Pravara Institute of Medical Sciences

(Deemed to beUniversity)

Syllabus for PIMS-AIPET 2023 Entrance Exam

(Doctor of Philosophy:Ph.D.)

Specific Subject- Pharmacy

SPECIALIZATION-1:PHARMACEUTICS

1. **Physical Pharmaceutics**
   a. Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations
   b. pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions

2. **Preformulation Studies:**
   Introduction to preformulation, goals and objectives.
   a. **Physical properties:** Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism
   b. **Chemical Properties:**Polymerization BCS classification of drugs & its significant Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

3. **Tablets:**
   a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.
   b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.
   c. Quality control tests: In process and finished product tests

4. **Biopharmaceutics and pharmacokinetics**
   a. Absorption- Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, Effect of pH on absorption of drug.
   b. Distribution- Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Clinical significance of protein binding
   c. Elimination- Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs
   d. Biotransformation of drugs- Phase I and II biotransformation reactions, factors affecting biotransformation.

5. **Bioavailability and Bioequivalence:** Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, in-vitro drug dissolution models, in-vitro-in-vivo correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

6. **Controlled drug delivery systems:** Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems

SPECIALIZATION-2:PHARMACEUTICALCHEMISTRY AND ANALYSIS

1. **Basics of Pharmaceutical analysis-**
   a. Definition and scope Different techniques of analysis
   b. Methods of expressing concentration
   c. Primary and secondary standards.
   d. Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures
   e. Pharmacopoeia, Sources of impurities in medicinal agents.

2. **Biochemistry**
   a. Biomolecules Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.
   b. Structure of DNA and RNA and their functions

3. **Medicinal Chemistry**
   Antibiotics Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes. β-Lactam antibiotics: Penicillin, Cepholosporins
   β- Lactamase inhibitors, Monobactams
   Aminoglycosides: Streptomycin, Neomycin,
   Tetracyclines: Tetracycline,Oxytetracycline, Doxycycline.

4. **InstrumentalMethodsofAnalysis:**
   a. **UV – Visible spectroscopy**:Introduction,Beerslawanditslimitations,molarextinctioncoefficient,woodwardsFiesherrulesforcalculatingabsorptionmaximum, instrumentationdesignandapplications.
   b. **IR Spectroscopy:** Basic Principles – Molecular vibrations, vibrational frequencyandits influencing factors, sampling techniques, instrumentationand applicationsofFT–IR.
   c. **NMR Spectroscopy:**Principle, Chemical shifts, shielding and deshieldingeffects,splittingofsignals,computingconstants,instrumentationsandapplications(H&CNMR).
   d. **Massspectroscopy:**Principle, Ionization Techniques, Fragmentation pattern,Instrumentationandapplications.
   e. **HPLC :**Principles,instrumentationwithspecialemphasisondifferentcolumnanddetectors andapplications.
   f. **HPTLC:** Principle,instrumentationandapplications.
   g. **PolarimetryFluorimetryandRefractometryConductometry:**Principle,instrumentationandapplications.

SPECIALIZATION-3:PHARMACOLOGY

1. **General Pharmacology**
   a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions.Dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
   b. Adverse drug reactions.
   c. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

2. **Neurotransmission**
   a. General aspects and steps involved in neurotransmission.
   b. Neurohumoral transmission in autonomic nervous system (Adrenaline and Acetyl choline).
   c. Neurohumoral transmission in central nervous system (histamine, serotonin, dopamine, GABA, glutamate and glycine].

3. **Laboratory Animals Common laboratory animals:** Description, handling and applications of different species and strains of animals. Transgenic animals: Production, maintenance and applications Anaesthesia and euthanasia of experimental animals. Maintenance and breeding of laboratory animals. CPCSEA guidelines to conduct experiments on animal.

4. **Principles of toxicology**
   a. Definition and basic knowledge of acute, subacute and chronic toxicity.
   b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity
   c. General principles of treatment of poisoning
   d. Regulatory guidelines for conducting toxicity studies OECD and ICH.

5. **Biostatistics**
   a. Introduction: Statistics, Biostatistics, Frequency distribution
   b. Measures of central tendency: Mean, Median, Mode
   c. Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals example
   d. Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way),
   e. Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test,

SPECIALIZATION-4:PHARMACOGNOSY

1. **Introduction to Pharmacognosy:**
   a. Sources of Drugs – Plants, Animals, Marine & Tissue culture
   b. Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

2. **Introduction to secondary metabolites:** Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins.

3. **Metabolic pathways in higher plants and their determination**
   Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.

4. **Basics of Phytochemistry**
   Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave assisted extraction, Methods of fractionation. Application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

5. **Screening and Evaluation:**Screening of plant extracts / phytochemicals for analgesic,anti-inflammatory, anti-diabetic, diuretic, hepatoprotective,anticancer andantimicrobialactivity.

SPECIALIZATION-5: DRUG REGULATORY AFFAIRS

1. **Regulatory Approval Process:** Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), and Abbreviated New Drug Application (ANDA). Regulatory authorities and agencies Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada.
2. **Validation**
   Types of Validation, Types of Qualification, Validation master plan (VMP), Analytical Method Validation.
3. **Drugs and Cosmetics Act, 1940 and its rules 1945:** Objectives, Definitions, Legal definitions of schedules to the Act and Rules.