

## PHARMACEUTICS QP No.-08

### Topic cover

#### 1. Fluid flow

Type of flow, Reynold's number, viscosity, concept of boundary layer, basic equation of fluid flow, study of valves, flow meters, manometers and measurement of flow and pressure including mathematical problems.

#### 2. Heat transfer

Source of heat, mechanism of heat transfer, the laws of heat transfer, steam and electricity as heating media, determination of requirement of amount of steam/electrical energy , steam pressure, boiler capacity, mathematical problems on heat transfer, steam traps and reducing valve, lagging etc.

#### 3. Evaporation

Basic concept of phase equilibrium, factors affecting evaporation, evaporators, film evaporators, single effect and multiple effect evaporators, mathematical problems on evaporation.

#### 4. Distillation

Rault's law, phase diagram, volatility: simple steam and flash distillation, principles of rectification, Mc-Cabe Thiele method for calculations of number of theoretical plates, azeotropic and extractive distillation, mathematical problems on distillation.

#### 5. Drying

Moisture content and mechanism of drying, rate of drying and time of drying calculations, classifications and types of dryers, dryers used in pharmaceutical industries and special drying methods like freeze drying and lyophilization, mathematical problems in drying.

#### 6. Size reduction and size separation

Definition, objectives of size reduction, factors affecting size reduction, laws governing in energy and power requirement of a mill, types of mills including ball mill, hammer mill, fluid energy mill , micronizer, quadro co-mil, multimill etc.

## **7. Extraction**

Theory of extraction, extraction methods, equipment for various types of extraction process.

## **8. Mixing**

Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipment.

## **9. Crystallization**

Characteristics of crystals like purity, size, shape, geometry, habit, forms, size and factors affecting them. Solubility curves and calculation curves and calculations of heat balance around S Swanson's Walker crystallizer , super saturation theory and its limitations, Nucleation mechanism, crystal growth, study of various types of crystallizers, tanks, agitated batch, Swanson's Walker, single vacuums, circulating magma and crystal crystallizers, cracking of crystals and its prevention. Numerical problems on yields. Introduction to polymorphism.

## **10. Filtration and Centrifugation**

Theory of filtrations, filter aids, filter media, industrial filters, including filter press, rotary filter, edge filters, filter leaf and laboratory filtration equipments etc., Factors affecting filtration, mathematical problems on filtrations, optimum cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters and centrifugal sedimentars.

## **11. Dehumidification and humidity control**

Basic concept and definition, wet bulb and adiabatic saturation temperatures, psychometric count and measurement of humidity, application of humidity measurement in pharmacy, equipments for humidification and dehumidification operations.

## **12. Refrigeration and air conditioning**

Principles and applications of refrigeration and air conditioning.

### **13. Material of constructions**

General study of composition, corrosion, resistance, properties and applications of the materials of construction with special reference to stainless steel, glass, ferrous metals, cast iron, non ferrous metals, copper and alloys, aluminum and alloys, lead, tin, silver, nickel and alloys, chromium and non metals, stone, slate, brick, asbestos, plastics, rubber, timber, concrete. Corrosion and its prevention with reference to commonly used material in pharmaceutical plants.

**14.** Industrial hazards & safety precautions Mechanical, chemical, electrical, fire, dust, noise hazards, Industrial dermatitis, accident, records, safety requirements/equipments etc.