

INDUSTRIAL CHEMISTRY**B.Sc. (Part-I) 2004-2005**

The examination shall consist of three papers and a practical examination as follows :

PAPER-I**Industrial Aspects of Organic Chemistry & Inorganic Chemistry.**

1. *Nomenclature* Generic names, Trade names
2. **Raw materials for organic compound:** Petroleum: Natural gas, Fractionation of crude oil, cracking, reforming, hydroforming, isomerisation.
3. **Coal :** Types, structure, properties, distillation of coal, chemicals derived therefrom.
4. **Renewable natural resources :** Cellulose, Starch-Properties, modification, important ind. chemicals derived from them, Alcohol and alcohol based chemicals, oxalic acid, furfural.
5. **Basic metallurgical operations:** Pulverisation, Calcination, Roasting, Refining.
6. **Physicochemical principles of extraction of:** Iron, Copper, Lead, Silver, Sodium, Aluminum, Magnesium, Zinc, Chromium.
7. **Inorganic materials of industrial importance:** Their availability, forms, structure and modification. Alumina, silica, silicates, clays, mica, carbon, zeolites.

PAPER-II**Industrial Aspects of Physical chemistry and Material & Energy Balance :**

1. **Surface chemistry and Interfacial phenomena:** Adsorption isotherm, Sols, Gels, Emulsions, Microemulsions, Micelles, Aerosols, Effect of surfactants, Hydrotropes.
2. **Catalysis :** Introduction, types- Homogeneous and Heterogeneous, Basic principles, mechanisms, Factors affecting the performance, Introduction to phase transfer catalysis, enzyme catalysed reactions- rate model, Industrially important reactions.
3. **Dimensions and units :** Basic chemical Calculations- Atomic weight, molecular weight, equivalent weight, mole, Composition of - (i) Liquid mixtures, and (ii) gaseous mixtures.

4. **Material Balance without Chemical Reactions** : Flow diagram for material balance, simple material balance with or without recycle or by-pass for chemical engineering operations such as distillation, absorption, crystallisation, evaporation, extraction, etc.
5. **Material Balance involving Chemical Reaction** : Concept of limiting reactant, conversion, yield, Liquid phase reaction, gas phase reactions, with/without recycle or by-pass.
6. **Energy Balance** : Heat capacity of pure gases and gaseous mixtures at constant pressures. Sensible heat changes in liquids. enthalpy changes.

PAPER-III

Unit Operation in Chemical Industry & Utilities and fluid Flow and Heat Transport in Industry.

1. **Distillation** : Introduction; Batch and continuous distillation, Separation of azeotropes, Plate columns and packed columns.
Absorption : Introduction; Equipments- packed columns, spray columns, bubble columns, packed bubble columns, mechanically agitated contactors.
2. **Evaporation** - Introduction; Equipments- short tube (standard) evaporator, forced circulation evaporators, falling film evaporators, climbing film (upward flow) evaporators, wiped (agitated) film evaporator.
Filtration - Introduction; Filter media and filter aids, Equipments- plate and frame filter press, nutch filter, rotary drum filter, sparkler filter, candle filter, bag filter, centrifuge. Drying - Introduction; Free moisture, bound, moisture, drying curve; Equipments- tray dryer, rotary dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.
3. **Crystallization** - Introduction: solubility, supersaturation, nucleation, crystal growth; equipment- tank crystallizer, agitated crystallizer, evaporator crystallizer, draft tube crystallizer.
4. **Extraction** - Introduction: selection of solvents; Equipments- spray column, packed column, rotating disc column mixer-settler.
Mixing - Introduction; mixing or liquid-liquid, solid-solid, liquid-solid systems.

Utilities in Chemical Industry

Fuel - Types of fuels - Advantages and disadvantages combustion of fuels, calorific value. Specifications for fuel oil.

Boilers- Types of boilers and their functioning

Water- Specifications for industrial use, various water treatments.

Steam - Generation and use.

Air - specifications for industrial use, Processing of air.

5. **Fluid Flow** : Fans, blowers, compressors, vacuum pumps, ejector

Pumps : Reciprocating pumps, Gear pumps, Centrifugal pumps.

Heat Transfer : Heat Exchangers- shell and Tube type; finned tube heat exchangers, plate heat exchangers, refrigeration cycles.