and blow moulding, thermoforming.

UNIT 2.8

Fibres and elastomers:

Manufacture of nylons, polyesters and polycarbonates, elastomers - natural rubber - compounding and vulcanisation, synthetic rubber - neoprene, butyl, nitrile, SBR and silicone rubber.

UNIT 2.9

Adhesives, resins and dyes:

Natural and synthetic adhesives - general constituents, types - thermoplastic, thermosetting and protein based adhesives, synthetic resins - epoxy, polyurethane and silicone resins, dyes - colour and constitution, azo dyes and vat dyes.

UNIT 2.10

Industrial paints, varnishes and lacquers:

Oil paints - Constituents, emulsions paints acrylic and vinyl paints, speciality paints - heat resistant, fire retardant, temperature indicating and luminous paints, varnishes - types, insulating varnishes, lacquers.