DETAILED SYLLABUS FOR THE POST OF ASSISTANT PROFESSOR IN PHARMACY IN MEDICAL EDUCATION

(Total Marks - 100)

MODULE: 01 (10 marks)

Pharmacognosy and Phytochemistry

1. Plant hormones and their applications- polyploidy, mutation, and hybridization with reference to medicinal plants.

2. Systematic pharmacognostic study of following:

a) Carbohydrates and derived products: Agar, acacia, Ispaghula, and tragacanth.

b) Lipids: castor oil, cocoa butter, hydnocarpus oil, linseed oil.

3. Study of drugs containing resins and resin combinations: colophony, podophyllum, cannabis, myrrh, asafoetida, benzoin, turmeric, ginger.

4. Study of tannins and tannin containing drugs: Bahera,catechu and myrobalan.

5. Volatile oils: General methods of obtaining volatile oils from plants and their classification, general properties, chemical nature and chemical tests. Study of volatile oil containing drugs - mentha, coriander, cinnamon, cassia, lemon grass, clove, fennel, nutmeg, eucalyptus, cardamom.

6. Study of pharmaceutical aids like kaolin, bentonite, and natural colours.

7. Study of the biological sources, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic, macroscopic and microscopic features and specific chemical tests of the following groups of drugs containing glycosides:

Saponins:- Liquorice, Dioscorea and Sarasparilla. Cardioactive sterols:
- Digitalis, Squil.
Anthrquinone cathartics: - Aloes, Senna. Others: -
Gentian, Saffron.

8. Introduction to Ayurvedic preparations like Asavas, Gutikas, Tailas, Choornas, Lehyas and Bhasmas.

9. Systematic study of source, cultivation, collection, processing constituents, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following alkaloid containing drugs:

Tropane:- Belladonna, Hyoscyamus, Datura, and Withania.
Quinoline & Isoquinoline:- Cinchona, Ipecac, Opium.
Indole:- Ergot, Rauwolfia, Catharanthus.
Steroidal:- Kurchi.
Alkaloidal amines:- Ephedra and Colchicum.
Purines:- Coffee and Tea.

10. General techniques of biosynthetic studies and basic metabolic pathways. Brief introduction to biogenesis of secondary metabolites of pharmaceutical importance. Shikimic acid pathway, Acetate mevalonate Pathway, Isoprenoid synthesis.

11. Marine pharmacognosy, novel medicinal agents from marine sources.

12. Protein containing drugs: Gelatin, Collagen, spirulina.

13. Chemistry, biogenesis (general pathway) and pharmacological activity of medicinally important monoterpenes, sesquiterpenes, diterpenes and Triterpenoids.

14. Glycosides: Chemistry and biosynthesis of Digoxin and Sennosides
Alkaloids: Chemistry, biogenesis and pharmacological activity of atropine and related compounds Quinine, Morphine, Papaverine, Ephedrine, Ergot and Vinca alkaloids.

15. Plant tissue culture, Totipotency, types of cultures, nutritional requirements, growth and their maintenance. Applications of plant tissue culture in pharmacognosy.

16. Gene transfer, Gene mapping of plants, transgenic plants, introduction to DNA finger printing.

17. Adulteration and evaluation of crude drugs. Standards for herbal formulations,WHO guidelines in evaluation of drugs.

18. Herbaceous health foods.

19. Herbal cosmetics – including classifications with examples, standards and biological sources, chemical constituents and uses of drugs used in herbal cosmetics.

MODULE: 02 (10 marks)

Human Anatomy&Physiology and Pharmacology-1

1) General anatomy and physiology :

Cell, homeostasis, ion channels, secondary messengers, tissues, body fluids and blood.

2) Anatomy, physiology and disorders of human body systems:

Human skeleton, cardiovascular system, digestive system, Respiratory system, Urinary system, reproductive system, endocrinology, Nervous system (ANS & CNS), muscular system, Sense organs

3) General pharmacology:

Routes of drug administration, targeted delivery, pharmacokinetics, pharmacodynamics, drug receptor theories, receptor subtypes, dose response relationship, drug dose and dosage, rational use of

medications, principles of toxicology, adverse drug reactions, pharmacovigilance, Pharmacoeconomics, pharmacoepidemiology, orphan drugs.

MODULE: 03 (10 marks)

Pharmacy Practice

1) Pharmacy and therapeutic committee: Objectives, composition and functions, budget preparation and implementation.

2) Hospital Formulary: Contents, preparation and revision of hospital pharmacy.

3) Drug store management and Inventory control:

a). Organization of Drug store, types of materials stocked, storage conditions.

b). Purchase and inventory control: Principles, purchases, procedures, purchase order, procurement and stocking.

4) Drug distribution system in hospitals:

a) Outpatient dispensing – methods adopted. b) Dispensing of drugs to inpatients, types of drug distribution systems, charging policy, labelling. c) Dispensing of drugs to ambulatory patients.

d) Dispensing of controlled drugs.

5) Central sterile supply unit and their management: functioning and types of materials for sterilization equipment's, supply of sterile materials.

6) Interpretation of clinical laboratory tests and its significance: liver function tests, pulmonary function tests, renal function tests and haematological tests.

7) Drug & Poison information services Introduction, sources of information, design of literature searches, critical evaluation of drug information and literature. Clinical pharmacokinetics & individualization of drug therapy.

8) Drug use in special population:- infants ,elderly , pregnancy & lactation-therapeutic consideration .Dosage adjustments in renal failure, hepatic failure. Therapeutic Drug Monitoring. TDM indications for measuring drugs in blood, choice of drugs to be monitored. Timings f measurements, measuring techniques. Clinical applications – Estimation of serum concentration of Digoxin, Gentamycin, Phenytoin.

9) Clinical management (including clinical manifestations, clinical investigations/ assessment, treatment algorithms, management of adverse effects of therapy, and patient education) of the following organ disorders:: Hypertension, Heart Failure; Epilepsy, Asthma Peptic ulcer, Diabetes mellitus, Thyroid disorders, Tuberculosis& HIV ,Anaemias, Rheumatoid Arthritis.

10) Communicable diseases: Causative agents, modes of transmission, Symptoms and prevention

- Chicken pox, Measles, Influenza, Diphtheria, Whooping cough, Tuberculosis, Poliomyelitis, Hepatitis, Cholera, Typhoid, Food poisoning, Helminthiasis, Malaria, Filariasis, Rabies, Trachoma, Tetanus, Leprosy, Syphilis, Gonorrhoea and AIDS.

11) First aid: Emergency treatment of Shock, Snake bite, Burns, Heart diseases (AMI & LHF), Fractures and Resuscitation methods, General methods of treatment of Poisoning.

12) Communication skills: model of communication, verbal and non-verbal communication, questioning skills, explaining skills, listening skills & counselling skills.

MODULE: 04 (10 marks)

Pharmacology –ll and lll

1) Pharmacology of following class of drugs:

Drugs acting on Autonomic nervous system(ANS), Cardiovascular drugs, Drugs acting on respiratory tract, Drugs acting on endocrine system, Drugs acting on central nervous system, Drugs acting on gastro-intestinal tract, Drugs acting on skin, eye,uterus, kidney, blood and blood forming organs, local anaesthetics, vitamins, Heavy metals, enzymes in therapy, therapeutic gases, free radicals and antioxidants and autocoids.

2) Bioassays:(Insulin, digitalis, adrenaline, histamine, oxytocin, d-tubocurarine, heparine-sodium)and Radioimmunoassay.

3) Pharmacological screening methods : Diuretic activity, Anti ulcer activity, Analgesic activity, Anticonvulsant activity and Anti-inflammatory activity

4) Drug discovery and new drug development

5) Antimicrobial drugs and Chemotherapy

6) Immunopharmacology: Immunosuppressant and immunostimulant drugs.

7) Gene therapy: Applications, proteins and peptides as therapeutic agents, stem cell therapy.

MODULE: 05 (10 marks)

Titrimetry and Instrumental Methods

1) Titrimetric methods:-

Neutralisation titrations, Redox titrations ,Complexometric titrations, Precipitation titrations, Non-aqueous titrations ,Gravimetry, Gasometry, Karl Fischer method.

2) Instrumental Methods :Theoretical aspects, instrumentation and application of the following analytical methods ;

Different Chromatographic methods, Potentiometry, Polarography,Amperometry, Conductometry Thermal methods,Immunoassays, Principle of absorption Spectroscopy, UV- Visible spectroscopy.IR Spectroscopy, Spectroflurimetry, Nephelometry-turbidimetry, Nuclear Magnetic Resonance spectroscopy, Mass spectroscopy, Flame Emission Spectphotometry, Atomic Absorption spectroscopy, X-ray crystallography.

3) Hyphenated techniques: GC-MS, LC-MS, Tandem-mass spectroscopy.

4) Quality control and Quality assurance.

MODULE: 06 (10 marks)

Pharmaceutical Chemistry

1) Organic chemistry

a) General Study (Including preparation, reactions and mechanisms) of aliphatic, alicyclic, aromatic hydrocarbons, Hetrocyclic compounds (five and six membered carbon rings) Polynuclear hydrocarbons, fused ring systems.

b) Stereochemistry

Various types of Isomerism, substitution and elimination reactions, Electrophilic and nucleophilic reactions, Addition reactions

c) Chemistry of natural products

General study (including classification and uses) of alkaloids, glycosides ,terpenoids, purines, steroids, vitamins, sex hormones fats and oils, carbohydrates, proteins.

2) Biochemistry

a) General study and metabolism of carbohydrates,proteins,lipids,vitamins,enzymes and co enzymes,nucleic acids ,

b) Structure of DNA, Significance of Genetic Material, DNA Replication types and details ,RNA Structure ,types and significance in protein synthesis, Transcription Translation and regulation of Gene expression, A brief account of Genetic engineering and polymerase chain reaction, A brief account of Chromosomes.

3) Inorganic chemistry

a) Limit tests.

b) Compounds belonging to the following classes of medicinal agents

Acidifiers,Antacids,Saline cathartics,Antimicrobials,Antidotes,Astringents,Expectorants and emetics,Dental products,Radiopharmaceuticals,Acids,bases and buffers,Electrolytes,Topical agents, pharmaceutical aids, protectives and adsorbants,official preparations of Iron ,Iodine, and Calcium.

c) A brief study of Colligative properties.

MODULE: 07 (10 marks)

Medicinal Chemistry

1. General study including Synthesis, Classification, Mechanism of action, Structure Activity Relationship and Uses of following classes of drugs;

a) Antibiotics, Sulpha drugs Antileprotics, Anthelmintics, Antimalarials, Schistomicides, Antifungals, Tuberculostatics, Antineoplastics, Immunosuppressive agents ,Anti HIV agents.

b) Drugs acting on Central Nervous System and Autonomic Nervous system.

c) Cardiovascular drugs.

d) Diuretics.

e) Hypoglycemic agents.

f) Drugs acting on Gastro Intestinal tract.

g) Analgesics, Antipyretics and Non steroidal anti inflammatory Drugs .

h) General and Local anaesthetics.

i) Coagulants and anticoagulants.

2) Quantitative Structure Activity Relationship.

3) A brief study of Molecular Docking, Types of Docking, Phamacophore mapping, Informatics and Drug Design.

MODULE: 08 (10 marks)

Pharmaceutical Jurisprudence

1) Pharmaceutical legislation in India: Historical developments, Legal and ethical responsibilities of pharmacists.

2) A detailed study of the following Acts and their significance to the profession of Pharmacy: Pharmacy Act, Drugs and Cosmetics Act, Medicinal and Toilet preparations (Excise Duties) Act and Rules, Narcotic Drugs and Psychotropic Substances Act ,Drugs and Magic Remedies (Objectionable Advertisements) Act and rules.

3) A brief study of the following Acts and their significance in Pharmacy: Drugs Prices Control Order, A.I.C.T.E. Act (Patents Act.), Prevention of Cruelty to Animals Act, Medical Termination of Pregnancy Act, The Poisons Act.

Pharmaceutical Management

1) Good Manufacturing Practice: Definition, cGMP in manufacturing, facilities, quality audit, design, development and process validation methods for Pharmaceutical operations involved in the production of tablets.

2) Stability testing protocols for various pharmaceutical products, Intellectual property rights.

Physical pharmaceutics

1) Surface and interfacial phenomena: Liquid interfaces- surface and interfacial tensions, measurement, electrical properties of interface, surface free energy, spreading coefficient.

2) Dispersions systems: Colloids: types, optical, kinetic and electrical properties, preparation, purification, stability, Surface active agents(HLB classification),solubilization, adsorption at liquid solid and gas interfaces, Suspensions (Theory of sedimentation, wetting of particles, Flocculation, Deflocculation and controlled flocculation, Sedimentation parameters), Emulsions (Theories of emulsification, phase volume ratio, Stability problems and stabilization. Classification of emulsifying agents, evaluation of emulsions)

3) Viscosity and Rheology: Newtonian systems (properties) and Non Newtonian systems (Plastic, Pseudo plastic, Dilatant and Thixotropy.) Measurement of viscosity: Viscometers- capillary, Falling sphere, Cup and Bob, Cone and Plate viscometer.

4) Accelerated stability studies (Stability problems, stabilization technique of pharmaceutical dosage forms and Expiration dating.
5) Micromeritics: Methods of determination of Particle size and size distribution (Optical microscopy, Sieving, sedimentation Particle volume-Coulter coulter), Particle surface area(Air permeability and Adsorption), Derived properties of powders (Porosity, Packing arrangement, Bulkiness, Flow properties, Densities, Carr's index, Hausner ratio.), Complexation methods for enhancement of solubility.

MODULE: 09 (10marks)

Pharmaceutical Microbiology and Biotechnology

1) Immunity and Immunological Products. Primary and Secondary defensive mechanisms of body, microbial resistance. Interferons. Humoral Immunity, Antigen, Antibodies, Immunological Tolerance. Hypersensitivity, Active and Passive immunization, Vaccines and Sera, their preparation, standardization and storage.

2) Control of microbes by Physical and Chemical methods: Disinfection and disinfectants, Study of sterilization techniques and validation.

3) Microbial assay of antibiotics.

4) Fermentation technology: Penicillin, alcohol, amylase and Vitamin B12.

5) Development of Hybridoma technology for Monoclonal Antibodies.

6) Enzyme immobilization: Techniques of immobilization of enzymes.

7) Aseptic techniques, source of contamination and methods of prevention, design and maintenance of aseptic area-classification, air handling units, laminar airflow units.

8) Surgical ligatures and sutures, types, Catgut-preparation and standardization. Cotton- absorbent and nonabsorbent, Blood products and plasma substitutes.

Biopharmaceutics and Pharmacokinetics

1) Physicochemical and pharmaceutical factors influencing drug absorption, Biopharmaceutical classification system. Absorption –passage of drugs across biological barriers.
2) Distribution – Factors affecting distribution, physiological barriers for distribution, volume of distribution. Plasma protein binding.

3)Pharmacokinetics of drug absorption-zero order and first order absorption rate constants.Compartment models- Definition, One compartment model- IV Bolus, IV Infusion, Extra-Vascular administration. Determination of pharmacokinetic parameters from plasma and urine data. Two compartment model- IV Bolus- determination of pharmacokinetic parameters,Non-linear pharmacokinetics- One compartment model IV Bolus administration, Michaelis-Menten equation.

4) Design of single dose Bioequivalent study, dissolution and disintegration testing, In vitro-in vivo correlation.

MODULE: 10 (10 marks)

Pharmaceutical Engineering

1) Size reduction and size separation: ball mill, hammer mill, fluid energy mills.

2) Mechanical separation: Filtration and centrifugation- filter aids, filter press, rotary filter, edge filter.

3) Evaporation: short tube, film evaporators.

4) Distillation: Fractional distillation, steam and flash distillation, preparation of water for injection.

5) Drying: fluidized bed, spray, and drum dryers. Principles of freeze drying.

6) Mixing: Mixers for powders, pastes and liquids.

7) Principles and methods of extraction, preparation of tinctures and liquid extracts.

Dispensing Pharmaceutics and Formulation Technology

1) Introduction to Pharmacopoeias (I.P, B.P, USP, B.P.C, NFI) with special reference to history & development of I.P.

2) Calculation of pediatric doses, percentage solutions, alligations, alcohol dilution, Isotonic solutions.

3)Study of Dosage form preparations: Tablets (Types of tablets, excipients, processing of tablet and processing problems, tablet coating techniques and evaluation of tablets),Capsules (Materials and method of production of capsules(hard and soft) and evaluation), Micro encapsulation techniques, Monophasic and Biphasic systems, Semisolid dosage forms and Suppositories.

4) Sterile products (parenterals &ophthalmic): Classification, Formulation and Additives used, production facilities and evaluation.

5) Packaging of Pharmaceutical preparations.

6) Pharmaceutical aerosols-components, propellants, containers, valves and actuators, types of aerosol systems.

7) Preparation and evaluation of creams (vanishing cream and cold cream), face powder, Shampoo, depilatories and dentifrices.

8) Formulation and evaluation of Liposomes, Niosomes, Nanoparticles,Osmotically controlled dosage forms,and Transdermal drug delivery systems.

NOTE: It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.