Syllabus for Entrance Examination – M. Tech. in Pharmaceutical Chemistry and Technology

2024-25

General Aspects of Pharmaceuticals

Overview of Pharmaceutical Industry

Introduction to Pharmacopoeias, Discussion of monographs and general test procedures and their importance,

Pharmaceutical inorganic chemicals, their manufacturing/preparation and uses, assay methods

Medicinal Chemistry

Introduction to Medicinal and Pharmaceutical Chemistry

Overview of Medicinal Chemistry: Role of Medicinal Chemist in Drug Design, Discovery and Development, Drug-like properties, Drug Metabolism, Prodrugs, Salts

Target classes – Enzymes, Receptors, Ion Channels, Nucleic acids, Kinases

Retrosynthesis analysis, Concepts

Name Reactions in Drug Synthesis - Friedel-Crafts Acylation, Grignard Reaction, Mannich Reaction, Horner-Wadsworth-Emmons (HWE) Reaction, Suzuki Coupling, Heck Reaction, Aldol Reaction, Wittig Reaction, Stille Coupling, Diels-Alder Reaction, Buchwald-Hartwig Amination, Michael Addition, Sandmeyer Reaction, Mitsunobu Reaction, Ugi Reaction

Introduction to Biopharmaceuticals – Monoclonal Antibodies, Vaccines, Hormones and analogs

Formulation Technology

Introduction and classification of pharmaceutical dosage forms

Routes of administration,

Preformulation, formulation, evaluation, large-scale manufacture and packaging with focus on equipment with reference to liquid dosage forms; Monophasic solution syrups, elixirs, Nasal and ear-drops, etc.

Tablets, Capsules

Biphasic suspensions and emulsions

Topicals: Ointments, creams, gels and suppositories

Parenteral Dosage Forms

Layout design and Unit operations related to above dosage forms

Novel drug Delivery Systems: Transdermal, Transmucosal, Ophthalmic, Colloidal, Liposomes, Nanoparticles

Medicinal Natural Products (Pharma)

Introduction to Phytopharmaceuticals, Classes - Lipids, alkaloids, glycosides, steroids, tannins, terpenoids, flavonoids, plant pigments, Extraction and Isolation Methods, Identification tests

Vitamins: Classification, Chemistry, Biological role

Pharmaceutical Technology

Raw materials for Pharmaceutical Industry

Chemical Development of enantiomerically pure products, resolution, chiral synthesis, etc.

Separation (a) Aspect of chemical purification and process separation technology (b) Introduction to Separation Technology; Choosing a separation process, Adsorption Separation methods, simulated moving-bed (SMB) chromatography; Large-scale chromatography; Homogeneous, Heterogeneous catalyst and phase transfer catalyst

Mixing (a) Flow pattern and theories (impeller); suspension of solid particles; lipid- lipid dispersion; three-phase dispersion; mass transfer at gas-liquid, solid-liquid, solid-solid, process design and scale up of mixing

Design and Development of Safe Chemical Processes

Introduction

Chemical process life-cycle

Legislative requirements for safe process development and scale-up, Development techniques for safe process design

Unit operations posing particular hazards during development,

Design of environmentally-friendly processes

Strategies for chemical hazards assessment

Hazards of gas and vapor generation, Identification of highly-energetic materials,

Process control consideration and safety critical systems,

GMP in chemical development

Optimization of Organic Reactions and Processes

Purpose of chemical development; Discovering the best synthetic route

Selecting the best route for scale-up, Choice of raw materials, reagents, etc. Planning for scale-up

Effluent minimization and control

Statistical methods of optimizations

Validation and Regulatory Requirements

cGMP and Quality assurance

Process Validation, Product Validation and Quality audits, Documentation, New Drug Approval

DPCO, New Drugs and Clinical Trials Rules, 2019, and amendments therein

Rules including licensing intermediates