Kurukshetra University, Kurukshetra
Institute of Pharmaceutical Sciences
Syllabus of B. Pharm. (Semester System)
V Semester

BPH 3.5.1: Pharmaceutics-VI (Physical Pharmacy)
Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. **Matter**: State and selected properties: State of matter, change in the state of matter, latent heats and vapour pressure, sublimation-critical point, eutectic mixtures, gases, aerosols-inhalers, relative humidity, liquid complexes, liquid crystals, glassy state, solid-crystalline and amorphous polymorphism. [8]

2. **Micromeretic and Powder Rheology**: Particle size and distribution, average particle size, number and weight distribution, particle number, method of determining particle volume, optical microscopy, sieving, sedimentation, measurement, particle shape, specific surface, methods of determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness and flow properties. [8]

3. **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, electric properties of interface. [8]

4. **Viscosity and Rheology**: Newtonian systems, laws of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatent, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling ball, rotational viscometers. [8]

5. **Dispersion system**:
   a. Colloidal dispersions: Definition, types, properties of colloids, protective colloids, applications of colloid in pharmacy. [5]


BPH 3.5.1: Practical Pharmaceutics-VI (Physical Pharmacy)
Max. Marks: 80
Exam Hours: 03

Number of experiments based on aforementioned theory.

**List of Books Recommended**


**Reference Books**
BPH 3.5.2: Pharmaceutics-VII (Pharmaceutical Microbiology)

Theory (Total hours: 45)                          Max. Marks: 80
                                                      Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Introduction to the science of microbiology-ancient theories concerning the origin of life, contribution of great scientists to this science, with particular reference to the contributions of the following scientists: A.V. Leeuwenhoek, Louis Pasteur, Edward Jenner, Robert Koch, Alexander Fleming, Joseph Lister. [2]
2. Microscopy: Microscopes, their magnification, resolution, illumination and filters, working of different types of microscopes, micrometry. [4]
3. Classification of microbes and their taxonomy. [2]
5. Bacterial enzymes – classification, nomenclature, production by fermentation, immobilization techniques and applications of bacterial enzymes in general and detailed account of following bacterial enzymes: alpha amylase (diastase) and proteases. [4]
7. Sterilization, different methods, applications and evaluation of sterilization methods. [8]
8. Aseptic technique. [1]
9. Microbial standardisation of antibiotics (ampicillin, streptomycin), Vitamins (Vitamin B-12, Niacin) and calcium pentothenate. [3]
10. Fermentation: Types of media used; factors affecting, control of various parameters during fermentation. A detailed account of the industrial fermentation process for manufacture of penicillin, streptomycin, glutamic acid; Lysine, citric acid, Vit.B_12. [6]

BPH 3.5.2: Practical Pharmaceutics-VII (Pharmaceutical Microbiology)

Max. Marks: 80                           Exam Hours: 03

Number of experiments based on aforementioned theory.

List of Books Recommended

Text Books
1. L. E. Casida, “Industrial Microbiology”, New Age International (P) Ltd. New
2. Pelczar, Chan and Krieg, “Microbiology”.

Reference Books
5. G Sykes, “Disinfection and Sterilization”.
6. Davis, Dulbetco, Eisen “Microbiology”.
BPH 3.5.3: Pharmaceutical Chemistry-VII (Pharmaceutical Analysis-II)

Theory (Total hours: 60)  Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. **Extraction**: procedure, separation of drug from excipients, liquid-liquid extraction, separation of mixtures by extraction, distribution law, successive extraction, the Craige method of multiple extraction, continuous counter-current extraction, effect of temperature, pH, inert solute, association, ion-pair formation, the emulsion problem in extraction. [7]

2. **Basic Principles of Chromatography**: Introduction and theory of underlying different types of chromatography techniques. Procedure, adsorbents & solvents used, detection methods and applications of: column chromatography, thin layer chromatography, paper chromatography, ion exchange chromatography. [7]

3. **Gas chromatography**: introduction, principles of gas chromatography, basic GLC apparatus, sample introduction, column, column efficiency, solid support, liquid phases, detectors and applications in pharmaceutical analysis. [8]

4. **HPLC**: introduction, instrumentation, liquid solid chromatography, liquid liquid chromatography, HPLC columns, solvent selection in HPLC, data handling in HPLC, applications of HPLC. [7]

5. **Electrochemistry**: [18] The electric cell, electrode potential, half cells, types of half cells, sign convention, Nernst equation, the salt bridge, activity series, standard potential, standard hydrogen electrode, measuring the relative voltage of half cells, calculations of standard potential, reference electrodes, indicator electrodes. Potentiometry: theoretical considerations, ion-selective electrodes, measurement of potential, location of end point equipment, analytical application, direct measurement of a metal concentration, differential curve, determination of Ksp, pH measurement dead-stop titrations; pH meter, pH definition, relation to pH to potential, equipment and applications. Conductometry and conductometric titrations including high frequency titrations and their applications. Coulometric titrations, its principles and applications, controlled potential coulometry, cell design, instrumentation, advantages and limitations, and electrode selection. Polarography and its applications: theory of mass transport processes, current processes, current potential relationship, polarization, choice of electrodes, effect of oxygen, instrumentation, calculation of concentration, laboratory design and safety. Amperometric titrations and its applications.

6. **Radioimmunoassay and radioactivity**: basic nuclear properties, measurement of radioactivity, analytical applications of radioactivity, counting statistics and radiation safety, Basic principle, method and application of radioimmunoassay. [7]


BPH 3.5.3: Practical Pharmaceutical Chemistry-VII (Pharmaceutical Analysis-II)

Max. Marks: 80  Exam Hours: 03

Number of experiments based on aforementioned theory.

**List of Books Recommended**

**Text Books**

Reference Books
7. Lunn G. “Handbook of Derivatisation Reaction for HPLC”

BPH 3.5.4: Pharmacology-IV

Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.


2. Pharmacokinetics: Absorption, Distribution, Metabolism and Excretion of drugs, Principles of Basic and Clinical pharmacokinetics, Adverse Drug Reactions and treatment of poisoning, ADME drug interactions, Therapeutics index -LD 50 & ED50, Bioassay of Drugs and Biological Standardization, Discovery and development of new drugs. [10]

3. Pharmacology of Peripheral Nervous System: [12]
   a) Neurohumoral transmission (autonomic and Somatic)
   b) Parasympathomimetics, Parasympatholytics, Sympathomimetics, Adrenergic Receptor and neuron blocking agents, Ganglionic, stimulants and blocking agents.
   c) Neuromuscular blocking Agents.
   d) Local anesthetic Agents.

   a) Neurohumoral transmission in the C.N.S.
   b) General Anaesthetics.
   c) Alcohols and disulfiram.
   d) Sedatives, hypnotics and centrally acting muscle relaxants.
   f) Anti-epileptics drugs.
   g) Anti-Parkinsonian Drugs.
   h) Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs.
   i) Narcotic analgesics and antagonists.
   j) C.N.S. stimulants
   k) Drug Addiction and Drug Abuse.

5. Drugs acting on urinary system: [8]
   a) Fluid and electrolyte balance
   b) Diuretics

BPH 3.5.4: Practical Pharmacology-IV

Max. Marks: 80 Exam Hours: 03

Number of experiments based on aforementioned theory including the following:
1. Introduction of Experimental Pharmacology:
2. Use of computer simulated CDs or Video cassettes for pharmacology practical where possible.
3. Preparation of different solutions for experiments.
5. Common laboratory animals and anaesthetics used in animal studies.
6. Commonly used instruments in experimental pharmacology.
7. Some common and standard techniques: Bleeding and intravenous injection, intragastric administration. Procedures for rendering animals unconscious- stunning of rodents, pithing of frogs, chemical euthanasia.
8. Experiments of intact preparations: Study of different routes of administration of drugs in mice/rats. To study the effect of hepatic microsomal enzyme inhibitors and induction on the pentobarbitone sleeping time in mice.
10. Effects of autonomic drugs on rabbit’s eye.

**List of Books Recommended**

**Practical Pharmacology**

2. Tripathi Pharmacological Experiments in Intact & Isolated Preparations.

**Suggested Readings**

8. Lewi’s Pharmacology
10. Laurence, DR & Bannet PN; Clinical Pharmacology, Churchill Livingstone.

**BPH 3.5.5: Pharmacognosy-IV**

Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

**Note:** The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. An introduction to traditional systems of medicine: [15]
   a) Ayurvedic system of medicine
   b) Siddha system of medicine
c) Unani system of medicine

d) Homeopathic system of medicine

e) Chinese system of medicine

2. Introduction and applications of Aromatherapy [3]

3. Introduction to primary metabolites, secondary metabolites, biogenesis and biosynthesis in plant [2]


5. An introduction to biogenesis of secondary Metabolites of pharmaceutical importance: Shikimic acid pathway, acetate mevalonate pathway, acetate melonate pathway, Amino acid pathway. [10]

6. Chemistry and biogenesis of medicinally important terpenoids: Citral, Menthol, carvone, Limonene, α-terpineol, camphor, Zingiberine, phytol, squalene [20]

7. Natural allergens and photosensitizing agents. [5]

**BPH 3.5.5: Practical Pharmacognosy-IV**

Max. Marks: 80 Exam Hours: 03

Number of experiments based on aforementioned theory portion and including the following:

1. Laboratory experiments on isolation, separation, purification of various groups of chemical constituents of pharmaceutical importance.
2. Exercises on paper and thin layer chromatographic evaluation of herbal drug constituents.

**List of Books Recommended**

**Text Books**

6. O. P. Aggarwal, Chemistry of organic Natural Products Vol. I & II
7. G. Chatwal, Chemistry of organic Natural Products Vol. I & II
13. Paul m Dewick, “Medicinal Natural Products”, John Wiley & Sons, NY

**Reference Books**

14. Manitto, P., “The Biosynthesis of Natural products”, Ellis Horwood, Chichester
Kurukshetra University, Kurukshetra
Institute of Pharmaceutical Sciences
Syllabus of B. Pharm. (Semester System)
VI Semester

BPH 3.6.1: Pharmaceutics-VIII (Dosage Form Design)
Theory (Total hours: 60)  Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Preformulation studies: [10]
   a) Study of physical properties of drug like physical form, particle size, shape, density, wetting dielectric constant, solubility, dissolution and organoleptic properties and their effect on formulation, stability and bioavailability.
   b) Study of chemical properties of drug like hydrolysis, oxidation, reduction, racemization, polymerization etc., and their influence on formulation and stability of products.
   c) Study of prodrugs in solving problems related to stability, bioavailability and elegancy of formulation.


4. GMP, Quality assurance, Quality audit. [5]

5. Radiopharmaceuticals: fundamentals of radiopharmacy, therapeutic applications of isotopes, diagnostic applications of isotopes, use of radioisotopes in basic research, product development, product production, process control and quality control. [6]


7. Skin: structure and physiology, physiology of sweating, physiology of skin secretions formulations, preparations for skin of face and hands, formulation, preparation and evaluation of cleansing creams, cold creams, cleansing lotions, foundation creams, moisturising creams, skin tonics, handy and body lotion. [10]

8. Hairs, structure and functions, formulation, preparation and evaluation of shampoos, dandruff preparation, hair creams, and fixers, hair colorants, hair remover (depilatories), shaving sticks and after shave lotion. [5]


10. Formulation, preparation and evaluation of other cosmetics like nail lacquers, anti-perspirants and deodorants, tooth powders and tooth paste. [5]

BPH 3.6.1: Practical Pharmaceutics-VIII (Dosage Form Design)
Max. Marks: 80  Exam Hours: 03

Number of experiments based on aforementioned theory.

List of Books Recommended

Text Books

Reference Books
3. “Cosmetic Science and Technology”, John Wiley & Sons, NY
5. S G Thompson, “Modern Cosmetics”, Universal Publishing Corporation, Mumbai

BPH 3.6.2: Pharmaceutics-IX (Pharmaceutical Industrial Management)

Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.


List of Books Recommended

Text Books

Reference Books

BPH 3.6.3: Pharmaceutical Chemistry-VIII (Medicinal Chemistry-I)

Theory (Total hours: 60) Max. Marks: 80
**Exam. Hours: 03**

**Note:** The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. **Basic Principles of Medicinal Chemistry: [15]**
   - Physio-chemical aspects of drug action, stereochemical aspects of drug molecules with biological action, conformational isomerism, solubility and partition coefficient, chemical bonding.
   - Drug-receptor interactions, receptor concept, receptor- effector theories, types of receptor and their action including transduction mechanism and G proteins.
   - Principles of drug design (Theoretical aspects): introduction and basic techniques of traditional analog (QSAR), computer aided drug designing (CADD), molecular modeling and combinatorial chemistry.

2. **Synthetic procedures of selected drugs, mode of action, uses, structure activity relationship including physiochemical properties of the following classes of drugs. [35]**
   1. Drugs acting at Synaptic and neuro-effector junction sites: cholinergics and anticholinergics, antispasmodics, antiulcer drugs, ganglionic stimulants, neuromuscular blocking agents, sympathomimetic agents including biosynthesis of adrenergic neurotransmitter, adrenergic drugs and adrenoceptor blockers.
   3. Drugs affecting Uterine Motility: Oxytocics including oxytocin, ergot alkaloids and prostaglandins.

**BPH 3.6.3: Practical Pharmaceutical Chemistry-VIII (Medicinal Chemistry-I)**

Max. Marks: 80

Exam Hours: 03

Number of experiments based on aforementioned theory.

**List of Books Recommended**

**Text Books**


**Reference Books**

6. Exploring QSAR

**BPH 3.6.4: Pharmacology-V**

Theory (Total hours: 60) Max. Marks: 80

Exam. Hours: 03

**Note:** The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.
1. Bioassay: [8]
   Definition, merits and demerits of bioassay, biological standardisation, threshold dose, interpolation, matching, bracketing, three point, four point and other assays, bioassay of acetylcholine, hydroxytryptamine, adrenaline, noradrenaline, sedative agents, oxytocin, digitalis, different hormones, anaesthetics, local anaesthetics, etc.

2. Pharmacology of Cardiovascular System: [20]
   a) Digitalis and cardiac glycosides
   b) Antihypertensive drugs
   c) Antianginal and Vasodilator drugs, including calcium channel blockers and beta adrenergic antagonists
   d) Antiarrhythmic drugs
   e) Antihyperlipidemic drugs
   f) Drugs used in the therapy of shock

3. Drugs Acting on the Hemopoetic System: [10]
   a) Hematinics
   b) Anticoagulants, Vitamin K and hemostatic agents.
   c) Fibrinolytic and anti-platelet drugs
   d) Blood and plasma volume expanders.

4. Autocoids: [12]
   a) Histamine, 5- HT and their antagonists.
   b) Prostaglandins, thromboxanes and leukotrienes.
   c) Pentagastrin, Cholecystokinin, Angiotensin, Bradykinin and Substance P.

5. Drugs Acting on the Respiratory System: [10]
   a) Anti-asthmatic drugs including bronchodilators
   b) Anti-tussives and expectorants
   c) Respiratory stimulants

BPH 3.6.4: Practical Pharmacology-V
Max. Marks: 80
Exam Hours: 03
Number of experiments based on aforementioned theory including the following:

1. Introduction of Experimental Pharmacology:
2. Use of computer simulated CDs or Video cassettes for pharmacology practical where possible.
3. To record the concentration response curve (CRC) of acetylcholine using rectus abdominis muscle preparation of frog.
4. To study the effects of physostigmine and d-tubocurarine on the CRC of acetylcholine using rectus abdominis muscle preparation of frog.
5. To record the CRC of 5- HT on rat fundus preparation.
6. To record the CRC of histamine on guinea pig ileum preparation.
7. To record the CRC of noradrenaline on rat anococcygeus muscle preparation.
8. To record the CRC of oxytocin using rat uterus preparation.
9. Effect of various agonists and antagonists and their characterization using Isolated preparations like frog’s rectus abdominus muscle and isolated ileum preparations of rat, guinea pig and rabbit.
10. To study the ionotropic and chronotropic effects of drugs on isolated Rat/Rabbit/frog heart.
11. To study the effects of drugs on normal and hypodynamic Rat/Rabbit/frog heart.
12. Blood Pressure of anaesthetized Dog/Cat/Rat: To demonstrate the effects of various drugs on the B.P. and respiration including the Vasomotor Reversal of Dale and nicotinic action of acetylcholine.
List of Books Recommended

Practical Pharmacology
2. Tripathi Pharmacological Experiments in Intact & Isolated Preparations.

Suggested Readings
8. Lewi’s Pharmacology
10. Laurence, DR & Bannet PN; Clinical Pharmacology, Churchill Livingstone.

BPH 3.6.5: Pharmacognosy-V
Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03
Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Alkaloids: chemistry and biogenesis of atropine, quinine, reserpine, morphine, papaverine, ephedrine, ergotamine and piperine. [20]
2. Chemistry and biosynthesis of α-Carotene, β-carotene and vitamin A [8]
3. Introduction and chemistry of xanthophylls of medicinal importance. [3]
4. Chemistry, classification and uses of medicinally important irridoids. [5]
5. Chemistry of penicillins, streptomycin and tetracyclines. [9]

BPH 3.6.5: Practical Pharmacognosy-V
Max. Marks: 80 Exam Hours: 03
Number of experiments based on aforementioned theory portion and including the following:
1. Laboratory experiments on isolation, separation, purification of various groups of chemical constituents of pharmaceutical importance.
2. Exercises on paper and thin layer chromatographic evaluation of herbal drug constituents.
List of Books Recommended

Text Books
2. O. P. Aggarwal, Chemistry of organic Natural Products Vol. I & II
3. G. Chatwal, Chemistry of organic Natural Products Vol. I & II
12. Paul m Dewick, “ Medicinal Natural Products”, John Wiley & Sons, NY

Reference Books
1. Manitto, P., “The Biosynthesis of Natural products”, Ellis Horwood, Chichester
Kurukshetra University, Kurukshetra
Institute of Pharmaceutical Sciences
Syllabus of B. Pharm. (Semester System)
VII Semester

BPH 4.7.1: Pharmaceutics-X (Biopharmaceutics and Pharmacokinetics)
Theory (Total hours: 60)  Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Introduction to Biopharmaceutics and Pharmacokinetics and their role in formulation development and clinical setting. [3]
2. Biopharmaceutics: [12]
   2.1 Passage of drug across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis).
   2.2 Factors influencing absorption-physiochemical, physiological and pharmaceutical.
   2.3 Drug distribution in the body, plasma protein binding.
3. Pharmacokinetics [25]
   3.1 Significance of plasma drug concentration measurement.
   3.2 Compartmental model: definition and scope.
   3.3 Pharmacokinetics of drug absorption-zero order and first order absorption rate constant using wagner-Nelson and Loo-piegelman method.
   3.4 Volume of distribution and distribution coefficient.
   3.5 Compartment kinetics-one compartment and two compartment models. Determination of pharmacokinetics parameters from plasma and urine data after drug administration by intravascular and oral route.
   3.6 Curve fitting (method of residuals), regression procedures.
   3.7 Clearance concept, mechanism of renal clearance, clearance ratio, determination of renal clearance.
   3.8 Hepatic elimination of drugs, first pass effect, extraction ratio, hepatic clearance, biliary excretion, enterohepatic circulation.
   3.9 Non-linear pharmacokinetics with special reference to one compartemtn model after I.V. drug administration, Michales Menten equation, determination of non-linearity (saturation mechanism).
4. Clinical pharmacokinetics; [12]
   4.1 Definition and scope.
   4.2 Dosage adjustment in patients with and without renal and hepatic failure.
   4.3 Dosage regimen adjustment for repeated therapy.
   4.4 Introduction to Pharmacokinetics drug interactions and its significance in combination therapy.
5. Bioavailability and bioequivalence: [8]
   5.1 Measures of bioavailability, C_{max}, t_{max} and Area under Curve(AUC).
   5.2 Design of single dose bio-equivalence study and relevant statistics.
   5.3 Overview of regulatory requirements for conduction of bio-equivalence study.

BPH 4.7.1: Practical Pharmaceutics-X (Biopharmaceutics and Pharmacokinetics)
Max. Marks: 80  Exam Hours: 03

Number of experiments based on aforementioned theory.

List of Books Recommended

Text Books
1. L Shargel and B C Andrew, “Applied Biopharmaceutics and Pharmacokinetics”, Prentice Hall
2. Brahmkar, CBS Publishers

Reference Books
6. M Gibaldi and D Parrier, “Pharmacokinetics”, Marcel Dekker Inc, NY

BPH 4.7.2: Pharmaceutics-XI (Pharmaceutical Technology-I)
Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03
Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Tablets: [27] types of tablets, formulation of tablets, various granulation techniques including slugging, chilsonator, extructor, Day-Nauta granulator, double cone granulator, spray granulator. Tabletting machinery for production of single layer, multilayer and compression coated tablets. Physics of tablet making: strain gauge, measurement of applied and transmitted pressure, distribution of forces during compression, effect of applied pressure on relative volume and factors affecting strength of tablet. Tablet coating: sugar coating, film coating and compression coating, coating processes i.e. air suspension coating and pan coating (using conventional, rear vented and perforated pans). Quality control of tablets, Process validation.


3. Aerosols: definitions, advantages and applications, liquefied-gas system, compressed gas system, propellants, containers, valves, cold-filling process, pressure filling process and quality control of aerosols. [7]

4. Introduction to Packaging Technology: Definition, life history of a package, qualities of the package, purpose of packaging, choosing the form of package, hazards encountered by the package, various types of inner and outer packages, selection of a suitable package and child resistant package. [4]

5. Packaging materials: Detailed study with regard to composition packaging characteristics, advantages, and limitations of various packaging materials with special emphasis on glass, plastics, metals and rubber. Evaluation of packaging materials. Production of oriented and non-oriented films and laminates.[7]

6. Strip Packing: Significance of Strip Packing, advantages and limitation of Strip Packing, Strip Packing machinery, films employed in Strip Packing (including composites and laminates) and evaluation of films and strips packs. [4]


BPH 4.7.2: Practical Pharmaceutics-XI (Pharmaceutical Technology-I)
Max. Marks: 80 Exam Hours: 03

Number of experiments based on aforementioned theory.
List of Books Recommended

Text Books
3. “Bentley’s Textbook of Pharmaceutics”, ELBS Bacilliere Tindall

Reference Books

BPH 4.7.3: Pharmaceutical Chemistry-IX (Medicinal Chemistry-II)
Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Drug metabolism: [7]
   - Functionlization reactions (Phase I): Oxidation, reduction and hydrolytic reactions.
   - Conjugation reactions: Glucuronic acid conjugation, sulphate conjugation, conjugation with amino acids, glutathione conjugation, acetylation, methylation.


3. Synthetic procedure of selected drugs, mode of action, uses, and structure activity relationship including physico-chemical properties of the following classes of drugs: [38]
   a. Drugs acting on Central nervous System: General anesthetics, Local anesthetics, Hypnotics and sedatives, opioid analgesics, antitussives, anticonvulsants, antiparkinsonian drugs, CNS stimulants, psychopharmacological agents (neuroleptics, antidepressants, anxiolytics).
   b. Steroids and related drugs: Steroidal nomenclature and stereochemistry; androgens and anabolic agents; oestrogens and paragestational agents; adrenocorticoids.
   c. Diuretics and Antidiuretics.
   d. Vitamins: Classification, chemistry of thiamine, pyridoxine, folic acid, ascorbic acid and vitamin A.

BPH 4.7.3: Practical Pharmaceutical Chemistry-IX (Medicinal Chemistry-II)
Max. Marks: 80 Exam Hours: 03

Number of experiments based on aforementioned theory.

List of Books Recommended

Text Books

Reference Books

BPH 4.7.4: Pharmacology-VI
Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Pharmacology of Endocrine System: [20]
   a) Hypothalamic and pituitary hormones
   b) Thyroid hormones and anti-thyroid drugs, parathormone, calcitonin and Vitamin D.
   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.

2. Principles of Toxicology: [10]
   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.

3. Chemotherapy: [20]
   a) General Principles of Chemotherapy, Sulfonamides and cotrimoxazole
   c) Antibiotics-Penicillins, Cephalosporins, Chloramphenicol, Erythromycin, Quinolones and Miscellaneous Antibiotics.
   d) Chemotherapy of tuberculosis, leprosy, fungal diseases, viral diseases, urinary tract infections and sexually transmitted diseases.
   e) Chemotherapy of malignancy and Immunosuppressive Agents

4. Drugs Acting on the Gastrointestinal Tract: [10]
   a) Antacids, Anti Secretory and Anti-ulcer drugs
   b) Laxatives and anti-diarrhoeal drugs.
   c) Appetite Stimulants and Suppressants
   d) Emetics and anti-emetics
   e) Miscellaneous-Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics.

BPH 4.7.4: Practical Pharmacology-VI
Max. Marks: 80 Exam Hours: 03

Number of experiments based on aforementioned theory including the following:
1. Introduction of Experimental Pharmacology.
2. Use of computer simulated CDs or Video cassetes for pharmacology practical where possible.
3. To calculate the pA, value of atropine using actylcholine as an agonist on rat ileum preparation.
4. To calculate the pA, value of mepyramine or chlorpheniramine using histamine as agonist on guinea pig ileum.
5. To estimate the strength of the test sample of agonist/drug (e.g. Acetylcholine, Histamine, 5-HT, Oxytocin, etc.) using a suitable isolated muscle preparation employing interpolation bioassay, Matching bioassay, Bracketing assay, Three point assay and Four point bioassay.
6. To study the Anti-secretory and anti-ulcer activity using pylorus ligated rats.
6. To determine the effects of certain clinically useful drugs on human volunteers like
   a) Antihistaminics
   b) Anti-anxiety and sedative drugs
   c) Analgesics
   d) Beta blockers.

List of Books Recommended

Practical Pharmacology
2. Tripathi Pharmacological Experiments in Intact & Isolated Preparations.

Suggested Readings
8. Lewi’s Pharmacology
10. Laurence, DR & Bannet PN; Clinical Pharmacology, Churchill Livingstone.

BPH 4.7.5: Pharmaceutical Biotechnology

Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Introduction & historical background: Define history, different branches and scope of biotechnology, Scientific & Technological foundations, Therapeutic & Pharmaceutical applications of biotechnology, and Micro & nano-technology for medicine. [9]
2. Bio-technology & Medicines: Vitamins, Steroids, Amino acid, Proteins, Antibiotics, and Natural compounds. [8]
3. Immunology and Immunological Preparations: Principles, antigens and haptens, immune system, cellular humoral immunity, immunological tolerance, antigen antibody reactions and their applications. Hypersensitivity, Active and Passive immunization; Vaccines- their reparation, standardization and storage. [10]
5. **Microbial Transformation**: Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation process and its improvements with special reference to steroids. [10]

6. **Enzyme immobilization**: Techniques of immobilization of enzymes, factors affecting enzyme kinetics. Study of enzymes such as hyaluronidase, penicillinase, streptokinase and streptodornase, amylases and proteases etc. immobilization of bacteria and plant cells. [8]

**List of Books Recommended**

5. Peppler “Microbial Technology” Vol. II & I.
Institute of Pharmaceutical Sciences  
Syllabus of B. Pharm. (Semester System)  
VIII Semester

BPH 4.8.1: Pharmacuetics-XII (Pharmaceutical Technology-II)  
Theory (Total hours: 60)  
Max. Marks: 80  
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Microencapsulation: terminology, advantages and applications. Study of various processes employed for microencapsulation i.e. coacervation phase separation, multiorifice centrifuge, spray drying, spray congealing, polymerization, air suspension technique and pan coating. [9]

2. Parenterals: types of parenteral products, formulation aspects, pyrogens, production facilities, production procedures for small volume and large volume parenterals, large scale production of injectable grade water and quality control of parenterals. [12]

3. Design, development, production and evaluation of controlled release preparations. [8]


6. Semi-Solid Packaging: Various types of containers/packages used for semi-solid products, filling and sealing machinery (including collapsible tube filling and sealing machine) merits and limitations of various packages, evaluation of semi-solid product package. [7]

7. Sterile Product Packaging: General principles of packaging of sterile products. Various types of containers used for sterile products including small volume and large volume parenterals. Types of closures used for the sterile products. Sterile product filling and sealing machinery i.e. ampoule filling and sealing machine. Limitations and merits of various packages. Evaluation of the sterile product packages. [8]

8. Labelling: Labelling requirements, packaging inserts and machinery employed for labelling. [4]

BPH 4.8.1: Practical Pharmaceutics-XII (Pharmaceutical Technology-II)  
Max. Marks: 80  
Exam Hours: 03

Number of experiments based on aforementioned theory.

List of Books Recommended

Text Books
3. “Bentley’s Textbook of Pharmaceutics”, ELBS Bacilliere Tindall

Reference Books
BPH 4.8.2: Pharmaceutical Chemistry-X (Medicinal Chemistry-III)

Theory (Total hours: 60) 
Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Chemistry and principles of prodrug design. [6]  
2. Synthetic procedure of selected drugs, mode of action, uses, and structure activity relationship including physico-chemical properties of the following classes of drugs: [20]  
   a. Insulin and oral hypoglycemic agents.  
   b. Thyroid and Antithyroid drugs.  
   c. Cardiovascular agents: Antihypertensives, Cardiotonics, Antiarrhythmics, antianginals, anticoagulants and antiplatelets, thrombolytics, antithrombolytics, hypolipoproteinimic drugs.  
3. Mode of action, uses, and structure activity relationship including physico-chemical properties of the following chemotherapeutic agents: [28]  
   a. Antibiotics including b-lactams, tetracyclines, aminoglycosides, polyenes, cycloserine, chloramphenicol.  
   b. Antineoplastics  
   c. Antifungals  
   d. Antimycobacterials  
   e. Antihelmentics  
   f. Antiprotozoals  
   g. Urinary antiseptics  

BPH 4.8.2: Practical Pharmaceutical Chemistry-X (Medicinal Chemistry-III)
Max. Marks: 80 Exam Hours: 03

Number of experiments based on aforementioned theory.

List of Books Recommended

Text Books


Reference Books


BPH 4.8.3: Pharmaceutical Chemistry-XI (Pharmaceutical Analysis-III)

Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Quality Assurance: [15]  
   a) Philosophy of GLP, ISO-9000, TQM, quality Review and Quality documentation.
b) Regulatory aspects: Legislation & regulatory control, regulatory drug analysis, interpretation of analytical data.

c) Aspects of validation /quality audit, Quality of equipment, Validation of equipment, Validation of analytical procedures.

2. The theoretical aspects, basic instrumentation, elements of interpretation of spectra and applications of the following analytical techniques: [45]

   a) Ultraviolet and Visible Spectrophotometry.

   b) Fluorimetry.

   c) Infrared spectrophotometry.

   d) Nuclear magnetic resonance spectroscopy including $^{13}$C NMR.

   e) Mass spectrometry.

   f) Flame photometry.

   g) Atomic absorption spectroscopy.

BPH 4.8.3: Practical Pharmaceutical Chemistry-XI (Pharmaceutical Analysis-III)
Max. Marks: 80
Exam Hours: 03

Number of experiments based on aforementioned theory.

List of Books Recommended

Text Books


Reference Books

5. Skoog, “Fundamental of Analytical Chemistry”.

BPH 4.8.4: Pharmacology-VII (Clinical Pharmacy and Drug Interactions)

Theory (Total hours: 60)  Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.

1. Introduction to Clinical Pharmacology. [4]

2. Important Disorders of Organ Systems and their Management: [16]

   a) Cardiovascular Disorders-Hypertension, Congestive Heart Failure, Angina, Acute Myocardial Infarction, Cardiac arrhythmia.

   b) CNS Disorders: Epilepsy, Parkinsonism, Schizophrenia, Depression.

   c) Respiratory Disease-Asthma

   d) Gastrointestinal Disorders-Peptic ulcer, Ulcerative colitis, Hepatitis, Cirrhosis.

   e) Endocrine Disorders-Diabetes mellitus and Thyroid Disorders.

   f) Infectious Diseases-Tuberculosis, Urinary Tract Infection, Enteric Infections, Upper Respiratory Tract Infections.

   g) Hematopoietic disorders-Anaemia

   h) Joint and Connective Tissue Disorders-Rheumatic Diseases, Gout and Hyperuricemia.


3. Basic Concepts of Pharmacotherapy: [14]

   a) Clinical Pharmacokinetics and individualization of Drug Therapy

   b) Drug Delivery Systems and their Biopharmaceuticals & Therapeutic Considerations.

   c) Drug used during Infancy and in the Elderly (Paediatrics & Geriatrics)
d) Drug use during Pregnancy
e) Drug induced Diseases
f) The Basics of Drug Interactions
g) General Principles of Clinical Toxicology
h) Interpretation of Clinical Laboratory Tests.

6. Drug interaction, Biotransformation’ [2]
   a) Introductory statistical concept, basic definitions,
   b) Introduction to probability—binomial distribution, normal distribution, t distribution, the chi-square distribution and the F- distribution.
   c) Estimation of these parameters by using computer
   d) Analysis of variance and experimental design. One way analysis of variance, multiple Comparison, two way analysis of variance, Using a standard package.
   e) Experimental design in clinical trial principles, parallel design, crosses over design.
10. Concept of Essential Drugs and Rational Drug use. [2]

List of Books Recommended

8. Lewi’s Pharmacology
10. Laurence, DR & Bannet PN; Clinical Pharmacology, Churchill Livingstone.
15. CMDT

BPH 4.8.5: Pharmacognosy-VI

Theory (Total hours: 60) Max. Marks: 80
Exam. Hours: 03

Note: The paper setter will set 08 questions, out of which the candidate will be required to attempt 05 questions in all. First question shall be compulsory and consist of sub-parts of 1 or 2 marks each from the whole syllabus. All questions will carry equal marks.
1. Role of medicinal and aromatic plants in national economy. [4]
2. World-wide trade in medicinal plants and derived products with special reference to diosgenin (dioscorea), taxol (taxus sps), digitalis, tropane alkaloid containing plants, papain, cinchona, ipecac, liquorice, ginseng, Aloe vera, Valerian, rouwolfia and plant containing lexatives. [10]
3. A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India, Utilization and production of phytoconstituents of poppy, ergot, cinchona, ipecac, tropane alkaloids, vinca, aloes, senna, ispaghula, digitalis, dioscorea and solanum Khasianum. [15]
4. Utilization of aromatic plants and derived products with special reference to menthol, citral, sandwood oil, vetiver oil, geronium oil and eucalyptus oil. [15]

5. Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance. Application of plant tissue culture in pharmacognosy [10]

6. Chemotaxonomy of medicinal plants with emphasis on alkaloids, carbohydrates, glycosides, phenolic compounds and terpenoids [6]

**BPH 4.8.5: Practical Pharmacognosy-VI**

Max. Marks: 80  
Exam Hours: 03

Number of experiments based on aforementioned theory and including the following:
1. Isolation of some selected phytoconstituents studied in theory.
2. Extraction of volatile oils and their chromatographic profiles.
3. Some experiments in plant tissue culture.

**List of Books Recommended**

**Text Books**
3. Kalia, A.N., Textbook of Industrial Pharmacognosy

**Reference Books**
6. Wealth of India.
7. “Supplement to Cultivation and Utilization of Medicinal Plants”, RRL, Jammu-Tavi