

TAMIL NADU PUBLIC SERVICE COMMISSION
SYLLABUS
PHARMACY/ PHARMACEUTICAL SCIENCES
(UG DEGREE STANDARD)

Code:429

UNIT-I:

- 1) **Historical background and development of profession of pharmacy:** History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
- 2) **Calculations:**
Posology: Dose calculations based on age, body weight and surface area.
Pharmaceutical calculations: Percentage solutions, Alligation, Proof spirit and isotonic solutions based on freezing point and molecular weight.
- 3) **Surface & interfacial Phenomenon:**
Measurement of surface and interfacial tensions, spreading coefficient, surface active agents, HLB Scale, solubilisation and Detergency
- 4) **pH, buffers and isotonic solution:**
pH determination, applications of buffers, buffer equation, buffer capacity and buffered isotonic solutions.
- 5) **Unit Operations:** Size reduction, size separation, mixing, filtration, centrifugation evaporation, drying, distillation, heat transfer, compression and Tablet coating.
- 6) **Coarse Dispersion:**
Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspension. Emulsions and theories of emulsification, micro emulsion and multiple emulsion, stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formation by HLB method.
- 7) **Micromeritics:** Particle size distribution, mean particle size, number and weight distribution, particle number, methods of determining particle size by different methods, specific surface, methods of determining surface area and derived properties of powders.
- 8) **Pre-formulation studies:** Introduction to pre-formulation, goals and objectives, study of physicochemical characteristics of drug substances
 - a. **Physical Properties:** Crystal & amorphous form, particle size, shape, flow properties, solubility profile (Pka, pH, Partition co-efficient) Polymorphism.
 - b. **Chemical properties:** Hydrolysis, Oxidation, reduction racemisation, polymerisation.BCS classification of drugs and 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.

- 9) **Pharmaceutical Excipients** – Used in Liquid, Semisolids and solid dosage forms.
- 10) **Quality Control Tests and Evaluation parameters of the following formulations:** Solid dosage forms, Semi solids, Liquid dosage forms, Parenteral, Ophthalmic preparation and Pharmaceutical Aerosols.
- 11) **Cosmetics:** Formulation and preparation of the following cosmetics preparations- Lipsticks, Shampoos, Cold Cream, Vanishing Cream, Tooth Paste, Hair Dyes and Sunscreens.
- 12) **Packaging Material Sciences:** Materials used for packaging of Pharmaceutical Products, factors influencing choice of containers, legal and official requirement for containers, Quality control tests for containers and rubber closures.
- 13) **Bio availability and Bioequivalence:** Definitions 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 dissolution rates and bioavailability of poorly soluble drugs.
- 14) **Pharmacokinetics:** Definition and introduction to Pharmacokinetics, Compartment models, Non-compartment models, Physiological models, One compartment open model
 - a) Intravenous Injection (bolus)
 - b) Intravenous infusion
 - c) Extra vascular administrations.Pharmacokinetic parameters - K_E , $T_{1/2}$, V_d , AUC , K_a , CL_t and CL_R – definitions, methods of elimination, understanding of their significance and application.
- 15) **Good manufacturing practices (GMP)**
- 16) **Good Laboratory practices (GLP):** Organisation and personnel, Facilities, equipment, Testing facilities operation, Test and control articles, Protocol for conduct of a Nonclinical Laboratory Study, Records and reports, Disqualification of Testing facilities.
- 17) **Warehousing:** Good Warehousing practice, Materials Management.
- 18) **Pilot Plant Scale up Techniques:** General considerations – including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology.
- 19) **Quality management systems:** Quality management and certification: concept of quality, Total quality management, Quality by Design (QbD), six sigma concept, out of specifications (OOS) change control, Introduction to ISO 9000 series of quality system standards, ISO 14000, NABL.
- 20) **Indian Regulatory Requirements:** Central Drug Standard Control Organisation (CDSCO) and State Licensing Authority, Organisation, Responsibilities, Certificate of Pharmaceutical products (COPP) Regulatory requirements and approval procedures for New drugs.

- 21) **Over the counter (OTC) Sales:** Introduction and sale of over the counter and Rational use of common over the counter medications.
- 22) **Drug Store Management and Inventory Control:** Organisation of Drug Store, types of materials stocked and storage conditions. Purchase and inventory control: Principles, Purchase procedures, Purchase order, Procurement and stocking, Economic order quantity, Reorder quantity level and methods used for the analysis of the drug expenditure.
- 23) **Novel Drug Delivery Systems:** Ocular Drug Delivery Systems, Transdermal Drug Delivery Systems, Implantable Newer Drug Delivery Systems, Targeted Drug Delivery and Controlled Drug Delivery Systems.

UNIT-II:

- 1) Study of principle, procedure, merits, demerits and applications of physical, chemical, gaseous, radiation and mechanical method of sterilization. Evaluation of the efficiency of sterilization methods. Sterility indicators.
- 2) Classification and mode of action of disinfectants, factors influencing disinfection, antiseptics and their evaluation, for bacteriostatic and bactericidal actions. Sterility Testing of Products (solids, liquids, Ophthalmic and other Sterile products) according to IP, BP and USP
- 3) Principles and methods of different microbiological assay. Methods for standardization of Antibiotics, Vitamins and Amino acids.
- 4) Types of immunity - humoral immunity, cellular immunity
- 5) **Blood products and Plasma Substitutes:** Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes
- 6) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring. Large scale production fermenter design and its various controls. Study of the production of - Penicillins, Citric acid, Vitamin B12, Glutamic acid, Griseofulvin.

UNIT-III:

- 1) Atomic structure and valency, Radioactivity, Radio isotopes and Pharmaceutical applications of Radio Pharmaceuticals, hazards and precautions.
- 2) Sources of impurities in Pharmaceutical substances; Limit test as per I.P; Fundamentals of volumetric Analysis. Errors: Sources, types, methods of minimizing errors, Accuracy, Precision, significant figures.
- 3) A systematic study of inorganic compounds for their preparation, assay and use which includes Gastrointestinal agents, Topical agents and Dental products.
- 4) Preparation and use of Chemical reagents and Volumetric Solutions as per Pharmacopeia in Pharmaceutical Analysis.

- 5) Metal hydride reduction, Wolff kishnar reduction, Clemenson's reduction, Beckmann and Schmidt rearrangement, Oppenauer Oxidation, Claisen-Schmidt condensation.

UNIT-IV:

- 1) Chemistry, synthesis and Medicinal uses of the following categories of drugs -
Local Anaesthetics, Drugs acting on CNS, ANS, CVS, Anti-infective agents like Sulphonamides, Antibiotics, AntiTB, Anti-Viral, Antiprotozoal, Antifungal, Antimalarials, Antineoplastic agents, Antihistaminics, Diuretics.
- 2) QSAR studies, various approaches in drug design.

UNIT-V:

- a) Principles and Pharmacopeial Assay Procedures involving Non-aqueous Titration, Redox, Diazotization, complexometric methods, electrometric titration, gravimetric analysis.
- b) Chromatography- TLC, Column, Paper, GC, Ion exchange, HPLC, HPTLC, Gel electrophoresis.
- c) Theory, principle, instrumentation and applications of colorimetry, UV- Visible Spectrophotometry, Spectrofluorimetry, Nepheloturbidometry, IR, Mass, NMR, RIA, Polarimetry, Refractometry, Thermal method of analysis - TGA, DSC, DTA, atomic absorption spectroscopy.
- d) ICH guidelines- Calibration and validation, calibration of electronic balance, UV spectrophotometer, IR spectrophotometer, Fluorimeter, HPLC, GC, Flame photometer

UNIT-VI :

a. General Pharmacology:-

Definition, Sources of drugs, essential drugs concept, routes of drug administration, agonist, antagonist, membrane transport, absorption, distribution, metabolism and excretion of drugs.

Enzyme induction, enzyme inhibition.

Principles and mechanism of drug action, Classification of receptors, drug receptor interactions, Signal transduction mechanisms, dose response relationship, therapeutic index, combined effects of drug & factors modifying drug action.

Adverse drug reactions, Drug interactions, Drug discovery and clinical evaluation of new drugs, Pharmacovigilance.

- b. **Pharmacology of Drugs acting on central nervous system:**
General anaesthetics and Pre anaesthetic medication, Sedatives and Hypnotics, centrally acting muscle relaxants, Anti- epileptics, Alcohols and disulfiram, Anti-Psychotics, Anti-depressants, anti-anxiety agents, anti-manics and hallucinogens, Drugs used in Parkinson's disease and Alzheimer's disease, CNS-Stimulants and nootropics, Opioid analgesics and antagonists, Drug Addiction, drug abuse, drug tolerance and drug dependence.
- c. **Pharmacology of Drugs acting on Peripheral nervous system:**
Neurohumoral transmission in Autonomic nervous system, Para Sympathomimetics, Parasympatholytics, Sympathomimetics, Sympatholytics, neuromuscular blocking agents, Skeletal muscle relaxants (peripheral), Local anaesthetic agents, Drug used in Myasthenia gravis and glaucoma.
- d. **Pharmacology of Drugs acting on cardio vascular system:**
Drugs used in congestive heart failure, Anti-hypertensive drugs, Anti-Anginal Drugs, Anti-arrhythmic drugs, Anti-hyperlipidemic drugs, Drugs used in the therapy of shock, Hematinics, Coagulants and anti-coagulants, Fibrinolytics and anti-platelet drugs, Plasma Volume expanders.
- e. **Pharmacology of drugs acting on urinary system:**
Diuretics and Anti-diuretics.
- f. **Pharmacology of drug acting on respiratory system:**
Anti-asthmatic drugs, Drugs used in the management of COPD [Chronic Obstructive Pulmonary disease], Expectorants, anti-tussives, nasal decongestants, Respiratory Stimulants.
- g. **Immuno Pharmacology:**
Immuno stimulants, immuno suppressants, bio-similars.
- h. **Bio-assay:**
Principles and applications of Bio-assay, types of bio-assay, bio-assay of insulin, oxytocin, Vasopressin, ACTH, d-tubocurarine, digitalis, histamine and 5 HT.
- i. **Chrono Pharmacology:**
Definition of rhythm and cycles, Biological clock and it's significance

UNIT-VII:

- a) **Pharmacology of Drugs acting on the Gastrointestinal tract:**
Anti-ulcer agents, Drugs for constipation and diarrhoea, appetite stimulants and Suppressants, Digestants and carminatives, Emetics and anti-emetics.
- b) **Pharmacology of drugs acting on endocrine system:**
Anterior Pituitary hormones – analogues and their inhibitors, Thyroid hormones-analogues and their inhibitors, Parathormone, Calcitonin, Vitamin-D, Insulin, oral-hypo glycemc agents and glucagon.
Adrenocorticotrophic hormone [ACTH] and corticosteroids, Androgens and Anabolic Steroids, Estrogens, Progesterone, Oral Contraceptives. Drugs acting on uterus.

c) Autocoids and related drugs:

Histamine, 5-HT and their antagonists, Prostaglandins, Thromboxanes and Leukotrienes, Angiotensin, Bradykinin and Substance-P, Non-Steroidal anti-inflammatory drugs, Anti-gout drugs, Anti-rheumatic drugs.

d) Chemotherapy :

General Principles of chemotherapy, Sulfonamides and co-trimoxazole, Antibiotics: Penicillins, Cephalosporins, Chloramphenicol, macrolides, Quinolones and fluoroquinolones, tetracycline and amino glycosides, Anti-tubercular agents, Anti-leprotic agents, Anti-fungal agents, Anti-viral drugs, Anthelmintics, Anti-malarial drugs, Anti-amoebic agents, Urinary tract infection and sexually transmitted diseases, Chemotherapy of malignancy.

e) Principles of toxicology:

Acute, Sub-acute, Chronic toxicity, genotoxicity, carcinogenicity, teratogenicity, mutagenicity, General Principles of treatment of poisoning, clinical symptoms and management of barbiturates, morphine, organophosphorus compound, lead, mercury and arsenic poisoning.

UNIT-VIII:

- (a) Alphabetical, Morphological, Taxonomical, Chemical and Pharmacological classification of crude drugs.
- (b) Adulteration of drugs of natural origin, Evaluation by Organoleptic, Microscopic, Physical, Chemical and Biological methods.
- (c) Plant hormones and their applications.
- (d) Types of plant tissue culture, nutritional requirements, growth and their maintenance. Application of plant tissue culture in pharmacognosy.
- (e) Brief study of basic metabolic pathways and formation of different Secondary metabolites through these pathways - Shikimic acid pathway, Acetate mevalonate pathway.

UNIT-IX:

- (a) General introduction, composition, chemistry and chemical classification, general methods of extraction and analysis, bio-sources, therapeutic uses and commercial application of following Secondary metabolites.
 - Alkaloids : Vinca, Rauwolfia, Belladonna, Opium
 - Steroids, Cardiac glycosides and Triterpenoids : Liquorice, Dioscorea, Digitalis
 - Volatile oils : Mentha, Clove, Cinnamon, Fennel, Coriander
 - Tannins : Black & Pale catechu
 - Resins : Benzoin, Ginger, Asafoetida, Colophony
 - Glycosides : Senna, Aloes

- (b) Isolation, Identification & Analysis of following Phytoconstituents
 - i) Terpenoids : Menthol, Citral, Artemisin
 - ii) Glycosides : Glycyrrhetic acid, Rutin
 - iii) Alkaloids : Atropine, Quinine, Reserpine, Caffeine
 - iv) Resins: Podophyllotoxin, Curcumin
- (c) Modern methods of extraction, application of latest techniques like Spectroscopy, Chromatography and Electrophoresis in isolation, purification and identification of Crude drugs.
- (d) Basic principles involved in Homeopathy systems of medicine.

UNIT-X:

- (a) The Drugs and Cosmetics Act, 1940 and Drugs Rules 1945 (As Amended from time to time)
- (b) The Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954 and Rules, 1955 (As Amended from time to time)
- (c) The Drugs (Price Control) Order 2013 (As Amended from time to time)
- (d) The Narcotic Drugs and Psychotropic substances Act and Rules, 1985 (As Amended from time to time)
- (e) The Pharmacy Act, 1948 (As Amended from time to time)