

SECOND PROFESSIONAL

PHARMACEUTICS-II (DOSAGE FORMS SCIENCE) (Theory)

Paper 1

Marks 100

1. **PHARMACEUTICAL CALCULATIONS:** Some Fundamentals of Measurements and Calculations. The Metric System. The Common Systems. Conversions. Calculation of Doses. Percentage calculations, Reducing and Enlarging Formulas. Weights and Volumes of Liquids. HLB Values. Industrial Calculations. Calculations involving parenteral admixtures. Some calculations involving Hydrogen-ion concentration. Calculations involving isotonic, electrolyte and buffer solutions.
2. **INTRODUCTION:** Dosage form, Ingredient, Product formulation.
3. **GALENICAL PREPARATIONS:** Infusions, Decoctions, Extracts, Fluid extracts, Tinctures, Aromatic waters.
4. **SOLVENTS USED IN PHARMACEUTICAL PREPARATIONS:**
5. **ORAL SOLUTIONS, SYRUPS, ELIXIRS AND SPIRITS:** Solutions: Preparation, dry mixtures for solution, oral rehydrate solutions, oral colonic lavage solution. Syrup: components and preparation of syrups. Elixirs: Preparation of elixirs, Medicated and non-Medicated elixirs. Spirits: Preparation of Spirits.
6. **ORAL SUSPENSIONS, EMULSIONS, MAGMA AND GELS:** Preparations, examples and importance.
7. **TOPICAL AND TRANSDERMAL DRUG DELIVERY SYSTEMS:** Introduction of Ointments, Creams, Pastes, Poultice, Plasters, Lotions, Liniments, Topical gels, Topical Tinctures, Collodions, Topical solutions, Topical powders, Percutaneous absorption, Transdermal systems in use.
8. **OPHTHALMIC, NASAL AND OTIC PREPARATIONS:** Ophthalmic solutions, suspensions, ointment, inserts, contact lens solutions. Nasal decongestant solutions, Decongestant inhalers. Ear preparations: Anti-infective, anti-inflammatory and analgesic.
9. **SUPPOSITORIES AND ENEMAS:** Semi-solid preparations, Suppositories: Bases, preparation, packaging and storage; Solutions/Enemas: Preparation, packaging and storage.
10. **AEROSOLS, INHALATIONS AND SPRAYS:** Aerosol: Principle, container and valve assembly, propellants, filling, testing, packaging, labelling and storage. Inhalations: Principle, container and valve assembly, propellants, filling, testing, packaging, labelling and storage. Sprays: Principle, container and valve assembly, propellants, filling, testing, packaging, labelling and storage.
11. **POWDERS, CAPSULES, TABLET DOSAGE FORMS:** Preparation of Powders, mixing

of powders, uses and packaging of powders, granules, effervescent granulated salts. Hard gelatin capsules: Capsule sizes, preparation of filled hard gelatin capsules. Soft gelatin capsules: Preparation and its application. Tablets, their types, characteristics and methods of preparation.

12. **INTRODUCTION TO PARENTERALS:** Official types of injections, solvents and vehicles for injections, added substances.

13. **A BRIEF INTRODUCTION TO ORAL HYGIENE PRODUCTS:**

PHARMACEUTICS-II (Dosage Forms Science) (Practical)

Paper 7

Marks 100

NOTE: Practicals of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g. Preparation of simple syrup, Orange syrup, Ferrous sulphate syrup, Cod Liver oil Emulsion, Liquid paraffin Emulsion, Throat paint (Mandle's paint), Boroglycerine glycerite, Tannic acid glycerin, Spirit ammonia aromatic, Spirit of Ethyl Nitrite. Preparation of Methyl salicylate ointment, Sulphur ointment, Calamine lotion, Iodine tincture, Preparations of oral hygiene products, Poultice of Kaolin, Effervescent granules, Distilled Water for injections (A minimum of 20 practicals will be conducted).

PHARMACOLOGY AND THERAPEUTICS-I (Theory)

Paper 2

Marks 100

1. GENERAL PHARMACOLOGY:

- a. **Pharmacology:** Definition, History, and its various branches. Drug: Definition and its various sources.
- b. **Routes of drugs administration, advantages and disadvantages.**
- c. **Pharmacokinetics:** Drug solubility and passage of drug across the biological membranes. Absorption, distribution, metabolism and elimination of drugs and factors affecting them. Various pharmacokinetic parameters including volume of distribution (V_d), clearance (Cl), Biological half life ($t_{1/2\beta}$), Bioavailability and various factors affecting it. Dose, Efficacy and potency of drugs. Hypersensitivity and Idiosyncratic reactions, drug tolerance and dependence. Drug interactions. Plasma protein binding.
- d. **Pharmacodynamics:** How drugs act? Receptors and their various types with special reference to their molecular structures. Cell surface receptors, signal transduction by cell surface receptors, signaling Mediated by intra cellular receptors, target cell and hyper sensitization, Pharmacological effects not Mediated by receptors (for example anesthetics and cathartics) Ion channel, enzymes, carrier proteins, Drug receptor interactions and theories of drug action. Agonist, antagonist, partial agonist, inverse agonist. Receptors internalization and receptors co-localization. Physiological Antagonism, Pharmacological Antagonism (competitive and noncompetitive), Neutralization Antagonism, Neurotransmission and neuro-modulation. Specificity of

drug action and factors modifying the action & dosage of drugs. Median lethal dose (LD:50), Median effective dose (ED:50) and Therapeutic Index, Dose-response relationships.

2. DRUGS ACTING ON AUTONOMIC NERVOUS SYSTEM (ANS):

- a. Organization of ANS its subdivisions and innervations.
- b. Neurotransmitters in ANS, their synthesis, release and fate.
- c. Sympathetic agonist drugs: Catecholamines and Non-catecholamines.
- d. Sympathetic antagonist drugs: Adrenergic receptor Blockers and neuron blockers.
- e. Parasympathetic (Cholinergic) agonists and Anticholinestrase inhibitors. Parasympathetic antagonists.
- f. Ganglion stimulants and Ganglion blockers
- g. Neuromuscular Blockers

3. DRUGS ACTING ON GASTROINTESTINAL TRACT:

- a. Emetic and anti-emetics.
- b. Purgatives.
- c. Anti-diarrheal agents.
- d. Treatment of Peptic ulcer: Antacids, H₂-Receptor antagonists, antimuscarinic agents, proton pump inhibitors, prostaglandin agonists, gastrin receptor antagonist and cytoprotective agents.
- e. Drug treatment of chronic inflammatory bowel diseases.
- f. Drugs affecting bile flow and Cholelithiasis.

4. AUTACOIDS AND THEIR ANTAGONISTS: Histamine and Anti-histamines, Serotonin and Serotonin Antagonists, Prostaglandins and their antagonists.

5. DRUGS ACTING ON RESPIRATORY SYSTEM:

- a. Drugs used for cough (Anti-tussives, Expectorants and Mucolytic Agents).
- b. Drugs used for Bronchial Asthma (Bronchodilators, Cromoglycate, Nedocromil, Cortecosteroids & other Anti-inflammatory drugs and Muscarinic receptor antagonists. Cromoglycate, Nedocromil, Cortecosteroids & other Anti-inflammatory drugs.

6. DRUGS ACTING ON CARDIO-VESCULAR SYSTEM:

- a. Angina pectoris and its drug treatment
- b. Congestive heart failure & its treatment
- c. Anti-arrhythmic drugs
- d. Anti-hyperlipidemia
- e. Coagulants and Anti-coagulants
- f. Anti-hypertensives
- g. Diuretics

7. DRUGS ACTING ON GENITO-URINARY SYSTEM: Oxytotoxic drugs, Ergot alkaloids and uterine relaxants.

8. ANTI-ANAEMIC DRUGS:

- 9. HORMONES, ANTAGONISTS AND OTHER AGENTS AFFECTING ENDOCRINE FUNCTION:** Endocrine function and dysfunctions. Drug used for therapy of Diabetes Mellitus: Insulin and Oral Hypoglycemic agents, Corticosteroids, Thyroid hormone and anti-thyroid drugs.

NOTE:

1. Only an introduction will be given of the banned and obsolete drug products.
2. While dealing with Pharmacology stress should be laid to the group actions of related drugs and only important differences should be discussed of the individual drugs placed in same group.
3. Newly introduced drugs should be included in the syllabus while drugs with no clinical and therapeutic values ought to be excluded from syllabus at any time.
4. The prototype drugs in each group from the latest edition of the recommended books.

PHARMACOLOGY AND THERAPEUTICS-I (Practical)

Paper 8

Marks 100

NOTE: Practical of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities e.g.

- Introduction to instruments: such as Organ Bath, Kymograph, Oscillograph polygraph Patch Clamp Technique and Power Lab.
- Preparation of standard solution: Ringer solution. Tyrode solution. Krebs solution. Normal saline solution. To demonstrate the effects of sympathomimetic (Adrenaline) & sympatholytic drugs (Propranolol) on Frog's heart.
- To demonstrate the effects of parasympathomimetic (Acetylcholine) and parasympatholytic (Atropine) drugs on Frog's heart.
- To demonstrate the effects of an unknown drug on Frog's heart. Routes of Administration of drugs.
- To demonstrate the effects of vasoconstrictor drugs on Frog's blood vessels. To demonstrate the effects of stimulant drugs on Rabbit's intestine (Acetyl choline, Barium chloride).
- To demonstrate the effects of depressant drugs on Rabbit's intestine (Atropine). To differentiate the effects of an unknown drug on Rabbit's intestine and identify the (unknown) drug.
- To study the effects of Adrenaline on Rabbit's Eyes.
- To study the effects of Homatropine on Rabbit's Eyes.
- To study the effects of Pilocarpine on Rabbit's Eyes.
- To study the effects of Local Anaesthetic drug (e.g Cocaine) on Rabbit's Eyes.
- To identify the unknown drug & differentiate its effects on Rabbit's Eyes.
- To demonstrate emetic effects of various drugs in pigeons.

(Note: A minimum of 20 practicals will be conducted).

1. **General Introduction and Scope of Pharmacognosy:** Historical development and scope of Pharmacognosy. Terminology Used in Pharmacognosy. An introduction of traditional Medical systems (Unani, Ayurvedic and Homoeopathic systems of medicine) with special reference to medicinal plants. Introduction to herbal pharmacopoeias and modern concepts about Pharmacognosy.
2. **Crude Drugs:** Crude drugs, commerce, preparation, chemical and therapeutic classifications of crude drugs (official and un-official drugs). Methods of Cultivation, Drying, Storage, Preservation and Packing.
3. **The study of the crude drugs belonging to various families of medicinal importance**

S. No.	Families	Crude Drugs
a.	Ranunculaceae	Aconitum, Larkspur, Pulsatilla, Hydrastis
b.	Papaveraceae	Papaver somniferum, Sanguinaria, Canadensis
c.	Leguminosae	Acacia, Glycyrrhiza, Senna, Cassia, Tamarind
d.	Umbelliferae	Fennel, Carum, Coriander, Conium, Asafoetida
e.	Apocynaceae	Rauwolfia, Catharanthus
f.	Asclepiadaceae	Gymnema sylvestre, Calotropis gigantean
g.	Compositae	Artemisia, Silybum marianum, Echinaceae, Arctium lappa
h.	Solanaceae	Belladonna, Hyoscyamus, Stramonium, Capsicum
i.	Scrophulariaceae	Digitalis, Verbascum (Mullien).
j.	Labiatae	Peppermint, Thyme, Spearmint, Salvia, Ocimum
k.	Liliaceae	Garlic, Colchicum, Aloe
l.	Zingiberaceae	Ginger, Curcuma

4. **Evaluation and Adulteration of Crude Drugs:** Evaluation of crude drugs i.e. Organoleptic, Microscopic, Physical, Chemical and Biological. Deterioration and Adulteration of crude drugs. Types of adulteration, inferiority, spoilage, admixture, sophistication and substitution of crude drugs.
5. **Drugs of Animal Origin:** General introduction and discussion about honey, gelatin, shellac, musk, civet, ambergris, cod liver oil, cantharides and spermaceti.
6. **Biologics:** Sources, structure, preparation, description and uses of vaccines, toxins, antitoxins, venoms, antivenoms, antiserums.
7. **Surgical Dressings:** Classification of fibers as vegetable, animals and synthetic fibers. Evaluation of fibers in surgical dressings, BPC standards for dressings and sutures. Discussion on cotton, wool, cellulose, rayon, catgut and nylon

8. **Pesticides:** Introduction, methods and control of pests with special reference to pyrethrum, tobacco, and other natural pesticides.
9. **Growth Regulators:** General account with special reference to plant hormones; Auxins, Gibberellins Abscisic acid and Cytokinins.
10. **Poisonous Plants including Allergens and Allergenic Preparations:** General introduction, case history, skin test, treatment of allergy, inhalant, ingestant, injectant, contactant, infectant and infestant allergens. Mechanism of allergy.
11. **Enzymes:** Enzymes obtained from plant source (Phytoenzymes). Papain Bromelain and Malt Extract. Enzymes obtained from Animal source. Rennin, pepsin, Pancreatin and Pancrealipase.

PHARMACOGNOSY-I (Basic) (Practical)

Paper 9

Marks 100

NOTE: Practicals of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g. Introduction of the entire and broken parts of the plant drugs (Macro and organoleptic characters). Microscopic examination of powders and sections of plant drugs. Physicochemical and Microscopic testing of surgical dressings (Note: A minimum of 20 practicals will be conducted).

NOTE: A Study Tour will be an integral part of the syllabus and will be arranged at the end of the session for collection of medicinal plants from the country.

PHARMACEUTICS-III (PHARM. MICROBIOLOGY & IMMUNOLOGY) (Theory)

Paper 4

Marks 100

NOTE: The topics will be taught with special reference to their Pharmaceutical Applications.

1. **GENERAL MICROBIOLOGY:** Historical introduction, Scope of microbiology with special reference to Pharmaceutical Sciences. Nomenclature and classification of Micro-organisms.
2. **MICRO-ORGANISMS:**
 - a. **The Bacteria:** General and cellular Morphology, structure and function. Classification of Bacteria. Growth curve, growth factors and growth characteristics. Nutrition requirements and nutrition factors affecting growth. Culture Media, Bacterial cultures and staining Methods.
 - b. **The Viruses:** Introduction, Classification (and detail of at least one species from every group), cultivation and replication.
 - c. **The Fungi/Yeast/Molds:**
 - d. **The Protozoa:**

3. **THE NORMAL FLORA:** Microbiology of air, water and soil (general introduction and normal inhabitants of air, water and soil).
4. **INDUSTRIAL MICROBIOLOGY:** Introduction to Sterilization/ Disinfection. Fermentation. Pharmaceutical products Produced by fermentation process (Penicillins, Cepalosporins, Gentamycin, Erythromycin, Tetracyclines, Rifamycin, Griseofulvin).
5. **IMMUNOLOGY:** Introduction and types of Immunity: Specific and non-specific (Cellular basis of Immune response. Immunity, autoimmunity, tolerance. Antigen. Antibodies). Antigen-Antibody reactions and their clinical and diagnostic applications. Hypersensitivity and allergy. Drug allergy mechanism. Vaccination: Introduction and aims. Types of Vaccines. Current vaccine practices.
6. **FACTORY AND HOSPITAL HYGIENE AND GOOD MANUFACTURING PRACTICES:** Introduction, Control of microbial contamination during manufacture, Manufacturing of Sterile products, A Guide to Current Good Pharmaceutical Manufacturing Practices.
7. **INTRODUCTION TO DISEASES:** Dengue fever, Bird flu, SARS or other prevailing diseases of bacteria and virus.

<u>PHARMACEUTICS-III (PHARM. MICROBIOLOGY & IMMUNOLOGY) (Practical)</u>
<u>Paper 10</u> <u>Marks 100</u>

NOTE: Practical of the subject shall be designed from time to time on the basis of the above mentioned theoretical topics and availability of the facilities, e.g. Sterilization of Glassware and pharmaceutical products by various methods. Microbiological assays of Anti-biotics and vitamins. Preparation of general and selective Media and culturing of micro-organisms. Total and viable counts of micro-organism. Morphological and selective biochemical characterization of some specimen. Staining of Bacteria: Gram method, Acid fast, Giemasas staining, Capsule staining, Flagella staining and Spore staining. Microbiological analysis of air, water and soil (Note: A minimum of 20 practicals will be conducted).

<u>PAKISTAN STUDIES AND ISLAMIYAT (Compulsory) (Theory)</u>
<u>Paper 5</u> <u>Marks 100</u>

PART: A PAKISTAN STUDIES:

40 MARKS

1. INTRODUCTION/OBJECTIVES:

- Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
- Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

2. HISTORICAL PERSPECTIVE:

- a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Dr. Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah.
- b. Factors leading to Muslim separatism
- c. People and Land
 - i. Indus Civilization
 - ii. Muslim advent
 - iii. Location and geo-physical features

3. GOVERNMENT AND POLITICS IN PAKISTAN:

Political and constitutional phases:

- a. 1947-58
- b. 1958-71
- c. 1971-77
- d. 1977-88
- e. 1988-99
- f. 1999-onward

4. CONTEMPORARY PAKISTAN:

- a. Economic institutions and issues
- b. Society and social structure
- c. Ethnicity
- d. Foreign policy of Pakistan and challenges
- e. Futuristic outlook of Pakistan

PART: B ISLAMIC STUDIES:

60 MARKS

Course Objectives: This course is aimed at:

- 1 To provide Basic information about Islamic Studies
- 2 To enhance understanding of the students regarding Islamic Civilization
- 3 To improve Students skill to perform prayers and other worships
- 4 To enhance the skill of the students for understanding of issues Related to faith and religious life.

1. Introduction to Quranic Studies:

- 1) Basic Concepts of Quran
- 2) History of Quran
- 3) Uloom-ul-Quran

2. Study of Selected Text of Holly Quran:

- 1) Verses of Surah Al-Baqra Related to Faith (Verse No. 284-286)
- 2) Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No. 1-18)
- 3) Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No. 1-11)
- 4) Verses of Surah al-Furqan Related to Social Ethics (Verse No. 63-77)
- 5) Verses of Surah Al-Inam Related to Ihkam (Verse No. 152-154)

3. Study of Selected Text of Holy Quran:

- 1) Verses of Surah Al-Ihzaab Related to Adab al-Nabi (Verse No. 6, 21, 40, 56, 57, 58)
- 2) Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
- 3) Verses of Surah Al-Saf related to Tafakar, Tadabar (Verse No. 1,14)

4. Seerat of Holy Prophet (S.A.W) I:

- 1) Life of Muhammad Bin Abdullah (Before Prophet Hood)
- 2) Life of Holy Prophet (S.A.W) in Makkah
- 3) Important Lessons derived from the life of Holy Prophet (S.A.W) in Makkah

5. Seerat of Holy Prophet (S.A.W) II

- 1) Life of Holy Prophet (S.A.W) in Madina
- 2) Important Events of Life Holy Prophet (S.A.W) in Madina
- 3) Important Lessons Derived from the life of Holy Prophet (S.A.W) in Madina

6. Introduction to Sunnah:

- 1) Basic Concepts of Hadith
- 2) History of Hadith
- 3) Kinds of Hadith
- 4) Uloom-ul-Hadith
- 5) Sunnah & Hadith
- 6) Legal Position of Sunnah

7. Selected Study from Text of Hadith:

8. Introduction to Islamic Law & Jurisprudence:

- 1) Basic Concepts of Islamic Law & Jurisprudence
- 2) History & Importance of Islamic Law & Jurisprudence
- 3) Sources of Islamic Law & Jurisprudence
- 4) Nature of Differences in Islamic Law
- 5) Islam and Sectarianism

9. Islamic Culture & Civilization:

- 1) Basic Concepts of Islamic Culture & Civilization
- 2) Historical Development of Islamic Culture & Civilization
- 3) Characteristics of Islamic Culture & Civilization
- 4) Islamic Culture & Civilization and Contemporary Issues

10. Islam & Science:

- 1) Basic Concepts of Islam & Science
- 2) Contributions of Muslims in the Development of Science
- 3) Quran & Science

11. Islamic Economic System:

- 1) Basic Concepts of Islamic Economic System
- 2) Means of Distribution of wealth in Islamic Economics
- 3) Islamic Concept of Riba
- 4) Islamic Ways of Trade & Commerce

12. Political System of Islam:

- 1) Basic Concepts of Islamic Political System
- 2) Islamic Concept of Sovereignty
- 3) Basic Institutions of Govt. in Islam

13. Islamic History:

- 1) Period of Khlaft-e-Rashida
- 2) Period of Umayyads
- 3) Period of Abbasids

14. Social System of Islam:

- 1) Basic Concepts of Social System of Islam
- 2) Elements of Family
- 3) Ethical Values of Islam

PHARMACY PRACTICE-I (PHARM. MATHEMATICS AND BIOSTATISTICS) (Theory)

Paper 6

Marks 100

PART A: (PHARMACEUTICAL MATHEMATICS)

(40 MARKS)

1. ALGEBRA:

- (a) Solution of Linear and Quadratic Equations: Equations reducible to Quadratic Form. Solution of simultaneous Equations.
- (b) Arithmetic, Geometric and Harmonic Progressions: Arithmetic, Geometric and Harmonic Means.
- (c) Permutations and Combinations:
- (d) Binomial Theorem: Simple application.

2. TRIGONOMETRY: Measurement of Angles in Radian and Degrees. Definitions of circular functions. Derivation of circular function for simple cases.

3. ANALYTICAL GEOMETRY: Coordinates of point in a plane. Distance between two points in a plane. Locus, Equations of straight line, Equation of Parabola, Circle and Ellips.

4. DIFFERENTIAL CALCULUS: Functions, variations in functions, limits, differential coefficient, differentiation of algebraic, trigonometric, exponential and logarithmic functions, partial derivatives. Maxima and minima values. Points of inflexion.

5. **INTEGRAL CALCULUS:** Concept of integration, Rules of integration, Integration of algebraic, exponential, logarithmic and trigonometric functions by using different techniques and numerical integration.

PART B: (BIOSTATISTICS)

(60 MARKS)

1. **DESCRIPTION OF STATISTICS:** Descriptive Statistics: What is Statistics? Importance of Statistics. What is Biostatistics? Application of Statistics in Biological and Pharmaceutical Sciences. How samples are selected?
2. **ORGANIZING and DISPLAYING DATA:** Variables, Quantitative and Qualitative Variables, Univariate Data, Bivariate Data, Random Variables, Frequency Table, Diagrams, Pictograms, Simple Bar Charts, Multiple Bar Charts, Histograms.
3. **SUMMARIZING DATA and VARIATION:** The Mean, The Median, The Mode, The Mean Deviation, The Variance and Standard Deviation, Coefficient of Variation.
4. **CURVE FITTING:** Fitting a Straight Line. Fitting of Parabolic or High Degree Curve.
5. **PROBABILITY:** Definitions, Probability Rules, Probability Distributions (Binomial & Normal Distributions).
6. **SIMPLE REGRESSION AND CORRELATION:** Introduction. Simple Linear Regression Model. Correlation co-efficient.
7. **TEST OF HYPOTHESIS AND SIGNIFICANCE:** Statistical Hypothesis. Level of Significance. Test of Significance. Confidence Intervals, Test involving Binomial and Normal Distributions.
8. **STUDENT “t”, “F” and Chi-Square Distributions:** Test of Significance based on “t”, “F” and Chi-Square distributions.
9. **ANALYSIS OF VARIANCE:** One-way Classification, Two-way Classification, Partitioning of Sum of Squares and Degrees of Freedom, Multiple Comparison Tests such as LSD, The analysis of Variance Models.
10. **STATISTICAL PACKAGE:** An understanding of data analysis by using different statistical tests using various statistical software’s like SPSS, Minitab, Statistica etc.