ANATOMY & HISTOLOGY [Practical]

PHARM 314 **Cr. Hr. 01**

1. Demonstration of the Preparation and staining of slides.
2. Histological examination of slides: Epithelium, Muscle tissue and Connective tissue.
3. Organ system: Lung, Kidney, Stomach, Appendix, Skin, Intestine and Gall bladder.

SECOND SEMESTER

ENGLISH-B (COMMUNICATION, TECHNICAL WRITING & PRESENTATION SKILLS)

ENG 301 **Cr. Hr. 04**

Course Objectives: Enable the students to meet their real life communication needs, enhance language skills and develop critical thinking.

Paragraph writing: Practice in writing a good, unified and coherent paragraph.

CV and job application:

Translation skills: Urdu to English.

Study skills: Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension.

Academic writing skills: Letter/memo writing, minutes of meetings, use of library and internet. How to write a proposal for research paper/term paper? (emphasis on style, content, language, form, clarity, consistency).

Presentation skills: Personality development (special emphasis on content, confidence, eye contact, style and pronunciation).

Essay writing: Descriptive, narrative, discursive, argumentative.

Technical Report writing: Pharmacy writing and oral communication.

NOTE: Documentaries to be shown for discussion and review. Extensive reading is required for vocabulary building.

PHARMACEUTICS-IB (PHYSICAL PHARMACY) [Theory]

PHARM 315 **Cr. Hr. 03**

1. **RHEOLOGY:** Definition and Fundamental concept; Properties contributing to Rheological behaviour; Graphic presentation of Rheological data.

2. PHYSICOCHEMICAL PROCESSES:

a. Precipitation: Process of precipitation and its applications in Pharmacy.
b. Crystallization: Types of crystals, Mechanism and methods of crystallization and its applications in Pharmacy.
c. Distillation: Simple distillation, fractional distillation, steam distillation, vacuum distillation, destructive distillation and their applications in Pharmacy.
d. Miscellaneous Processes: Efflorescence, deliquescence, lyophillization, elutrition, exiccation, ignition, sublimation, fusion, calcination, adsorption, decantation, evaporation, vaporization, centrifugation, dessication, levigation and trituration.

3. EXTRACTION PROCESSES:

a. Maceration: Purpose & process.
b. Percolation: Purpose and Process.
c. Liquid-Liquid extraction: Purpose and Process.
d. Large scale extraction: Purpose and Process.

4. RATE AND ORDER OF REACTIONS.

5. KINETIC PRINCIPLES AND STABILITY TESTING:
THEORETIC CONSIDERATIONS: Degradation:

a. Physical Factors: Influence of pH, temperature, ionic strength, acid-base catalysis, U.V. light.
b. Chemical Factors: Complex chemical reactions, Oxidation-reduction reactions, Hydrolysis.

PHARMACEUTICS-IB (PHYSICAL PHARMACY) [Practical]

PHARM 315 **Cr. Hr. 01**

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.

a. Partition-coefficient, surface tension, viscosity.
b. Experiments to demonstrate some of physico-chemical processes like simple distillation, steam distillation, crystallization, dialysis.

PHARMACEUTICAL CHEMISTRY-IB (ORGANIC) [Theory]

PHARM 316 **Cr. Hr. 03**

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

1. HETEROCYCLIC CHEMISTRY:

i. Preparation and properties of medicinally important Heterocyclic Compounds such as pyrol, furan, thiophene, pyridine, pyrimidine and pyrazine.
ii. Preparation and properties of heterocyclic compounds in which benzo-ring is fused with five and six membered ring containing one hetero atom; Indole, Quinoline and Isoquinoline.

2. **REACTION MECHANISM:**
   Organic Reaction Mechanism: Arndt-Eistert reaction, Baeyer-Villiger oxidation, Diels Alder reaction; Grignard's reaction, Metal Hydride reduction and Wolff Kishner reduction, Friedel Craft's reaction, Perkin reaction, Cannizzaro's reaction, Mannich reaction.

3. **REACTIVE INTERMEDIATE AND FREE RADICALS:**
   Introduction: Generation, stability and Reaction of the following Intermediates; Carbocations, Carbanions, Carbenes, Nitrenes, Benzynes.
   Type of reactions: An Overview.
   Free radicals: Free radical scavengers and their applications.

4. **CARBONIUM ION REARRANGEMENTS:**
   Pinacol-Pinacolone, Wagner-Meerwein, Wolff, Hofmann and Beckmann rearrangements.

5. **CARBANIONS:**
   Condensation reaction (Aldol condensation, Favorskii rearrangement, Wittig rearrangement).

PHARMACEUTICAL CHEMISTRY-IB (ORGANIC) [Practical]
PHARM 316 **Cr. Hr. 01**

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. Organic Preparations: Benzoic acid, Aspirin, Acetanilide, Iodoform, Nitrophenol, 3-nitrophthalic acid, Benzhydrol and 2,4-Dinitro-chlorobenzene.

PHARMACEUTICAL CHEMISTRY-IIB (BIOCHEMISTRY) [Theory]
PHARM 317 **Cr. Hr. 03**

1. **METABOLIC FATE OF BIOMOLECULES (Anabolism and Catabolism):**
   a. Carbohydrates: Brief introduction to the digestion and absorption of carbohydrates, Aerobic and anaerobic breakdown of Glucose, Glycolysis, Pentose Phosphate Pathway, Glycogenolysis, Glycogenesis, Gluconeogenesis, Citric acid cycle, Energetics of various metabolic processes.
   b. Lipids: Brief introduction to the digestion and absorption of lipids, Oxidation of fatty acids through β-oxidation, Biosynthesis of fatty acids, neutral lipids and cholesterol.
   c. Proteins and Amino acids: Brief introduction to the digestion and absorption of proteins and amino acids, Metabolism of essential and non-essential amino acids, Biosynthesis and catabolism of Haemins and porphyrin compounds.
   d. Bioenergetics: Principles of bioenergetics, Electron transport chain and oxidative phosphorylation.

2. **REGULATION OF METABOLIC PROCESSES:**
   a. Role of Vitamins: Physiological role of Fat-soluble (A, D, E and K) and Water-soluble (Thiamin, Riboflavin, Pantothenic acid, Niacin, Pyridoxal phosphate, Biotin, Folic acid, Cyanocobalamin-members of B-complex family and Ascorbic acid), Coenzymes and their role in the regulation of metabolic processes.

b. Receptor Mediated regulation (Hormones): Mechanism of action of hormones, Physiological roles of various hormones, Site of synthesis and target sites of hormones.
c. Secondary Messengers: Role of cAMP, Calcium ions and phosphoinositol in the regulation of metabolic processes.
d. Gene Expression: Replication, Transcription and Translation (Gene expression) Introduction to Biotechnology and Genetic Engineering, Basic principles of Recombinant DNA technology, Pharmaceutical applications, Balance of Catabolic, Anabolic and Amphibolic processes in human metabolism, Acid-Base and Electrolyte Balance in Human body.

3. INTRODUCTION TO CLINICAL CHEMISTRY:

Introduction and importance of the clinical chemistry. Laboratory tests in diagnosis of diseases including Uric acid, Cholesterol, Billirubin and Creatinine.

PHARMACEUTICAL CHEMISTRY-IIB (BIOCHEMISTRY) [Practical]

PHARM 317 **Cr. Hr. 01**

1. **Qualitative analysis of:** Carbohydrates, Amino acids, Peptides and Sugar, Uric acid, Proteins, Lipids and Sterols (Cholesterol), Bile salts, Billirubin, Analysis of Cholesterol and Creatinine in Blood.
2. **Quantitative analysis of:** Carbohydrates-Glucose (reducing sugar) and any other carbohydrate using Benedict and Anthrone method, Amino acids, Peptides and Proteins using Biuret and Ninhydrin (Spectrophotometric) method. Analysis of normal & abnormal components of Urine-Sugar, Uric acid, Billirubin, Cholesterol and Creatinine.

PHYSIOLOGY-B [Theory]

PHARM 318 **Cr. Hr. 03**

Coordinated Body Functions:

a. Circulation: Plasma, the Blood Cell, Pressure, flow and resistance, Anatomy, Heartbeat coordination, Mechanical Events of the Cardiac Cycle, The Cardiac output, Measurement of Cardiac Function, Arteries, Arterioles, Capillaries, veins, The Lymphatic system, Baroreceptor Reflexes, Blood Volume and Long term Regulation of Arterial Pressure, Other Cardiovascular Reflexes and Responses, Hemorrhage and Other Causes of Hypotension, the Upright Posture, Exercise, Hypertension, Heart Failure, Coronary Artery Disease and Heart Attacks, Formation of Platelet Plug, Blood coagulation: Clot Formation, Anticlotting systems, Anticlotting Drugs.
b. Respiration: Organization of the Respiratory System, Ventilation and Lung Mechanics, Exchange of Gases in Alveoli and tissues, Transport of Oxygen in Blood, Transport of Carbon dioxide in Blood, Transport of Hydrogen ions between Tissues and Lungs, Control of Respiration, Hypoxia, Nonrespiratory functions of the Lungs.
c. The kidneys and Regulation of Water and Inorganic Ions: Renal Functions, Structure of the Kidneys and Urinary System, Basic Renal Process, The Concept of Renal Clearance Micturition, Total Body Balance of sodium and Water Basic Renal Process for sodium and Water, Renal Sodium Regulation, Renal Water regulation, A Summary Example: the response to Sweating, Thirst and Salt Appetite, Potassium Regulation, Effector Sites for Calcium Homeostasis, Hormonal controls, Metabolic Bone Disease, Source of Hydrogen Ion gain or

loss, Buffering of Hydrogen Ions in the Body, Integration of Homeostatic Controls, Renal Mechanisms, Classification of Acidosis and Alkalosis, Diuretics, Kidney Disease.

d. The Digestion and Absorption of Food (Overview): Functions of the Gastrointestinal Organs, Structure of the Gastrointestinal Tract Wall, Digestion and Absorption, Regulation of Gastrointestinal Processes, Pathophysiology of the Gastrointestinal Tract.
e. Regulation of Organic Metabolism, Growth and Energy Balance: Events of the Absorptive and Postabsorptive States, Endocrine and Neural Control of the Absorptive and Postabsorptive States, Fuel Homeostasis in Exercise and Stress Diabetes Mellitus, Hypoglycemia as a Cause of Symptoms, Regulation of Plasma Cholesterol, Bone Growth, Environmental Factors, Influencing Growth, Hormonal Influences on Growth, compensatory Growth, Basic Concepts of Energy Expenditure, Regulation of Total Body Energy Stores, Regulation of Body Temperature.
f. Reproduction: General Principles of Gametogenesis, Anatomy, Spermatogenesis, Transport of Sperm, Hormonal control of Male Reproductive Functions, Ovarian Function, Control of Ovarian Function, Uterine Changes in the Menstrual Cycle, Other Effects of Estrogen and Progesterone, Androgens in Women, Female Sexual Response, Pregnancy, Sex Determination, Sex Differentiation, Puberty, Menopause.
g. Defense Mechanisms of the Body: Cells Mediating Immune Defenses, Nonspecific Immune Defenses, Specific Immune Defenses, Systemic Manifestations of Infection Factors that Alter the Body's Resistance to Infection, Harmful Immune Responses, Absorption, Storage Sites, Excretion, Biotransformation, Functions of Cortisol in Stress, Functions of the Sympathetic Nervous System in Stress, Other Hormones Released During Stress Psychological Stress and Disease.

NOTE: Special emphases should be given on the normal physiological values and their changes during respective pathological conditions. Furthermore, the physiological link will be developed with pathology as well as pharmacology.

PHYSIOLOGY-B [Practical]

PHARM 318 **Cr. Hr. 01**

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. Experimental Physiology includes;

1. BLOOD: Determination of Haemoglobin (Hb), Determination of ESR, RBC Count, WBC Count, DLC (Differential Leucocyte Count), Bleeding Time, Coagulation Time and Blood groups.
2. RESPIRATION: Estimation of vital capacity and its relation to posture and standard vital capacity, Determination of Tidal volume and Demonstration of Artificial Respiration.
3. CARDIOVASCULAR SYSTEM: Recording of Arterial Pulse, Recording of Arterial Blood Pressure and Electro-cardiogram.