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.
   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.
   Narcotic analgesics, drug addiction, drug abuse, tolerance and dependence.
7. Pharmacology of Endocrine system

8. Chemotherapy

9. Autacoids and their Antagonists

10. Pharmacology of drug acting on the gastrointestinal tract

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**

3. **Proteins**

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**

8. **Nucleic acids**

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

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

5. Neoplastic diseases

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

10. Infectious diseases
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.

2. Bio-availability & Bio-equivalence

3. Bio- pharmaceutical statistics
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.
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.
13. Drug therapy for rheumatic, eye and skin disorders.
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**

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**

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**

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)**

12. **Standard institutions and regulatory authorities**
   1. Bureau of Indian standards (BIS).
   3. United States of Food and Drug Administration (USFDA).
   5. International Conference on Harmonization (ICH).
   6. World Health Organization (WHO).
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.
9. Drug (Price Control) Order.
10. Shops and Establishment Act.
16. An Introduction to Standard Institutions and Regulatory Authorities such as BIS, ASTM, ISO, TGA, USFDA, MHRA, ICH, WHO.
19. Bibliography
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.