

Syllabus
of
RECRUITMENT EXAM
for
The post of **Executive Officer**



Gujarat State Pharmacy Council
Ahmedabad.

PHARMACOLOGY

1. General Pharmacology

Introduction to Pharmacology- Definition, scope and source of drugs, dosage form and routes of drug administration. Pharmacodynamics-Mechanism of drug action, Receptors, classification and drug receptors interaction, combined effect of drugs, factors modifying drug action.

Pharmacokinetics-Mechanism and principle of Absorption, Distribution, Metabolism and Excretion of drugs. Principles of basic and clinical pharmacokinetics. Pharmacogenetics. Adverse drug reactions.

Discovery and development of new drugs-Preclinical and clinical studies.

2. Pharmacology of peripheral nervous system

Neurohumoral transmission (Autonomic and somatic).

Parasympathomimetics, Parasympatholytics, Sympathomimetics, Sympatholytics, Ganglionic stimulants and blockers. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

Local anesthetic agents. Drugs used in Myasthenia Gravis.

3. Pharmacology of cardiovascular system

Introduction of hemodynamic and Electrophysiology of heart.

Anti-hypertensive drugs, Anti-anginal agents, Anti-arrhythmic drugs.

Drugs used in congestive heart failure. Anti-hyperlipidemic drugs.

Drugs used in the therapy of shock.

Haematinics, anticoagulants and haemostatic agents.

Fibrinolytics and antiplatelet drugs.

Blood and plasma volume expanders.

4. Drugs acting on urinary system

Diuretics and anti-diuretics.

5. Drugs acting on Respiratory system

Anti-asthmatic drugs, Mucolytics and nasal decongestants, Anti-tussives and expectorants. Respiratory stimulants

6. Pharmacology of central nervous System

Neurohumoral transmission in the C.N.S with special emphasis on Pharmacology of various neurotransmitters. General anesthetics. Alcohols and disulfiram. Sedatives, hypnotics and centrally acting muscle relaxants, Psychopharmacological agents: Antipsychotics, antidepressants, antianxiety agents, anti-manics and hallucinogens. Anti-epileptic drugs. Anti-parkinsonism drugs. Nootropics.

Narcotic analgesics, drug addiction, drug abuse, tolerance and dependence.

7. Pharmacology of Endocrine system

Basic concepts in endocrine pharmacology. Hypothalamic and pituitary hormones. Thyroid hormones and ant thyroid drugs, Parathormone, Calcitonin and vitamin-D. Insulin, oral hypoglycemic agents and glucagon. ACTH and corticosteroids. Androgens and anabolic steroids. Estrogens, progesterone and oral contraceptives. Drugs acting on the uterus.

8. Chemotherapy

General principals of chemotherapy. Sulphonamides and co-trimoxazole. Antibiotics- Penicillins, cephalosporins, chloramphenicol, Macrolides, quinolones and fluoroquinolones, quinolones. Tetracyclines. Aminoglycosides and miscellaneous antibiotics. Chemotherapy of tuberculosis, leprosy, fungal diseases, viral diseases, AIDS, protozoal diseases, worm infections, urinary tract infections and sexually transmitted diseases. Chemotherapy of malignancy.

9. Autacoids and their Antagonists

Histamine, 5-HT and their antagonists. Prostaglandins, thromboxanes and leukotrienes. pentagastrin, cholecystokinin, angiotensin, bradykinin and substance P. Analgesic, anti-pyretic, anti-inflammatory and anti-gout drugs.

10. Pharmacology of drug acting on the gastrointestinal tract

Antacids, anti-secretory and antiulcer drugs. Laxatives and antidiarrheal drugs. Appetite stimulants and suppressants. Digestants and carminatives. Emetics and antiemetics.

11. Chronopharmacology

Definition of rhythm and cycles. Biological clock and their significance leading to chronotherapy.

12. Immunopharmacology

Immunostimulants and immunosuppressants.

13. Chemotherapy of malignant diseases

Basic principal of chemotherapy. Drugs used in cancer chemotherapy.

14. Peptides and proteins as mediators

General Principal of peptide pharmacology Biosynthesis and regulation of peptides Peptide antagonists. Protein and peptide as drugs.

15. Nitric oxide

Biosynthesis of nitric oxide and its physiological role. Therapeutic use of nitric oxide and nitric oxide donors. Clinical condition in which nitric oxide may play a part.

16. Vitamins & Minerals

Vitamin deficiency diseases and their management. Role of minerals in health & diseases.

17. Principles of toxicology

Definition of poison. General principles of treatment of Poisoning. Treatment of poisoning due to Heavy metals, insecticides, opioids and other addict forming drugs. Study of acute, sub acute and chronic toxicity as per OECD guidelines. Genotoxicity, Carcinogenicity, teratogenicity and mutagenicity studies.

BIOCHEMISTRY

1. Cell

Revision of ultra structure of cell, functions of various cellular constituents. Applications of biochemical principles to pharmacy.

2. Carbohydrates

Types of carbohydrates, their functions, digestion, & absorption. Aerobic & anaerobic oxidation with energetics. Glycogenesis, glycogenolysis, & gluconeogenesis. Hexose monophosphate shunt [HMP shunt]. Diseases associated with carbohydrate metabolism.

3. Proteins

Different types of proteins. Their functions, digestion & absorption. Denaturation & its effect on biological activity. Renaturation of proteins. Urea formation, urea cycle, creatinine formation. Transamination & deamination. Proteins as enzymes.

4. Lipids

Different types of lipids. Their functions, digestion, absorption & metabolism. (Beta-Oxidation of fatty acids with energetics. Biosynthesis of cholesterol [from acetate], adrenocorticoids, androgens, progesterone, estrogens, & bile acids / salts. Ketone bodies, their formation & biochemical significance. Diseases associated with lipid metabolism.

5. Vitamins

Definition. Classification, structures [except B12] biochemical role, sources, daily requirements, & deficiency symptoms. Vitamins as co-factors in biochemical reactions.

6. Biological oxidations & reductions

Oxidation reduction systems in the body their role. Oxidative phosphorylation & Electron transport chain. Cytochromes & inhibitors of the same.

7. Enzymes

Classification & their various roles. Enzyme co-factors. Enzyme kinetics. Michaelis-Menton equation along with its transformations. Double reciprocal plot. Factors affecting enzyme action. Enzyme inhibition, competitive & noncompetitive, & kinetics.

8. Nucleic acids

Different types of nucleic acids [NAs] & their composition. Purine & pyrimidine bases, sugars, & phosphoric acid. Nucleosides & nucleotides. Formation of NAs & their backbone. Different ways of representing DNA & RNA molecules. Physico-chemical properties of NAs. Their stability in acidic & basic solutions. Isolation, purification & identification, buoyant density, sedimentation coefficient, & Svedberg constant of NAs. De-novo biosynthesis of NAs. DNA & the Watson-Crick model & its features. DNA as

the bearer of genetic information. Central dogma of molecular genetics & the processes defined in the same. Replication of DNA. Different types of RNAs with their special features & functions. Minor or rare bases. Transcription & translation. Different post translational modifications of proteins. Triplet codon & the codon dictionary. Mutations. An introduction to different types of mutations. Their nature & repair.

9. Hereditary diseases.

Eliptocytosis, spherocytosis, HNPCC, diabetes insipidus.

BIOTECHNOLOGY

1. Plant Cell and Tissue Culture

Structure of plant cell, DNA, Genes and chromosomes.

1. Cell and tissue culture,
 - a. Requirements.
 - b. Callus culture, suspension culture, batch culture.
 - c. Concept of somatic hybridization, somatic embryogenesis.
2. Processes and applications,
 - a. Isolation and immobilization of enzymes and plant cells and application.
 - b. Protoplast and cell fusion.
 - c. Germ plasm conservation.
 - d. Production of secondary metabolites by plant tissue culture.
 - e. Gene transfer techniques.

2. Animal Cell Culture

Introduction to animal cell culture, medium used in ATC. Use of FCS, primary culture, secondary culture, cell line. Cloning: concept and application with technical hurdles. Transgenic animals as source of food, organs and tissues, concept of xeno transplant.

3. Fermentation Technology and Industrial Microbiology

1. Fermentation as biochemical process, types of fermentations.
2. Fermenter - working and construction, accessory components, modification.
3. Fermentation monitoring and in situ recovery of products.

4. Recombinant DNA Technology

Basic concepts

- a) Introduction.
- b) Role of restriction endonuclease, DNA ligase, DNA polymerase, Reverse transcriptase.

5. Process and Applications

- a) Constructing Recombinant DNA molecules.
 - DNA Clones sources of DNA for cloning.
 - DNA vectors, role of expression vectors.
 - Host cell for recombinant work.
 - Method for screening and selecting transformants.
 - Expression of foreign genes.
 - Uses of recombinant DNA.
- b) PCR and applications.
 - Human gene therapy concept and applications.
- c) Drug delivery systems in gene therapy.

6. Biotechnology Derived Products

- a) Sources and upstream processing.
 - Introduction.
 - Escherichia coli as a source of recombinant, therapeutic protein.

- Additional production systems,
 - ✓ Yeast.
 - ✓ Fungal production systems.
 - ✓ Transgenic animals.
 - ✓ Transgenic plants.
 - ✓ Insects cell based systems.
- Upstream processing.
- b) Downstream processing.
 - Product analysis,
 - ✓ Introduction.
 - ✓ Protein -based contaminant.
 - ✓ Removal of altered form of the protein of interest from the product stream.
 - Determination of protein concentration.
- c) Immunological approaches to detection of contaminant, Endotoxin and other pyrogenic contaminants.
 - Pyrogen detection.
 - DNA as contaminant.
 - Microbial and viral contaminant.
 - Viral assays.
 - Miscellaneous contaminants.
 - Validation studies.
- d) Production and purification of recombinant proteins like, Insulin, Growth hormones, somatostatin, interferons, only examples of recombinant blood products.

7. Proteomics

- a) Introduction,
- b) Genomic study, structural and functional genomes, human genome project,
- c) Technologies for Proteomics.
- d) Protein identification,
 - D-SDS-PAGE (1-dimensional sodium dodecyl sulfate-polyacrylamide gel electrophoresis).
 - Dimensional electrophoresis.
- e) Applications of DNA and Protein Microarray Technology.
- f) Pharmaceutical and Medical Application of Proteomic.

8. Formulation of Proteins and Peptides

- a) Introduction.
- b) Making Small Protein Particles: Precipitation of proteins from Supercritical Fluids.
- c) Aseptic Assembly.
- d) Quality Control Issues.
- e) Lyophilization (Freeze-Drying).
- f) Protein Compaction.

PATHOPHYSIOLOGY

1. Basic principles of cell injury and adaptation

Causes, pathogenesis and morphology of cell injury. Abnormalities in lipoproteinemia, glycogen infiltration and glycogen storage disease.

2. Basic mechanisms of inflammation and repair

Pathogenesis of inflammation. Chemical mediators in inflammation. Pathogenesis of chronic inflammation. Repair of wounds in the skin, factors influencing healing of wounds.

3. Hypersensitivity

Hypersensitivity type I, II, III, IV. Biological significance of hypersensitivity. Allergy due to food, chemicals and drugs.

4. Auto-immunity & diseases of immunity

Mechanism of autoimmunity. Classification of autoimmune diseases in man. Transplantation and allograft reactions, mechanism of rejection of allograft. Acquired Immune Deficiency Syndrome (AIDS). Amyloidosis.

5. Neoplastic diseases

Disturbances of growth of cells. General biology of tumors, differences between benign and malignant tumors. Classification of tumors. Historical diagnosis of malignancy. Etiology and pathogenesis of cancer. Invasions, metastasis, patterns of spread of cancer. Environmental carcinogenesis.

6. Shock

Types, mechanisms, stages and management.

7. Biological effects of radiation

Nuclear radiation, UV, X-ray and other radiations.

8. Protein calorie malnutrition, vitamins, obesity, starvation

Deficiency of vitamins, study of various syndromes due to obesity and starvation.

9. Pathophysiology of common diseases

Parkinsonism. Schizophrenia. Depression and mania. Stroke (ischemic and hemorrhage). Hypertension. Angina. Myocardial infarction, CCF. Atherosclerosis. Diabetes mellitus. Peptic ulcer and inflammatory bowel disease. Cirrhosis and alcoholic liver diseases. Acute and chronic renal failure. Asthma and chronic obstructive airway diseases.

10. Infectious diseases

Hepatitis - Infective hepatitis.

Sexually transmitted diseases (syphilis, gonorrhea, HIV). Pneumonia, typhoid, urinary tract infections. Tuberculosis. Leprosy. Malaria. Dysentery (Bacterial and amoebic). Viral oncogenesis.

BIOPHARMACEUTICS AND PHARMACOKINETICS

1. Bio-pharmaceutics

- a) Fate of drug after drug absorption, various mechanisms for drug absorption, drug concentration in blood, biological factors in drug absorption, physicochemical factors, dosage form consideration for gastrointestinal absorption.
- b) Drug Absorption:
 - Gastrointestinal absorption-biological considerations.
 - Gastrointestinal absorption - physicochemical considerations.
 - Gastrointestinal absorption-role of the dosage form.
 - Pharmacokinetics. Compartmental and non-compartmental pharmacokinetics. Biotransformation, drug disposition - distribution, drug disposition - elimination. Variability-Body weight, age, sex and genetic factors. Pharmacokinetic variability-diseases. Pharmacokinetic variability-drug interactions. Individualization and optimization of drug dosing regimens.

2. Bio-availability & Bio-equivalence

Quality parameters of dosage forms. Assay methods & its validation.

Physico - chemical properties of drugs & added substances and its effect on preparations and biological availability of dosage forms. Pharmaceutical properties of dosage forms, disintegration, dissolution rate. Biological, pharmacological effects of dosage forms. Factors affecting Bioavailability, Determination of bioavailability. Significance of bio-equivalence studies. Statistical analysis of bioequivalence studies.

Development, scale up & post approval changes [SUPAC] & *in vitro* [dissolution] *in vivo* [plasma concentration profile] correlation or IV/IV correlation (IVIVC). Multi stage - Bioequivalence studies. Therapeutic equivalence. Titration design for clinical rationales. New Drug Application [NDA].

3. Bio- pharmaceutical statistics

Post Marketing Surveillance. Process Validation.

CLINICAL PHARMACY AND THERAPEUTICS

1. General Principles, preparation, maintenance, analysis of observational records in clinical Pharmacy.
2. Clinical trials, type and phases of clinical trials, placebo, ethical and regulatory issues including Good clinical practice in clinical trials.
3. Therapeutic drug monitoring, adverse drug reaction (ADR), types of ADR, Mechanism of ADR. Drug interaction, Monitoring and reporting of ADR and its significance.
4. Drug information services, Drug interactions.
5. Drug interaction in pediatric and geriatric patients, drug treatment during pregnancy, lactation and menstruation.
6. Pharmacovigilance, Therapeutic drug monitoring, Neutraceuticals, essential drugs and rational drug usage.
7. Age related drug therapy: concept of posology, drug therapy for neonates, pediatrics and geriatrics. Drugs used in pregnancy and lactation.
8. Drug therapy in gastrointestinal, hepatic, renal, cardiovascular and respiratory Disorders.
9. Drug therapy for neurological and psychological disorders.
10. Drug therapy in infections of respiratory system, urinary system, infective meningitis, TB, HIV, malaria and filaria.
11. Drug therapy for thyroid and parathyroid disorders, diabetes mellitus, menstrual cycle disorders, menopause and male sexual dysfunction.
12. Drug therapy for malignant disorders like leukemia, lymphoma and solid tumors.
13. Drug therapy for rheumatic, eye and skin disorders.

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION

1. Cell physiology

Cell, Cell junctions, transport mechanisms, homeostasis, ion channels, secondary messengers.

2. The Blood

Composition and functions of blood, RBC, WBC, platelets. Homeostasis, blood groups, mechanism of clotting. Introduction to disorders of blood.

3. Gastrointestinal tract

Structure of the gastrointestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal structures and their role in the digestion and absorption of food.

4. Respiratory System

Structure of respiratory organs, functions of respiration mechanism and regulation of respiration, respiratory volumes and vital capacity.

5. Autonomic nervous system

Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in ANS.

6. Sense organs

Structure and physiology of eye (vision), ear (hearing), taste buds, nose (smell) and skin.

7. Skeletal System

Structure and function of skeleton. Articulation and movement. Disorders of bones and joints.

8. Central Nervous system

Functions of different parts of brain and spinal cord. Neurohumoral transmission in the central nervous system, reflex action, electroencephalogram, specialized functions of the brain, cranial nerves and their functions.

9. Urinary System

Various parts Structure and functions of the kidney and urinary tract. Physiology of urine formation and acid base balance. Brief Introduction to disorders of kidney.

10. Endocrine Glands

Basic anatomy and physiology of pituitary, thyroid, parathyroid, adrenal glands and pancreas. Local hormones. Brief introduction to disorders of various endocrine glands.

11. Reproductive System

Structure and functions of male and female reproductive system. Sex hormones, physiology of menstrual cycle, and various stages of pregnancy and parturition.

12. **Cardio vascular system**

Anatomy of heart and blood vessels, physiology of blood circulation, cardiac cycle, conducting system of heart, heart sound, electrocardiogram, blood pressure and its regulation.

13. **Lymphatic system**

Composition, formation and circulation of lymph. Spleen and its functions.

PHARMACEUTICAL MANAGEMENT

1. **Introduction to management**

Types of management. Basic concepts of management, management process, function and principles. Levels of management, pharmaceutical management art, science or profession.

Social responsibilities of management, functions of management.

2. **Planning and Forecasting**

Planning: Nature, process and types of planning, steps in planning process, planning premises. Advantages and limitations of planning. Management by objective, meaning, objective features, advantages and limitations. Forecasting: meaning, nature, importance, limitations. Techniques of forecasting.

3. **Organization**

Definition, nature, theories, functions, line and staff organization concepts.

4. **Research Management**

R & D organizations and research categories. Elements needed for an R & D organization. Technology transfer.

5. **Inventory Management**

Objective and functions of inventory control. Types of inventories. Requirements of effective inventory control.

6. **Communication**

Nature, types of communication, process, channels and barriers of communication. Limitations of communications. Importance in pharmaceutical industries.

7. **Marketing Research**

New product selection, product management, advertising.

8. **Leadership and motivation**

Leadership: meaning, nature, leadership styles. Theories of leadership. Motivation: meaning, nature, importance. Theories of motivation.

9. **Human resource and development (HRD)**

Definition, HRD methods, HRD process, HRD in Indian industry.

10. **GATT**

General Agreement on Tariff and Trade and its impact on pharmaceutical industry. History of GATT, its impact on pharmaceutical industry. Pharmaceutical market in

India.

11. **World trade organization (WTO) and trade related intellectual property rights (TRIPS)**

Introduction to WTO. Types of intellectual property rights: industrial property and copyrights Indian Patent Acts, 1970 with latest amendment. Definition, types of patents.

12. **Standard institutions and regulatory authorities**

1. Bureau of Indian standards (BIS).
2. International Organization for Standardization (ISO).
3. United States of Food and Drug Administration (USFDA).
4. Central Drug Standard Control Organization (CDSCO).
5. International Conference on Harmonization (ICH).
6. World Health Organization (WHO).

PHARMACEUTICAL JURISPRUDENCE

1. Historical background Drug legislation in India, Code of Ethics for Pharmacists.
2. The Pharmacy Act 1948 (inclusive of recent amendments).
3. Drugs and Cosmetics Act 1940, Rules 1945, including New Drug applications.
4. Narcotic Drugs and Psychotropic Substances Act, and Rules there under.
5. Drugs and Magic Remedies (Objectionable Advertisements) Act 1954.
6. Medicinal and Toilet Preparations (Excise Duties) Act 1955, Rules 1976.
7. Medical Termination of Pregnancy Act 1970 and Rules 1975.
8. Prevention of Cruelty to Animals Act 1960.
9. Drug (Price Control) Order.
10. Shops and Establishment Act.
11. Factory Act.
12. Consumer Protection Act.
13. Indian Pharmaceutical Industry- An Overview.
14. Industrial Development and Regulation act 1951.
15. Introduction to Intellectual Property Rights and Indian Patent Act 1970.
16. An Introduction to Standard Institutions and Regulatory Authorities such as BIS, ASTM, ISO, TGA, USFDA, MHRA, ICH, WHO.
17. Minimum Wages Act 1948.
18. Prevention of Food Adulteration Act 1954 and Rules 1955.
19. Bibliography

DISPENSING & HOSPITAL PHARMACY

1. Introduction to laboratory equipments, weighing methodology, handling of prescriptions, labeling instructions for dispensed products.
2. Preparations based on percolation process.
3. Preparations based on maceration process.
4. Study of difference between marketed and dispensed products of different dosage forms.
5. Posological calculations involved in calculation of dosage for infants. Enlarging and reducing formula, displacement value.
6. Preparations of formulations involving allegation, alcohol dilution, isotonic solution.
7. Study of current patent and proprietary products, generic products and selected brand products, indications, contra indications, adverse drug reactions, available dosage forms and packing of ,
 - Antihypertensive drug
 - Antiamoebic drugs
 - Anti histaminic drugs
 - Anti emetic drugs
 - Antacids and ulcer healing drugs.
 - Anti diarrheals and laxatives
 - Respiratory drugs
 - Antibiotics
 - Analgesics and antipyretic drugs.
8. **Compounding and dispensing of following prescriptions**
 - Mixtures
 - Solutions
 - Emulsions
 - Lotions (External preparations)
 - Liniments (External preparations)
 - Powder
 - Granules
 - Suppositories
 - Ointments / Paste

- Cream
- Incompatibility: Prescription based on physical, chemical and therapeutic incompatibility . Tablets
- Inhalations

9. **Reading and counseling of prescriptions from the clinical practice.**

- Designing from mock Pharmacy: Layout and structure of retail Pharmacy, compounding, dispensing, storing, labeling, pricing, recording and counseling of prescription.
- Procurement of information for the given drug for drug information services.
- Preparation of Hospital Formulary.