TAMIL NADU PUBLIC SERVICE COMMISSION

SYLLABUS

PHARMACY AND CHEMISTRY

(DEGREE STANDARD)

CODE:517

UNIT I: (20 Questions)

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 : Pediatric 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) Unit Operations: Size reduction, Size separation, Mixing, Filtration, Centrifugation, Evaporation, Drying, Distillation, Heat transfer, Tablet Compression and Tablet coating.

4) 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.

5) 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 distribution and determination, shape, flow properties, derived 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 pre-formulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

6) Pharmaceutical Excipients – Used in Liquid, Semisolids and Solid dosage forms.

7) Quality Control Tests of the following formulations: Oral Solid dosage forms, Semi solids, Oral Liquid dosage forms, Parenteral, Ophthalmic preparation and Pharmaceutical Aerosols.

8) Cosmetics: Formulation and preparation of the following cosmetics preparations- Lipsticks, Shampoos, Cold Cream, Vanishing Cream, Tooth Paste, Hair Dyes, Sunscreens.

9) 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.

10) 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.

11) Pharmacokinetics: Definition and introduction of 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 –Elimination rate constant (K_E), Half life ($t_{1/2}$), Volume of distribution (Vd), Area under curve (AUC), Absorption rate constant (Ka), Total body clearance (CL_t) and Renal Clearance (CL_R) – definitions, methods of elimination, understanding of their significance and application.

12) 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.

13) 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.

14) 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: (20 Questions)

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.

3) Sterility Testing of Products (solids, liquids, Ophthalmic and other Sterile products) according to IP, BP and USP

4) Principles and methods of different microbiological assay. Methods for standardization of Antibiotics, Vitamins and Amino acids

5) Types of immunity - humoral immunity, cellular immunity

6) Blood products and Plasma Substitutes: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substitutes

7) 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, Griseofulviin.

Unit III: (20 Questions)

1) Principles and Pharmacopoeial Assay Procedures involving Non-aqueous Titration, Redox, Diazotization, complexometric methods, electrometric titration, gravimetric analysis.

2) Chromatography – Thin Layer Chromatography (TLC), Column, Paper, Gas Chromatography (GC), Ion exchange, High Performance Liquid Chromatography (HPLC), High Performance Thin Layer Chromatography (HPTLC), Gel electrophoresis.

3) Theory, principle, instrumentation and applications of colorimetry, UV-Visible Spectrophotometry, Spectrofluorimetry, Nepheloturbidometry, Infra-Red (IR), Mass, Nuclear Magnetic Resonance (NMR), Radio Immuno

Assay (RIA), Polarimetry, Refractometry, Thermal method of analysis – Thermo Gravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), Differential Thermal Analysis (DTA), Atomic absorption spectroscopy.

4) ICH guidelines – Calibration and validation, calibration of electronic balance, UV spectrophotometer, IR spectrophotometer, Fluorimeter, High Performance Liquid Chromatography (HPLC), Gas Chromatography(GC), Flame photometer.

UNIT IV : (20 Questions)

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 sitmulants, 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. 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.

j. 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 glycemic agents and glucagon.
Adrenocorticotropic hormone [ACTH] and corticosteroids, Androgens and Anabolic Steroids, Estrogens, Progesterone, Oral Contraceptives. Drugs acting on uterus.

k. 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.

l. Chemotherapy:

General Principles of chemotherapy, Sulfonamides and co-trimoxazole, Anti-biotics: 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.

UNIT V: (20 Questions)

a) Alphabetical, Morphological, Taxonomical, Chemical and Pharmacological classification of crude drugs.

b) Adulteration and evaluation of drugs of natural origin. WHO guidelines for the assessment of herbal drugs.

c) 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,
OpiumSteroids, 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

d) Isolation, Identification and Analysis of following phytoconstituents

(i) Terpenoids : Menthol, Citral, Artemisin
(ii) Glycosides : Glycyrrhetenic acid, Rutin
(iii) Alkaloids : Atropine, Quinine, Reserpine, Caffeine
(iv) Resins : Podophyllotoxin, Curcumin

e) Homeopathy : Introduction, Basic principles, Preparation and evaluation of Various Dosage forms of homeopathy system of medicine

f) Marine Drugs : Novel Medicinal agent from marine sources.

g) Herbal Cosmetics :Sources and description of raw material of herbal origin used via, fixed oils, waxes, gums, colours, perfumes, protective agents,

bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

UNIT VI: (20 Questions)

a) The Drugs and Cosmetics Act, 1940 (As Amended from time to time)
b) The Drugs Rules 1945 (As Amended from time to time)
c) The Cosmetics Rules, 2020 (As Amended from time to time)
d) The Medical Devices Rules, 2017 (As Amended from time to time)

UNIT VII: (20 Questions)

Preparation of standard solutions – Indicators, Buffer solutions Molarity, Normality – Principles of Volumatic Analysis - Different types of titrations – Gravimetric Analysis – Basic Principles – Separation and purification techniques.

UNIT VIII: (20 Questions)

Atomic structure and valency, Radioactivity, Radio isotopes and Pharmaceutical applications of Radio Pharmaceuticals, hazards and precautions.

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.

A systematic study of inorganic compounds for their preparation, assay and use which includes Gastrointestinal agents, Topical agents and Dental products.

Preparation and use of Chemical reagents and Volumetric Solutions as per Pharmacopeia in Pharmaceutical Analysis.

UNIT IX: (20 Questions)

Optical isomerism and Geometrical isomerism - chirality - optical isomerism of lactic and tartaric acid - Racemisation – Resolution - asymmetric synthesis - Walden inversion - cis and trans isomerism of maleic and fumaric acids-R-S-Notations - conformational analysis of cyclohexane

UNIT X: (20 Questions)

Carbohydrates: Classification, sources, preparation and reactions - Glucose, Fructose, Sucrose and lactose - structure of glucose and fructose.

Amino acids – Classification - Zwitterions - peptide linkage-structure of proteins - structure and functions of DNA and RNA

Hormones and vitamins - Classifications, sources and functions

Dated: 20.02.2025