परिशिष्ट–1

लिखित परीक्षा में 200–200 अंकों के पाँच पत्र होंगें तथा प्रत्येक पत्र दो घंटे का होगा। प्रत्येक प्रत्र का पाठ्यक्रम परिशिष्ट–2 के अनुसार होगा। प्रश्न का स्वरूप वस्तुनिष्ठ प्रकृति का होगा। लिखित परीक्षा के प्रश्न पत्र, साक्षात्कार का स्वरूप आयोग के द्वारा ही तय किया जाएगा।

क्रं0 सं0	प्रश्नपत्र	योग्यता	विषय	पूर्णांक
लिखित परीक्षा के पत्र				
1	प्रथम पत्र	Degree in Pharmacy or Pharmaceutical Sciences Degreein Medicine with specialization in Clinical Pharmacology or Microbiology	Pharmaceutics General Medicine	200
2	द्वितीय पत्र	Degree in Pharmacy or Pharmaceutical Sciences Degree in Medicine with specialization in Clinical Pharmacology or Microbiology	Microbiology	200
3	तृतीय पत्र	Degree in Pharmacy or Pharmaceutical Sciences Degree in Medicine with specialization in Clinical Pharmacology or Microbiology	Pharmacology	200
4	चतुर्थ पत्र	Degree in Medicine with specialization in Clinical Pharmacology or Microbiology Degree in Medicine with specialization in Clinical Pharmacology or Microbiology	Pharmaceutical Chemistry Biochemistry	200
5	पंचम पत्र	Degree in Pharmacy or Pharmaceutical Sciences Degree in Medicine with specialization in Clinical Pharmacology or Microbiology	Pharmaceutical Jurisprudence & Ethics	200
साक्षात्कार				
6	षष्टम पत्र	Interview	-	100
Total				1100

(अरुण कुमार सिंह)
अपर मुख्य सचिव
स्वास्थ्य, चिकित्सा शिक्षा एवं परिवार कल्याण
विभाग, झारखण्ड, राँची।

परिशिष्ट–2

Syllabus

Pharmaceutics

1. **Micromeretic and Powder Rheology:** Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle volume, optical microscopy, Sieving, sedimentation, measurement, particle shape, specific surface, methods for determining surface area; permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.
2. **Surface and Interfacial Phenomenon:** Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB classification, solubilization, detergency, adsorption at solid interfaces, solid-gas and solid-liquid interfaces, complex films, electrical properties
3. **Viscosity and Rheology:** Newtonian systems, Law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling ball, rotational viscometers.
4. **Dispersion Systems: Colloidal Dispersions:** Definition, types, properties of colloids, protective colloids, applications of colloids in pharmacy; Suspensions and Emulsions: Interfacial properties of suspended particles, settling in suspensions, theory of sedimentation, effect of Brownian movement" sedimentation of flocculated articles, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, rheological considerations; Emulsions-types, theories, physical stability.
5. **Kinetics and Drug Stability:** General considerations & concepts, half-life determination, influence of temperature, light, solvent, catalytic species and other factors, Accelerated stability study, expiration dating.
6. **Liquid Dosages Forms:** Introduction, types of additives used in formulations, Vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizer, colors, flavors and others, manufacturing packaging and evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia.
7. **Semisolid Dosage Forms: Definitions,** types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging.
8. **Suppositories:** Ideal requirements, bases, manufacturing procedure, packaging and evaluation.
9. **Pharmaceutical Aerosols:** Definition, propellants, general formulation, manufacturing and packaging methods, pharmaceutical applications.
10. **Ophthalmic Preparations:** Requirements, formulation, methods of preparation, containers, evaluation.
11. **Cosmeticology and Cosmetic Preparations:** Fundamentals of cosmetic science, structure and functions of skin and hair. Formulation, preparation and packaging of cosmetics for skin, hair, dentifrice and manicure preparations like nail polish, Lipsticks, eye lashes, baby care products etc.

12. Biopharmaceutics & Pharmacokinetics: Introduction to Biopharmaceutics and Pharmacokinetics and their role in formulation development and clinical setting
13. Capsules: Advantages and disadvantages of capsule dosage form, material for production of hard gelatin capsules, size of capsules, method of capsule filling, soft gelatin, capsule shell and capsule content, importance of base absorption and minimum/gm factors in soft capsules, quality control, stability testing and storage of capsule dosage forms.
14. Micro-encapsulation: Types of microcapsules, importance of microencapsulation in pharmacy, microencapsulation by phase separation, coacervation, multi orifice, spray drying, spray congealing, polymerisation complex emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules.
15. Tablets: Formulation of different types of tablets, granulation, technology on large-scale by various techniques, physics of tablets making, different types of tablet compression machinery and the equipments employed, evaluation of tablets. Coating of Tablets : Types of coating, film forming materials, formulation of coating solution, equipments for coating, coating process, evaluation of coated tablets, Stability kinetics and quality assurance.
16. Parenteral Products: Preformulation factors, routes of administration, water for injection, pyrogenicity, non aqueous vehicles, isotonicity and methods of its adjustment, Formulation details, containers and closures and selection, Prefilling treatment, washing of containers and closures, preparation of solution and suspensions, filling and closing of ampoules, vials, infusion fluids, lyophillization& preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products. Aseptic Techniques-source of contamination and methods of prevention. Design of aseptic area, Laminar flow bench services and maintenance. Sterility testing of pharmaceuticals.
17. Surgical products : Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc., bandages, adhesive tape, protective cellulosic hemostastics, official dressings, absorbable and non-absorbable sutures, ligatures and catguts. Medical prosthetics and organ replacement materials.
18. Packaging of Pharmaceutical Products: Packaging components, types, specifications and methods of evaluation, stability aspects of packaging. Packaging equipments, factors influencing choice of containers, legal and other
19. official requirements for containers, package testing.
20. Dosage Form Design: Preformulation studies, Performance evaluation methods and Design, development, production and evaluation of controlled released formulations.

General Medicine

1. The 'art' and 'science' of Medicine
2. Principles of prevention of disease
3. Clinical Pharmacology
4. Nutritional and metabolic disorders
5. Water, electrolyte and acid-base imbalance
6. Critical care Medicine
7. Physiology of the critically ill patient
8. Pain management and palliative care
9. Medical Psychiatry
10. Poisonings

11. Immune response and Infections
12. Specific Infections - Epidemiology, clinical features, laboratory diagnosis, treatment and prevention of
    I. Protozoal infections
    II. Bacterial infections
    III. Viral infections
    IV. Mycoplasma & Chlamydial diseases,
    V. Fungal infections, Candidiasis,
    VI. Helminthic infections,
    VII. Nematodes
    VIII. System-Based diseases
        a. Cardiovascular system
        b. Respiratory system
        c. Kidney and genitourinary system
        d. Gastrointestinal tract
        e. Diseases of the pancreas
        f. Liver and Biliary tract disease
        g. Endocrinology and Metabolism
        h. Diabetes mellitus
        i. Thyroid gland
        j. The reproductive system
        k. The parathyroid glands
        l. The adrenal glands
        m. The endocrine pancreas and gastrointestinal tract
        n. The hypothalamus and the pituitary gland
        o. Hematological disorders
        p. Disorders of the immune system, connective tissue and joints
        q. Skin diseases
        r. Neurological diseases

Microbiology.

1. **Introduction to the scope of microbiology.**
2. **Structure of bacterial cell.**
3. **Classification of microbes and their taxonomy.** Actinomycetes, bacteria, rickettsia, spirochetes and viruses.
4. **Identification of Microbes:** Stains and types of staining techniques, electron microscopy.
5. **Nutrition, cultivation, isolation of bacteria, actinomycetes, fungi, viruses, etc.**
6. **Microbial genetics and variation.**
    i. Structure and replication of bacterial DNA
    ii. Plasmids
    iii. Transfer of genetic materials
    iv. Mutations
    v. Viral replication
    vi. Interactions among viruses (recombination, genetic reactivation, complementation etc).
    vii. Epidemiology of viral infection
    viii. Recombinant DNA technology

7. Control of microbes by physical and chemical methods.
   i. Disinfection, factors influencing disinfectants, dynamics of disinfection, disinfectants and antiseptics and their evaluation.
   ii. Sterilization, different methods, validation of sterilization methods & equipment's.
8. Sterility testing of all pharmaceutical products.
9. Immunity, primary and secondary, defensive mechanisms of body, microbial resistance, interferon.
10. Vaccines
11. Microbial assays of antibiotics, vitamins & amino acids.

Pharmaceutical Chemistry

1. Basic Principles of Medicinal Chemistry: Physico-chemical aspects (Optical, geometric and bioisosterism) of drug molecules and bilological action, Drug-receptor interaction including transduction mechanisms.
2. Principles of Drug Design (Therapeutic Aspects): Traditional analog (QSAR) and mechanism based approaches.
3. Synthetic procedures of drugs including physicochemical properties of the following classes of drugs:

   A. Drugs acting at Synaptic and neuro-effector junction sites:
      i. Cholinergics and Anticholinesterases
      ii. Adrenergic. drugs
      iii. Antispasmodic and anti-ulcer drugs iv. Neuromuscular blocking agents.

   B. Autocoids
      i. Antihistamines
      ii. Eicosanoids
      iii. Analgesic-antipyretics, anti-inflammatory (non-steroidal) agents.

   C. Drugs affecting uterine motility

   D. Oxytocics: (including oxytocin, ergot alkaloids and prostaglandins Biochemical approaches in drug designing wherever applicable should be discussed.

   E. Steroids and related Drugs: Steroidal nomenclature and stereochemistry, androgens and anabolic agents, estrogens, and progestational agents, adrenocorticoids.

   F. Drugs acting on the Central Nervous System: General Anesthetics, Local Anesthetics, Hypnotics and Sedatives, Opioid analgesics, antitussives, anti convulsants, Antiparkinsonism drugs, CNS stimulants, Psychopharmacological agents (neuroleptics, antidepressants, anxiolytics).

   G. Diuretics, Cardiovascular drugs, Anticoagulant and Antiplatelet drugs.

   H. Antimetabolites (including sulfonamides).

   I. Chemotherapeutic agents used in Protozoal, Parasitic and other infection

   J. Antineoplastic agents

   K. Anti-viral including anti – HIVagents.

   L. Immunosuppressives and immunostimulants.

   M. Amino acids, peptide, nucleotides and related drugs

   N. Thyroid and Anti thyroid drugs

   O. Insulin and oral hypoglycaemic agents.

   P. Peptidomimetics and nucleotidomimetics.

   Q. Diagnostic agents.

   R. Pharmaceutical Aids.

4. Drug metabolism and Concepts of Prodrugs.
5. Theoretical considerations, and application in drug analysis and quality control of the following analytical techniques
    a. Non-aqueous titrations
    b. Acid Base
    c. Oxidation Reduction Titrations
    d. Precipitation Titrations
    e. Gravimetric Analysis
    f. Complexometric titrations
    g. Miscellaneous Methods of Analysis: Diazotisation titrations, Kjeldahl method of nitrogen estimation, Karl-Fischer titration, Oxygen flask combustion, gasometry.
    h. Extraction procedures including separation of drugs from excipients
    i. Chromatography: The following techniques will be discussed with relevant examples of Pharmacopoeial products. TLC, HPLC, GLC, HPTLC, Paper Chromatography and Column Chromatography.
    j. Potentiometry
    k. Conductometry
    l. Coulometry
    m. Polarography
    n. Ultraviolet and visible spectrophotometry
    o. Infrared spectrophotometry.
    p. Mass Spectrometry.
    q. Emission Spectroscopy.
    r. Radio immunoassay.

Biochemistry

1. Biological cell
    (a) Architecture, compartmentation, cell membrane structure and functions; structure-function relationships.
    (b) Membrane transport. Biomolecules
    (c) Function and classification of carbohydrates, lipids, protein and amino acids.
    (d) Stereoisomerism and chemistry of monosaccharides, amino acids, and fatty acids.
    (e) Structural organization and structure-function relationships of proteins. Hemoglobin and myoglobin, molecular mechanism of O2 transport and storage. Molecular basis of sickle cell anaemia and thallesemias.
    (f) Molecular mechanism of muscle contraction.
    (g) Plasma proteins, their functions and clinical significance.
2. Enzymes
    (a) Nomenclature, classification,
    (b) Kinetics, mechanism of enzymatic catalysis.
    (c) Factors influencing enzymatic catalyses, enzyme activators and inhibitors.
    (d) Regulation of enzyme activity,
    (e) Clinical enzymology, isoenzymes.
3. Metabolic pathways, their regulation and metabolic interrelationships
4. Metabolism: general concepts and characteristics of metabolic pathways.
5. Carbohydrate metabolism
    (a) Pathways of glucose metabolism: glycolysis
    (b) HMP shunt
    (c) Gluconeogenesis

(d) Glycogenolysis, glycogenesis
(e) Galactose and fructose metabolism
(f) Glycogen storage disease
(g) Inborn errors of glucose metabolism
(h) Regulation of glucose metabolism.

6. Amino acid metabolism
   (a) General reactions, transamination, its metabolic and diagnostic significance
   (b) Disposal of amino acid nitrogen and detoxication of urea
   (c) Metabolic fate of amino acid carbon skeleton
   (d) Sulphur containing amino acids
   (e) In born errors of branched chain and aromatic amino acids
   (f) Important amino acid derivatives.
7. **Lipid metabolism**
   (a) Biosynthesis and degradation of fatty acids, phospolipids and triacylglycerols
   (b) Biosynthesis of cholesterol, chemistry and metabolism of lipoproteins.
   (c) Hyperlipoproteinemias
   (d) Lipid storage disease.
   (e) Ketone bodies: their synthesis, utilization and conditions leading to ketoacidosis, prostaglandin, TCA cycle and biological oxidation, prostanoids
8. **Regulation of the metabolic pathways**
   (a) Carbohydrate, lipid and amino acid metabolism
   (b) Interlinks between these pathways.
   (c) Organ interrelationships in metabolism,
   (d) Blood glucose regulation, and its impairment in diabetes mellitus.
   (e) Metabolic adaptation in the fed state, fasting and prolonged starvation.
   (f) Metabolic derangements and adaptations in diabetes mellitus.
9. **Food assimilation and nutrition**
   (a) Digestive enzymes, their action on dietary carbohydrates, fats and proteins.
   (b) Absorption of glucose, amino acids and lipids.
   (c) Gastric, pancreatic and intestinal function tests, liver function tests.
   (d) Functions of dietary ingredients, the macro and micronutrients.
   (e) Fat soluble and water soluble vitamins
   (f) Malnutrition
   (g) Iron metabolism and heme synthesis.
10. Hormones
   (a) Molecular basis of hormonal action, signal transduction mechanisms.
   (b) Chemistry, functions and mechanism of action of hormones of the pituitary, thyroid, parathyroid,
   (c) adrenals, panaceas, and gonads.
   (d) Biosynthesis of steroid hormones their functions and mechanism of action.
   (e) Pineal body
   (f) Endorphins and encephalins,
   (g) Calcium homeostasis.
   (h) Hormonal interplay in the regulation of metabolism.
11. Molecular Biology
   (a) Nucleic acids: DNA and RNA structure
   (b) DNA Replication,
   (c) DNA Transcription
   (d) Post-transcriptional processing.
   (e) Translation of genetic code
   (f) Regulation of gene expression and protein synthesis inhibitors of protein synthesis.

(g) DNA repair mechanisms.
(h) Applied aspects of purine and pyrimidine metabolism
(i) Genetic Engineering: Recombinant DNA technology
(j) DNA and diagnostics

(k) DNA repair mechanisms and related disorders
(l) Telomers, telomerases
(m) Inhibitors of DNA replication, apoptosis

12. **pH, Buffer, physiological buffer systems**
    (a) Regulation of blood pH, acidosis, alkalosis,
    (b) Renal functions tests.
13. **Immunology**
    (a) Reticuloendothelial system, components and functions of the innate and adaptive immunity.
    (b) Role of T and B lymphocytes, antigen presentation
    (c) Induction of immune response
    (d) Cell mediated immune response
    (e) Immunoglobulin structure and functions
    (f) Humoral immune response
    (g) Fate of antigen antibody complex,
    (h) Complement system
    (i) Generation of antibody diversity,
    (j) Hypersensitivities
    (k) Immunoregulation, autoimmunity, tolerance
    (l) HLA, disease association & transplantation
    (m) Immunological techniques, application in medicine (vaccines, immunotherapy, immunoassays andimmunodiagnostics).
14. **Environmental biochemistry, cancer and cancer makers**
    a. Xenbiotics, interaction with biomolecules, effects, metabolism, detoxication,
    b. Biochemical characteristics of cancer
    c. Environmental pollutants and carcinogenensis

Pharmacology

1. **General Pharmacology:** Introduction to Pharmacology, Sources of drugs, Dosage forms and routes of administration, mechanism of action, Combined effect of drugs, Factors modifying drug action, tolerance and dependence, Pharmacogenetics. Absorption, Distribution, Metabolism and Excretion of drugs, Principles of Basic and Clinical pharmacokinetics, Adverse Drug Reactions and treatment of poisoning, ADME drug interactions, Bioassay of Drugs and Biological Standardization, Discovery and development of new drugs.

2. **Pharmacology of Peripheral Nervous System:**
    i. Neurohumoral transmission (autonomic and Somatic)
    ii. Parasympathomimetics, Parasympatholytics, Sympathomimetics, Adrenergic Receptor and neuron blocking agents, Ganglionic, stimulants and blocking agents.
    iii. Neuromuscular blocking Agents.
    iv. Local anesthetic Agents.
3. **Pharmacology of Central Nervous System:**
    i. Neurohumoral transmission in the C.N.S.
    ii. General Anesthetics.

iii. Alcohols and disulfiram.
iv. Sedatives, hypnotics. Anti-anxiety agents and Centrally acting muscle relaxaQ.ts.
v. Psychopharmacological agents (anti-psychotics) antidepressants anti maniacs and hallucinogens.
vi. Anti-epileptics drugs.
vii. Anti-Parkinsonian Drugs.
viii. Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs.
ix. Narcotic analgesics and antagonists.
x. C.N .S. stimulants

4. Drug Addiction and Drug Abuse
5. **Pharmacology of Cardiovascular System:**
   a) Digitalis and cardiac glycosides.
   b) Antihypertensive drugs.
   c) Antianginal and Vasodilator drugs, including calcium channel blockers and beta adrenergic antagonists.
   Antiarrhythmic drugs
   Antihyperlipedemic drugs
   Drugs used in the therapy of shock.
6. **Drugs Acting on the Hemopoietic System:**
   a) Hematinics.
   b) Anticoagulants, Vitamin K and hemostatic agents.
   c) Fibrinolytic and anti-platelet drugs.
   d) Blood and plasma volume expanders.
7. **Drugs acting on urinary system:**
   a) Fluid and electrolyte balance
   b) Diuretics
8. **Autocoids :**
   a) Histamine, 5-HT and their antagonists.
   b) Prostaglandins, thromboxanes and leukotrienes.
   c)Pentagastrin, Cholecystokinin, Angiotensin, Bradykinin and Substance P.
9. **Drugs Acting on the Respiratory System:**
   a) Anti-asthmatic drugs including bronchodilators.
   b) Anti-tussives and expectorants.
   c) Respiratory stimulants.
10. **Drugs Acting on the Gastrointestinal Tract:**
    a) Antacids, Anti Secretory and Anti-ulcer drugs.
    b) Laxatives and anti diarrhoeal drugs.
    c) Appetite Stimulants and Suppressants (d) Emetics and anti-emetics.
    d) Miscellaneous-Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.
11. **Pharmacology of Endocrine System:**
    a) Hypothalamic and pituitary hormones
    b) Thyroid hormones and anti thyroid drugs, parathormone, calcitonin and Vitamin
    c) Insulin, oral hypoglycaemic agents & glucagon.
    d) ACTH and corticosteroids.
    e) Androgens and anabolic steroids.
    f) Estrogens, progesterone and oral contraceptives.
    g) Drugs acting on the uterus.

12. Chemotherapy:
    a) General Principles of Chemotherapy.
    b) Sulfonamides and cotrimoxazole.
    c) Antibiotics-Penicillins, Cephalosporins, Chloramphenicol Erythromycin,
    d) Quinolones and Miscellaneous Antibiotics.
    e) Chemotherapy of tuberculosis, leprosy, fungal diseases, viral diseases, urinary tract infections and sexually transmitted diseases.
13. Chemotherapy of malignancy and Immunosuppressive Agents.
14. Principles of Toxicology:
    a) Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning.
    b) Heavy metals and heavy metal antagonists.

Pharmaceutical Jurisprudence & Ethics

An elaborate study of the following

a. Pharmaceutical Ethics
b. Pharmacy Act 1948.
c. Drugs and Cosmetics Act 1940 and Rules 1945 including Medical Device Rule 2017, New Drugs & Clinical Trials Rules 2019, Cosmetics Rules 2020.
d. Medicinal & Toilet Preparations (Excise Duties) Act 1955.
e. Narcotic Drugs & Psychotropic Substances Act 1985 & Rules.
f. Drugs Price Control Order 2013
g. Drugs and Magic Remedies (Objectionable Advertisements) Act 1954
h. The Clinical Establishments(Registration and Regulation)Act, 2010
i. Pre-Conception and Pre-Natal Diagnostic Techniques (PCPNDT) Act, 1994
k. The medical Termination of pregnancy (MTP) Act, 1971
l. The Transplantation of Human Organs and Tissues Act, 1994

9.9.22

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