

Pharm-D Courses

(Through Department of Pharmacology)

| First Year | | | | | |
|--|--|----------------|---------------------|---|----------------|
| 1st Semester | | | 2nd Semester | | |
| Course No. | Title of Course | Cr. Hr. | Course No. | Title of Course | Cr. Hr. |
| PHL-305 | Islamic Ideology- Pakistan studies | 2 | PHL-308 | Pharmacology Physiology & Histology- II | 3 |
| PHL-307 | Pharmacology - Physiology & Histology-I | 3 | PHL-310 | Pharmacology - Pharmaceutical Biochemistry II | 3 |
| PHL-309 | Pharmacology - Pharmaceutical Biochemistry-I | 3 | PHL-314 | Pharmacology - Anatomy | 2 |
| PHL-311 | Pharmacology - Pharmaceutical Biochemistry (Lab) | 3 | - | - | - |
| Second Year | | | | | |
| PHL-407 | Pharmacology - Physiology & Histology (Lab) | 3 | PHL-410 | Pharmacology - Systemic Pharmacology - I | 3 |
| PHL-409 | Pharmacology & Therapeutics | 3 | - | - | - |
| PHL-413 | Pharmacology - Pathology | 2 | - | - | - |
| Third Year | | | | | |
| PHL-507 | Pharmacology - Systemic Pharmacology -II | 3 | PHL-510 | Pharmacology - Pharmacology Lab - I | 3 |
| PHL-509 | Pharmacology - Pathology (Lab) | 2 | - | - | - |
| Fourth Year | | | | | |
| PHL-609 | Pharmacology - Systemic Pharmacology - III | 3 | PHL-612 | Pharmacology Lab - II | 3 |
| Fifth Year | | | | | |
| PHL-711 | Pharmacology - Clinical Pharmacology | 2 | PHL-712 | Pharmacology - Toxicology | 2 |
| Total 18 Courses making 48 Credit Hours in five years. | | | | | |

FIRST SEMESTER

First Professional

PHL-305

Islamic Ideology Pakistan Studies

Cr. Hrs. 2

1. The Need Religion

A critical analysis of the sources of human knowledge and importance of why (Divine revelation).

2. Islamic Concept of Life

Islamic concept of universe, the position of mankind, the earth, the goal for men's activities.

3. Islamic Beliefs

Islamic and aqida the role of iman in character building and in the development civilization.

Aqida-tawhid (beliefs in unity of God) its details and its impact on character. Iman bil Malaikah (belief in angels).

Aqida risalat (belief in prophethood) its details. Its importance

In the development of Islamic civilization, the distinguishing features of Mohammad (PBUH) Prophethood, the doctrine of the last prophet. Iman bil kutub (Belief in the revealed books).

Aqida Akhlat (Belief in the life hereafter) its details, quranic style of arguments on the life hereafter. The impact of Aqida Akhlat on individual and society. A comparison and Islamic concept of Ibadat with other religions. Salat (Prayer). Zakat, its philosophy, rates and minimum zakat amount, its impact on economy. Sawm (Fasting). Haj (Pilgrimage): Manasik and its importance.

4. Pakistan Studies

Ideology of Pakistan and its basic elements, two nation theory; Aims and objective for Establishment of Pakistan; The Khilafat Movement. The struggle for Islamic System (with the special reference to constitution of Pakistan 1973); The common problems of Muslim Ummah and their solutions.

5. Islamic Moral Values

Philosophy of morality in Islamic moral Values.

Books Recommended

1. Kursheed Ahmed, Islam ka Nazariya hayat
2. Shiblee Nuamani/Syed Suleman Nadvi. Seerat-un-Nabi (SAWW) Jild-e-Kamil

PHL-307

Physiology & Histology-I

Cr. Hrs. 3

1. Physiology of Nerve and Muscle

Chemical changes during muscle contraction, nerve action potential, skeletal, smooth muscle and cardiac excitation contraction.

2. Blood

Composition, functions and genesis of formed elements. RBC, WBC and platelet. Fate of RBC, jaundice, reaction of blood, blood groups. Rh factors, ESR, blood volume, function of spleen, blood coagulation, hemophilia, classification of anemias.

3. Circulatory System

Properties of cardiac muscles, origin and conduction of heart beat, cardiac cycle, ECG, heart sounds, cardiac output, stroke volume and heart rate. Nerve supply to heart, coronary, pulmonary and skin circulation. Blood pressure, vasomotor center. Arterial pulse, venous pulse, hemorrhage, circulatory changes in exercise, composition and circulation of lymph, shock.

4. Skin

Structure and functions of skin, temperature regulation.

5. Digestive System

Mastication, deglutition, digestive juices (gastric, pancreatic, bile and intestinal juices) their composition, function and mechanism of secretions. Movement of stomach and intestine, function of large intestine, defecation, functions of liver and gall bladder.

Books Recommended

1. Arthur C. Guyton and John E. Hall. Textbook of Medical Physiology. 13th Edition, 2015, W.B. Saunders, Philadelphia.
2. Barbara Young philipwoord ford, Geraldine o' Dowd Wheater's Functional Histology: A Text and Colour Atlas. 6th Edition, 2013.
3. Douglas F. Paulsen. Basic Histology: Examination and Board Review. 5th edition, 2010, Prentice Hall Internal Inc.
4. Frederic H. Martini. Fundamentals of Anatomy and Physiology. 10th Edition, 2014, Prentice Hall, New Jersey.
5. Gerard J. Tortora & Bryan Derrickson. Principles of Anatomy and Physiology. 14th Edition, 2013, John Wiley & Sons, New York.

PHL-309

Pharmaceutical Biochemistry-I

Cr. Hrs. 3

1. Introduction and Basic Biochemical Principles

Role of pharmaceutical biochemistry in the health profession, nature of biochemical reactions.

2. Basic Chemistry of Biomolecules

Carbohydrates; Chemistry, classification, reactions, optical activity, biological and pharmaceutical importance of carbohydrates.

Lipids; Chemistry of fatty acids and lipids classifications, (saponifiable and non saponifiable lipids, simple, complex and derived). Reactions of fatty acids and other lipids. Essential fatty acids, biological and pharmaceutical importance of lipids.

Proteins and Amino acids; Chemistry, classification, reactions of proteins and amino acids. Organizational level, macromolecular nature, biological and pharmaceutical importance of proteins and amino acids.

3. Metabolic Fate of Biomolecules

Carbohydrates; Brief digestion and absorption, aerobic and anaerobic breakdown of glucose, glycolysis, pentose phosphate pathway, glycogenolysis, gluconeogenesis, citric acid cycle, energetics of various metabolic processes. Lipids; Brief digestion and absorption, oxidation of fatty acids through beta oxidation, Biosynthesis of fatty acids, neutral lipids, and cholesterol.

Proteins and Amino-acids; Brief digestion and absorption, metabolism of essential and non essential amino acids, Biosynthesis and catabolism of Haemins and porphyrin compounds.

4. Bioenergetics

Principles of bioenergetics, electron transport chain and oxidative phosphorylation.

5. Enzymes

Chemistry, classification, mode of action, kinetics (Michaelis Menten Equation and some modifications), Inhibition, activation, specificity, allosteric enzymes. Factors affecting the rate of an enzyme catalyzed reaction, Biological and pharmaceutical importance, mechanism of action of some important enzyme (Chymotrypsin, Ribonuclease).

Books Recommended

1. Alisa Peet, Michael A. Lieberman, Allan Marks. Marks' Basic Medical Biochemistry. 4th edition, 2012, Lippincott Williams & Wilkins.
2. David L. Nelson , Michael M. Cox. Lehninger Principles of Biochemistry. 6th Edition, 2012, W.H. Freeman.
3. MN Chatterjee & Rana Shinde. Text book of medical biochemistry. 8th Edition. 2011 Jaypee publishers.
4. Pamela C. Champe & Richard A. Harvey. Lipincott's Illustrated Review: Biochemistry. 6th Edition, 2013, Lippincott Williams & Wilkins, Philadelphia.
5. Robert K. Murray. Harper's Illustrated Biochemistry. 30th Edition, 2015, Lange Medical Books, McGraw Hill, New York.

PHL-311 Pharmaceutical Biochemistry (Lab) Cr. Hrs. 3

1. **Qualitative Analysis**
Carbohydrates, amino acids, peptides and proteins. Lipids and sterols (Cholesterol) bile salts and bilirubin. Blood sugar analysis, uric acid, bilirubin, cholesterol and creatinine.
2. **Quantitative Analysis**
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 and abnormal constituents of urine sugar. Uric acid, bilirubin, cholesterol and creatinine

Books Recommended

1. Alisa Peet, Michael A. Lieberman, Allan Marks. Marks' Basic Medical Biochemistry. 4th edition, 2012, Lippincott Williams & Wilkins.
2. David L. Nelson, Michael M. Cox. Lehninger Principles of Biochemistry. 6th Edition, 2012, W.H. Freeman.
3. MN Chatterjee & Rana Shinde. Text book of medical biochemistry. 8th Edition. 2011 Jaypee publishers.
4. Pamela C. Champe & Richard A. Harvey. Lipincott's Illustrated Review: Biochemistry. 6th Edition, 2013, Lippincott Williams & Wilkins, Philadelphia.
5. Robert K. Murray. Harper's Illustrated Biochemistry. 30th Edition, 2015, Lange Medical Books, McGraw Hill, New York.

Second Professional

PHL-407 Physiology & Histology (Lab) Cr. Hrs. 3

1. **Introduction to Experimental Physiology**
2. **Blood**
Determination of hemoglobin. Determination of ESR, RBC count, WBC count, differential leucocytes count, bleeding and clotting time, blood groups.
3. **Respiration**
Estimation of vital capacity and its relation to posture and standard vital capacity. Determination of tidal volume. Demonstration of artificial respiration.
4. **C.V.S.**
Recording of arterial pulse, recording of arterial B.P.
5. **Eye**
Visual acuity, far vision, near vision and field of vision.

6. **C.N.S.**
Nerve muscle preparation in frog, effect of temperature on muscle, Demonstration of special reflexes.
7. **Histology**
Demonstration, preparation and staining of the slides, histological examination of slides, epithelium, connective tissue, muscle tissue, organ system - lungs, kidney, appendix, skin, gall bladder, stomach, intestine.

Books Recommended

1. Arthur C. Guyton and John E. Hall. Textbook of Medical Physiology. 13th Edition, 2015, W.B. Saunders, Philadelphia.
2. Barbara Young, Philipwoodford, Geraldine o' Dowd Histology: A Text and Colour Atlas 6th Edition, 2013.
3. Douglas F. Paulsen. Basic Histology: Examination and Board Review. 5th Edition, 2010, Prentice Hall Internal Inc.
4. Frederic H. Martini. Fundamentals of Anatomy and Physiology. 10th Edition, 2014, Prentice Hall, New Jersey.
5. Gerard J. Tortora & Bryan Derrickson. Principles of Anatomy and Physiology. 14th Edition, 2013, John Wiley & Sons, New York.

PHL-409

Pharmacology & Therapeutics

Cr. Hrs. 3

1. **Introduction**
History and scope of Pharmacology, classification of Pharmacology, classification of drugs and their sources.
2. **Definitions**
Bioavailability, bioequivalence, therapeutic index, potency, efficacy, risk benefit ratio, selective toxicity, plasma half-life, dose response curve, desensitization and tachyphylaxis.
3. **Drugs Delivery System**
Advantages and disadvantages of oral medication. Advantages and disadvantages non-oral medication.
4. **Pharmacokinetics**
Drug solubility and passage of drugs across body membranes, plasma concentration of drugs and various factors affecting it. Factors affecting absorption, distribution, biotransformation and excretion.
5. **Pharmacodynamics**
Drug receptors and theories, agonist and antagonists, mechanism of drug action, specificity of drug action, and factors modifying the action.
6. **Drugs Acting on Blood**
Antianemic (Vit B₁₂, folic acid, iron). Coagulants and anticoagulants.
7. **Autonomic Nervous System**
Introduction to autonomic pharmacology.
8. **Drugs Acting on ANS**
Sympathetic agonists, sympathetic antagonists, parasympathetic agonists and antagonists, anticholinesterases, ganglion blockers and neuromuscular blockers.

Books Recommended

1. Anthony Trevor, Bertram Katzung, Susan Masters, Marieke Knuidering-Hall. Katzung & Trevor's Pharmacology Examination and Board Review, 11th Edition, 2015. Lange Medical Books.
2. Bertram G. Katzung, Susan Masters, Anthony Trevor. Basic and Clinical Pharmacology, 13th Edition, 2014. A Lange Medical Book. London.

3. David E. Golan, Armen H. Tashjian, Jr. Ehrin J. Armstrong, April W. Armstrong. Principles of Pharmacology "The Pathophysiologic Basis of Drug Therapy". 3rd Edition (2011). Lippincott Williams & Wilkins.
4. Goodman & Gilman's. The Pharmacological Basis of Therapeutics 12th Edition, 2010. McGraw-Hill, USA.
5. Rang H.P., Dale M.M. Rang & Dale's Pharmacology, 8th Edition, 2015. Churchill Living Stone, England.

PHL-413

Pharmacology-Pathology

Cr. Hrs. 2

1. **Scope of Pathology and Concept of Diseases**
2. **Definitions and Terminologies**
3. **Response of Body to Injury and Infection**
Acute inflammation, chronic inflammation. Immunity, allergy and hyper sensitivity.
4. **Specific Diseases**
Peptic and duodenal ulcer, hypertension. M.I., SLE, Nephrotic syndrome, COPD.
5. **Diagnosis of Cancer**
Fate, survival and prognosis of tumors. Leukemia, malignant carcinoma, sarcoma lymphoma.

Books Recommended

1. David E. Golan, Armen H. Tashjian, Jr. Ehrin J. Armstrong, April W. Armstrong. Principles of Pharmacology. "The Pathophysiologic Basis of Drug Therapy". 3rd Edition (2011).
2. Martin Gwent Lewis and Thomas K. Barton. Appleton & Lange's Review of General Pathology. 4th Edition, 2002, Prentice Hall International Inc.
3. Michael D. Randall and Karen E Neil. Disease Management, 2nd Edition, 2008.
4. Ramzi S. Cotran, Vinay Kumar & Stanley L. Robbins. Robbins & Cotran Pathologic Basis of Disease. 9th Edition, 2014. W.B. Saunders Company, Philadelphia.
5. Russell J. Greene and Norman D. Harris. Pathology and Therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice. 3rd edition, 2008. Chapman & Hall, London

Third Professional

PHL – 507

Systemic Pharmacology-II

Cr. Hrs. 3

1. **Drugs Acting on Cardio Vascular System**
Angina and antianginal drugs. Thrombosis and thrombolytic agents, Congestive heart failure and its treatment. Cardioactive glycosides, Bipyridines, β -adrenergic blockers. Xanthine derivatives, vasodilators. Antiarrhythmic drugs, Hyperlipidemia and hypocholesterolemic agents. Hypertension, antihypertensives and diuretics.
2. **Dermatological Agents**
Factors affecting topical absorption of drugs, Pharmacology of dermatological agents.
3. **Drugs Acting on Respiratory System**
Drugs used for Cough: Antitussives, demulcents, steam inhalation, local anesthetics. Narcotic antitussives, non-narcotic antitussives, expectorants and mucolytic agents.
Bronchodilators, Corticosteroids and other anti-inflammatory drugs, Muscarinic, receptor antagonists, Mast cell stabilizers; β agonists, Leukotriene inhibitors.
4. **Anti Neoplastics** Drug used for treatment of cancer including Alkylating agents, Mitotic Spindle poisons, Podophyllotoxins, Anti Biotic, Miscellaneous, Topoisomerase, inhibitors and Mono Clonal Antibodies.

Books Recommended

1. Anthony Trevor , Bertram Katzung , Susan Masters, Marieke Knuidering-Hall. Katzung & Trevor's Pharmacology Examination and Board Review, 11th Edition, 2015. Lange Medical Books.
2. Bertram G. Katzung, Susan Masters, Anthony Trevor. Basic and Clinical Pharmacology, 13th Edition, 2014. A Lange Medical Book. London.
3. David E. Golan, Armen H. Tashjian, Jr. Ehrin J. Armstrong, April W. Armstrong. Principles of Pharmacology "The Pathophysiologic Basis of Drug Therapy". 3rd Edition (2011). Lippincott Williams & Wilkins.
4. Goodman & Gilman's. The Pharmacological Basis of Therapeutics 12th Edition, 2010. McGraw-Hill, USA.
5. Rang H.P., Dale M.M. Rang & Dale's Pharmacology, 8th Edition, 2015. Churchill Living Stone, England.

PHL-509

Pharmacology Pathology (Lab)

Cr. Hrs. 2

1. Study of Pathological Slides of various Pathological Conditions

Acute inflammation; chronic inflammation; chronic specific inflammation. Different types of degeneration. Thrombosis, embolism, infarction, necrosis, gangrene, hyperplasia, metaplasia, pigmentation, calcification, C.B.C., papilloma, adenoma, chondroma, fibroma, neofibroma, sq. cell carcinoma, Basal cell carcinoma, transitional cell carcinoma.

Adenocarcinoma, fibrocarcinoma, rhabdomyosarcoma, leiomyosarcoma, lymphosarcoma, liposarcoma, reticular cell sarcoma, Hodgkin's disease, breast carcinoma, osteogenic, Sarcoma, osteoclastoma.

2. Examination of Different Body Fluids in various Pathological Conditions

Urine complete examination, stool examination, blood complete examination. Semen examination, cerebrospinal fluid examination, pericardial fluid examination, pleural fluid examination, aseptic fluid examination, blood sugar, blood urea, blood cholesterol etc.

3. Tests for various Specimens of Clinical Importance

Techniques of clinical blood examination for various diseases, gastric analysis, Tests for liver function and renal function. Test for endocrine abnormalities, biopsies and cytological techniques.

Books Recommended

1. David E. Golan, Armen H. Tashjian, Jr. Ehrin J. Armstrong, April W. Armstrong. Principles of Pharmacology. "The Pathophysiologic Basis of Drug Therapy". 3rd Edition (2011).
2. Martin Gwent Lewis and Thomas K. Barton. Appleton & Lange's Review of General Pathology. 4th Edition, 2002, Prentice Hall International Inc.
3. Ramzi S. Cotran, Vinay Kumar & Stanley L. Robbins. Robbins & Cotran Pathologic Basis of Disease. 9th Edition, 2014. W.B. Saunders Company, Philadelphia.
4. Russell J. Greene and Norman D. Harris. Pathology and Therapeutics for Pharmacists: A Basis for Clinical Pharmacy Practice. 3rd edition, 2008. Chapman & Hall, London
5. Stephen J. McPhee, Maxine Papadakis, Lawrence M. Tierney . Current Medical Diagnosis and Treatment, 54th Edition, 2015, Lange Medical Books, McGraw-Hill Medical Publishing Division, London.

Fourth Professional

PHL-609

Systemic Pharmacology - III

Cr. Hrs. 3

1. Drug Acting on Central Nervous System

Hypnotic and sedatives, analgesics, narcotic analgesics and opioids antagonists, anxiolytics, antipsychotics, antidepressants, antimanic, cerebral stimulants, spinal cord stimulants, drug treatment of epilepsy, drug treatment of parkinsonism and other movement disorders.

General and local anesthetics

2. Insulin, thyroxin and other agents affecting endocrine function

3. Ocular Pharmacology

Use of autonomic agents in eyes, chemotherapy of diseases in eye.

Use of immunomodulatory drugs for ophthalmic therapy; Use of anesthetics in ophthalmic procedures.

4. Oxytocic drugs

5. Drugs Acting on Reproductive System

Contraceptives; Fertility drugs; Testosterone and contraception in males; erectile dysfunction and pharmacotherapy.

Books Recommended

1. Anthony Trevor , Bertram Katzung, Susan Masters, Marieke Knuidering-Hall. Katzung & Trevor's Pharmacology Examination and Board Review, 11th Edition, 2015. Lange Medical Books.
2. Bertram G. Katzung, Susan Masters, Anthony Trevor. Basic and Clinical Pharmacology, 13th Edition, 2014. A Lange Medical Book. London.
3. David E. Golan, Armen H. Tashjian, Jr. Ehrin J. Armstrong, April W. Armstrong. Principles of Pharmacology "The Pathophysiologic Basis of Drug Therapy". 3rd Edition, 2011. Lippincott Williams & Wilkins.
4. Goodman & Gilman's. The Pharmacological Basis of Therapeutics 12th Edition, 2010. McGraw-Hill, USA.
5. Rang H.P., Dale M.M. Rang & Dale's Pharmacology, 8th Edition, 2015. Churchill Living Stone, England.

Fifth Professional

PHL-711

Clinical Pharmacology

Cr. Hrs. 2

1. Introduction to Clinical Pharmacology

Terminology, basic components and scope.

2. Role of Drug Monitoring in Therapeutics

Patient profile, diseases profile, drug profile, monitoring responses, monitoring plasma concentration.

3. Factors Affecting Drug Response

Pharmacogenetics, drug interactions.

4. Development of New Drugs

Process of drug development, preclinical studies, types of clinical trials, choice of patients, exclusion criteria of patients.

5. Drugs in Pregnancy

Prescribing in pregnancy, harmful effects on fetus, pharmacokinetics in pregnancy.

6. Drugs in Infants and Children

Practical aspects of prescribing drugs, pharmacokinetics.

7. Drugs in Elderly

Pharmacokinetics changes, Pharmacodynamic changes.

8. Drug Toxicity

Adverse drug reactions, monitoring adverse drug reactions, risk benefit ratio.

Books Recommended

1. Arthur J. Atkinson Jr, Shiew-Mei Huang, Juan J.L. Lertora, Sanford P. Markey. Principles of Clinical Pharmacology. 3rd edition, 2012, Academic Press.
2. P.V. Rataboli. Clinical Pharmacology and Rational Therapeutics, 2nd edition, 2010, Ane Books Pvt Ltd.
3. Gerard A. McKay, Matthew R. Walters. Clinical Pharmacology and Therapeutics .9th edition, 2013, Wiley Blackwell.
4. Mary Anne Koda Kimble. Koda-kimble & Young's Applied Therapeutics: "The Clinical Use of Drugs" 10th Edition, 2012. Lippincott Williams & Wilkins USA.
5. Roger Walker and Cate Whittlesea. Clinical Pharmacy and Therapeutics, 5th Edition (2011).

SECOND SEMESTER

First Professional

PHL-308

Physiology and Histology-II

Cr. Hrs. 3

1. Respiratory System

Mechanics of respiration, intrathoracic, intrapulmonary pressure. Pulmonary ventilation. Lungs volume and capacities. Composition of inspired air, expired air and alveolar air, carriage of oxygen and CO₂ by the blood. Regulation of breathing (Nervous and Chemical control).

2. Urinary System

Urine formation, composition of urine, urea clearance. Formation of concentrated and dilute urine, Regulation of osmolarity, and pH (acidic and basic urine), process of micturition (nervous control), renal failures.

3. Nervous System

Spinal reflexes. Reflex regulation of movement and posture. Cerebral cortex functions, Voluntary movements, Descending tracts of spinal cord. Basal ganglia, cerebellum, thalamus, C.S.F. Autonomic nervous system.

4. Special senses

Elementary knowledge of structure and function of the special senses.

5. Endocrinology

Definition of hormone. Nature of different types of hormone. Mechanism of action of hormones including pituitary hormones with abnormalities, thyroid gland with pathologies para thyroid hormone, pancreatic hormone with diabetes mellitus, Adrenal glands with cushing syndrome, Addison's disease. Male and female sex hormones.

6. Histology

Underlying principles of histological techniques and staining specific tissues. Staining of paraffin and frozen sections.

Books Recommended

1. Arthur C. Guyton and John E. Hall. Textbook of Medical Physiology. 13th Edition, 2015, W.B. Saunders, Philadelphia.
2. Barbara Young, Philip woodford, Geraldine o' Dowd Wheater's Functional Histology: A Text and Colour Atlas. 6th Edition, 2013.
3. Douglas F. Paulsen. Basic Histology: Examination and Board Review. 5th edition, 2010, Prentice Hall Internal Inc.
4. Frederic H. Martini. Fundamentals of Anatomy and Physiology. 10th Edition, 2014, Prentice Hall, New Jersey.

5. Gerard J. Tortora & Bryan Derrickson. Principles of Anatomy and Physiology. 14th Edition, 2013, John Wiley & Sons, New York.

PHL-310

Pharmaceutical Biochemistry-II

Cr. Hrs. 3

1. Vitamins

Chemistry, classification (fat-soluble and water-soluble vitamins), biological and pharmaceutical importance of vitamins.

2. Hormones

Chemistry, classification (proteinous and non-proteinous hormones, amino acid derivatives, steroids), Biological and pharmaceutical importance of hormones.

3. Regulation of Metabolic Processes

Role of Vitamins, Physiological role of fat-soluble and water-soluble vitamins. Co-enzymes and their role in the regulation of metabolic processes. Niacin, thiamine, riboflavin, pyridoxine, pantothenic acid, biotin, folic acid and vitamin B₁₂.

4. Receptor Mediated Regulation (Hormones)

Mechanism of action of hormones, physiological roles of various hormones, site of synthesis and target sites of hormones, action, regulation, signal transduction mechanism, role of cAMP, calcium ions and phosphoinositides, tyrosine kinase, JAK-kinase in the regulation of metabolic processes.

5. Gene Expression

Regulation of gene expression, chemistry, transcription and translation, introduction to biotechnology and genetic engineering. Basic principles of recombinant DNA technology, Pharmaceutical applications. Genetic switch, inducers, fusion, genes, regulatory genes, zinc finger, Helix-turn helix motif, the leucine-zipper motif.

Books Recommended

1. Alisa Peet, Michael A. Lieberman, Allan Marks. Marks' Basic Medical Biochemistry. 4th edition, 2012, Lippincott Williams & Wilkins.
2. David L. Nelson, Michael M. Cox. Lehninger Principles of Biochemistry. 6th Edition, 2012, W.H. Freeman.
3. MN Chatterjee & Rana Shinde. Text book of medical biochemistry. 8th edition, 2011 Jaypee Publishers.
4. Pamela C. Champe & Richard A. Harvey. Lippincott's Illustrated Review: Biochemistry. 6th Edition, 2013, Lippincott Williams & Wilkins, Philadelphia.
5. Robert K. Murray. Harper's Illustrated Biochemistry. 30th Edition, 2015, Lange Medical Books, McGraw Hill, New York.

PHL – 314

Anatomy

Cr. Hrs. 2

1. Introduction

Anatomical terminology, definition of cell, tissue, organ, structure of cell membrane, cytoplasm, organelles, nucleus, cell cycle.

2. Tissues of Body

Cartilage, bone structure and types of bones and joints.

3. Muscle

Structure of skeletal, smooth muscles, and cardiac muscles.

4. Integumentary System

Including skin, glands, hair and nail.

5. Cardio Vascular System

Structure of heart, location, blood supply to heart, types of blood vessels.

6. Elementary System

Name and structure of different parts of elementary system and their interrelationship.

7. Urinary System

Name and structure of organs of urinary system and their inter relationship.

8. Male and Female Reproductive Systems

Endocrine system including pituitary, thyroid and adrenal glands with their structures.

9. Central Nervous System

Including neuron, organization of CNS, brain, cerebrum, cerebellum, brain stem, Pons and medulla oblongata, thalamus, hypothalamus, cranial nerves. Internal structure of spinal cord CSF, sensory and motor pathways, spinal reflexes, peripheral spinal nerves.

10. Autonomic Nervous System

Sympathetic and Parasympathetic nervous system.

Books Recommended

1. Edith Applegate. The Anatomy and Physiology Learning System. 4th edition, 2010, Saunders.
2. Frederic H. Martini. Fundamentals of Anatomy and Physiology. 10th Edition, 2014, Prentice Hall, New Jersey.
3. Gerard J. Tortora & Bryan Derrickson. Principles of Anatomy and Physiology. 14th Edition, 2013, John Wiley & Sons, New York.
4. Richard L. Drake, A. Wayne Vogl, Adam W. M. Mitchell. Gray's Anatomy for Students. 3rd edition, 2014, Churchill Livingstone.
5. Kevin T. Patton, Gary A. Thibodeau. Anatomy & Physiology . 8th edition, 2013, Mosby.

Second Professional

PHL-410

Systemic Pharmacology - I

Cr. Hrs. 3

1. Autacoids and their Antagonists

Serotonin and serotonin antagonist, other autacoids; Histamine and antihistamines, prostaglandins.

2. Inflammatory Disorders

Medication for inflammatory disorders; Uricosuric agents; Glucocorticoids.

3. Drugs Acting on G.I.T. System

Gastroesophageal reflux disease and its treatment; emesis and antiemetics; Constipation and laxatives. Diarrhea and antidiarrheals; Peptic and duodenal ulcer, drugs used in their treatments; Drugs for inflammatory bowel disease, and for cholelithiasis; Prokinetics.

4. Chemotherapy

Introduction, principles of cell proliferation and chemotherapy. Principles of combination therapy, resistance of chemotherapy.

5. Chemotherapeutic Drugs

Antimicrobial, antiviral, antiprotozoal, antifungal, anthelmintic, antimycobacterial.

Books Recommended

1. Anthony Trevor, Bertram Katzung, Susan Masters, Marieke Knuidering-Hall. Katzung & Trevor's Pharmacology Examination and Board Review, 14th Edition, 2015. Lange Medical Books.
2. Bertram G. Katzung, Susan Masters, Anthony Trevor. Basic and Clinical Pharmacology, 13th Edition, 2014. A Lange Medical Book. London.
3. David E. Golan, Armen H. Tashjian, Jr., Ehrin J. Armstrong, April W. Armstrong. Principles of Pharmacology "The Pathophysiologic Basis of Drug Therapy". 3rd Edition (2011). Lippincott Williams & Wilkins.
4. Goodman & Gilman's. The Pharmacological Basis of Therapeutics 12th Edition, 2010. McGraw-Hill, USA.
5. Rang H.P., Dale M.M. Rang & Dale's Pharmacology, 8th Edition, 2015. Churchill Living Stone, England.

Third Professional

PHL-510

Pharmacology (Lab)

Cr. Hrs. 3

1. Research methods and experimental techniques in pharmacology.
2. Development of experimental design and animal handling.
3. Routes of administration.
4. Preparation of physiological salt solutions.
5. To demonstrate the effects of sympathomimetic and sympatholytic drugs on frog's heart.
6. To demonstrate the effects of parasympathomimetic and parasympatholytic drugs on frog's heart.
7. To demonstrate the effects of an unknown drug on frog's heart
8. To demonstrate the effects of vasoconstrictor drugs on frog's blood vessels.
9. To demonstrate the effects of stimulant drugs on rabbit's intestine.
10. To demonstrate the effects of depressant drugs on rabbit's intestine.
11. To demonstrate the effects of an unknown drug on rabbit's intestine and identify the (unknown) drug.
12. To study the effects of adrenaline on rabbit's eyes.
13. To study the effects of homatropine on rabbit's eyes.
14. To study the effects of pilocarpine on rabbit's eyes.
15. To study the effects of local anesthetic drug.
16. To determine the analgesic response of the given drug.

Books Recommended

1. Bertram G. Katzung, Susan Masters, Anthony Trevor. Basic and Clinical Pharmacology, 13th Edition, 2014. A Lange Medical Book. London.
2. Bikash M, Ajay P. Practical Manual of Experimental and Clinical Pharmacology. 1st edition, 2010, Jaypee Brothers Medical Publishers.
3. K.K. Pillai. Experimental Pharmacology. 2012, CBS Publisher.
4. Mark A. Suckow, Karla A. Stevens, Ronald P. Wilson. "The Laboratory Rabbit, Guinea Pig, Hamster, and Other Rodents". 1st edition, 2012, Academic Press.
5. Richard A. Harvey, Michelle A Clark, Richard Finkel, Jose A. Rey, Karen Whalen. Pharmacology (Lippincott's Illustrated Reviews). 6th edition, 2014, Lippincott Williams & Wilkins.

Fourth Professional

PHL-612

Pharmacology (Lab)

Cr. Hrs. 3

1. To study the convulsant effect of strychnine and picrotoxin in frogs and to determine the site of action.
2. To observe the effect of drugs on gross behavioral changes of animal.
3. To observe the effect of drugs on exploratory behavior of mice.
4. To identify the unknown (convulsant) drug and determine its site of action.
5. To observe the anti-inflammatory effect of given drug by hind paw method.
6. To observe the effect of a diuretic in animal.
7. To observe the hypoglycemic effect of drugs in rabbit.
8. To identify and differentiate the effects of unknown drug on human and the nerve plexus of frog.
9. To demonstrate the effects of acetylcholine on the rectus abdominus muscle of frog and competitive pharmacological antagonism by Neuromuscular blocking agents.
10. To identify the unknown drug by performing pharmacological competitive antagonism on rectus abdominus muscle of frog.
11. To study the effects of heparin and oral anticoagulants on rabbits.
12. To identify the unknown anticoagulant drug using rabbits.
13. To identify unknown concentration of acetylcholine from graded dose-response curves.
14. To observe the effect of drug on swimming induced depression.
15. To observe the effects of drug on learning behavior of animal.

Books Recommended

1. Bertram G. Katzung, Susan Masters, Anthony Trevor. Basic and Clinical Pharmacology, 13th Edition, 2014. A Lange Medical Book. London.
2. Bikash M, Ajay P. Practical Manual of Experimental and Clinical Pharmacology. 1st edition, 2010, Jaypee Brothers Medical Publishers.
3. K.K.Pillai. Experimental Pharmacology. 2012, CBS Publisher.
4. Mark A. Suckow, Karla A. Stevens, Ronald P. Wilson. "The Laboratory Rabbit, Guinea Pig, Hamster, and Other Rodents". 1st edition, 2012, Academic Press.
5. Richard A. Harvey, Michelle A Clark, Richard Finkel, Jose A. Rey, Karen Whalen. Pharmacology (Lippincott's Illustrated Reviews). 6th edition, 2014, Lippincott Williams & Wilkins.

Fifth Professional

PHL-712

Toxicology

Cr. Hrs. 2

1. **Principles of Toxicology**
Principles of treatment of poisoning, classification of toxic agents, spectrum of undesired effects, mechanisms of toxicity.
2. **Disposition of Toxicants**
Absorption, distribution and elimination of toxicants, biotransformation of xenobiotics.
3. **Target Organs of Toxicity**
Toxic responses of the blood, toxic responses of the liver, toxic responses of the heart, toxic responses of the kidney, toxic responses of reproductive system.

4. Environmental Toxicology

Air pollution and ecotoxicology.

5. Applications of Toxicology

Food toxicology, forensic toxicology, clinical toxicology, occupational toxicology, risk assessment.

Books Recommended

1. Bertram G. Katzung, Susan Masters, Anthony Trevor. Basic and Clinical Pharmacology, 13th Edition, 2014. A Lange Medical Book. London.
2. Curtis D. Klaassen. Casarett & Doull's Toxicology: The basic science of poisons. 8th Edition, 2013, McGraw Hill Medical Publishing Division, London.
3. Ernest Hodgson, Patricia E. Levi. A text book of modern toxicology. 4th edition.2010.John wiley & Sons. Inc.
4. Fank C. Lu and Sam Kacew.Lu's basic toxicology: Fundamentals, target organs and risk assessment, 6th Edition 2012, CRC Press
5. Timbrell J.A. Introduction to Toxicology. 3rd edition, 2001, Taylor & Francis Ltd.

