DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY,
UTTAR PRADESH, LUCKNOW

EVALUATION SCHEME & SYLLABUS

BACHELOR OF PHARMACY
### SECOND SEMESTER

<table>
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<tr>
<th>Course Code</th>
<th>Name of the Course</th>
<th>No. of Hours/week</th>
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Semester II
BP201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

45 Hours

Course Content:

Unit-I
Nervous system
Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.
Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity).

Unit II
Digestive system: Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.
Energetics: Formation and role of ATP, Creatinine Phosphate and BMR.

Unit-III
Respiratory system
Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration.
Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

Unit-IV
Endocrine system: Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Unit-V
Reproductive system: Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition.
Introduction to genetics: Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.
BP207P. HUMAN ANATOMY AND PHYSIOLOGY-II (Practical)

4 Hours/week

1. To study the integumentary and special senses using specimen, models, etc.
2. To study the nervous system using specimen, models, etc.
3. To study the endocrine system using specimen, models, etc.
4. To demonstrate the general neurological examination.
5. To demonstrate the function of olfactory nerve.
6. To examine the different types of taste.
7. To demonstrate the visual acuity.
8. To demonstrate the reflex activity.
9. Recording of body temperature.
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index.
15. Demonstration of total blood count by cell analyzer.
16. Permanent slides of vital organs and gonads.

Recommended Books (Latest Editions)

- Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
- Human Physiology, Volume 1 and 2 by Dr. C.C. Chatterjee, Academic Publishers Kolkata.
BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY-I (Theory)

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained. To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences.

Unit-I
Classification, Nomenclature and Isomerism: Classification of Organic Compounds, Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds). Structural isomerism in organic compounds.

Unit II
Alkanes*, Alkenes* and Conjugated dienes*
sp$^3$ hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, sp$^2$ hybridization in alkenes.
E$_1$ and E$_2$ reactions – Kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeff’s orientation and evidences. E$_1$ verses E$_2$ reactions, Factors affecting E$_1$ and E$_2$ reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff’s orientation, free radical addition reactions of alkenes, Anti-Markownikoff’s orientation.
Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement.

Unit III
Alkyl halides*
SN$_1$ and SN$_2$ reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN$_1$ versus SN$_2$ reactions, Factors affecting SN$_1$ and SN$_2$ reactions.
Structure and uses of ethyl chloride, chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.
Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol.

45 Hours

07 Hours

10 Hours

10 Hours

Evaluation Scheme Bachelor of Pharmacy I, II, III & IV Year syllabus 2019-2020
Unit-IV 10 Hours

Carbonyl compounds* (Aldehydes and ketones)
Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanillin, Cinnamaldehyde.

Unit-V 08 Hours

Carboxylic acids*: Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester.
Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid.
Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid.
BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY-I (Practical)

4 Hours / week

A. Systematic qualitative analysis of unknown organic compounds like
   1. Preliminary test: Color, odor, aliphatic/aromatic compounds, saturation and
      unsaturation, etc.
   2. Detection of elements like Nitrogen, Sulphur and Halogen by
      Lassaigne’s test.
   4. Functional group test like Phenols, Amides/Urea, Carbohydrates, Amines,
      Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and
      Halogenated Hydrocarbons, Nitro compounds and Anilides.
   5. Melting point/Boiling point of organic compounds.
   6. Identification of the unknown compound from the literature using melting point/
      boiling point.
   7. Preparation of the derivatives and confirmation of the unknown compound by
      melting point/boiling point.
   8. Minimum 5 unknown organic compounds to be analyzed systematically.

B. Preparation of suitable solid derivatives from organic compounds.

C. Construction of molecular models.

Recommended Books (Latest Editions)

- Organic Chemistry by Morrison R.T., Boyd R.N. and Bhattacharjee, S.K., Dorling
  Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Organic Chemistry by Bruice P.Y. and Prasad, K.J.R., Dorling Kindersley (India) Pvt. Ltd,
  New Delhi.
- A Guidebook to Mechanism in Organic Chemistry by Peter Sykes, Longman Group Ltd.,
  Noida.
- Strategic Applications of Named Reactions in Organic Chemistry by Laszlo Kurti and
  Barbara Czako, Elsevier Academic Press.
- Reaction and Reaction Mechanism by Ahluwalia/Chatwal, Narosa Publishing House, New
  Delhi.
- Elementary Practical Organic Chemistry by Vogel A.I., Dorling Kindersley (India) Pvt.
  Ltd. (Pearson Education Ltd.), New Delhi.
- Practical Organic Chemistry by Mann F.G, and Saunders, B.C., Dorling Kindersley (India)
  Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
  Ltd., Noida.
- Introduction to Organic Laboratory Techniques by Pavia, Lampman and Kriz, Cengage
  Learning, Delhi.
BP203T. BIOCHEMISTRY (Theory) 45 Hours

Course Content:

Unit-I 08 Hours

**Biomolecules**: Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

**Bioenergetics**: Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP.

Unit-II 10 Hours

**Carbohydrate metabolism**: Glycolysis- Pathway, energetics and significance. Gluconeogenesis- Pathway and its significance. Citric acid cycle- Pathway, energetics and significance. HMP shunt and its significance- Glucose-6-Phosphate dehydrogenase (G6PD) deficiency. Glycogen metabolism Pathways and glycogen storage diseases (GSD). Hormonal regulation of blood glucose level and Diabetes mellitus.

**Biological oxidation**: Electron transport chain (ETC) and its mechanism. Oxidative phosphorylation & its mechanism and substrate level phosphorylation. Inhibitors ETC and oxidative phosphorylation/Uncouplers.

Unit-III 10 Hours

**Lipid metabolism**: β-Oxidation of saturated fatty acid (Palmitic acid). Formation and utilization of ketone bodies; ketoacidosis. De novo synthesis of fatty acids (Palmitic acid). Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D. Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

Unit-IV                                                                                                                  10 Hours

Nucleic acid metabolism and genetic information transfer
Biosynthesis of purine and pyrimidine nucleotides.
Catabolism of purine nucleotides and Hyperuricemia and Gout disease.
Organization of mammalian genome.
Structure of DNA and RNA and their functions DNA replication (semi conservative model)
Transcription or RNA synthesis.
Genetic code, Translation or Protein synthesis and inhibitors.

Enzymes
Introduction, properties, nomenclature and IUBMB classification of enzymes.
Enzyme kinetics (Michaelis-Menten plot, Line-Weaver Burke plot) Enzyme inhibitors with examples.
Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation.
Coenzymes: Structure and biochemical functions.
Therapeutic and diagnostic applications of enzymes and isoenzymes.
BP209P. BIOCHEMISTRY (Practical) 4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch).
2. Identification tests for Proteins (Albumin and Casein).
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method).
4. Qualitative analysis of urine for abnormal constituents.
5. Determination of blood creatinine.
6. Determination of blood sugar.
7. Determination of serum total cholesterol.
8. Preparation of buffer solution and measurement of pH.
9. Study of enzymatic hydrolysis of starch.
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Recommended Books (Latest Editions)

- Fundamentals of Biochemistry by Voet D., Voet J.G., Pratt C.W., John Wiley and Sons Inc.
• Practical Biochemistry by Harold Varley, CBS Publishers and Distributors, New Delhi.
• Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
• Practical Manual to Biochemistry by Singh S.P., CBS Publisher, New Delhi.
• Modern Experimental Biochemistry by Boyer R.F., Dorling Kindersley (India) Pvt. Ltd.
• Comprehensive Viva and Practical Biochemistry by Deb A.C., New Centre Book Agency (P.) Ltd. London.
BP204T. PATHOPHYSIOLOGY (THEORY)  

Course content:

Unit-I  
Basic principles of Cell injury and Adaptation:  

Basic mechanism involved in the process of inflammation and repair:  
Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC’s, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis.

Unit-II  
Cardiovascular System:  
Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)  
Respiratory system: Asthma, Chronic obstructive airways diseases.  
Renal system: Acute and chronic renal failure.

Unit-III  
Hematological Diseases:  
Iron deficiency, megaloblastic anemia (Vitamin B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia.  
Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones.  
Nervous system: Epilepsy, Parkinson’s disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer’s disease.  
Gastrointestinal system: Peptic Ulcer.

Unit-IV  
8 Hours  
Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease.  
Disease of bones and joints: Rheumatoid arthritis, osteoporosis and gout.  
Unit-V  7 Hours

**Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis, Urinary tract infections.

**Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhea.

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**Recommended Books (Latest Editions)**

- Robbins & Cotran Pathologic Basis of Disease by Vinay Kumar, Abul K. Abas, Jon C. Aster; South Asia edition; India; Elsevier.
- Best and Taylor’s Physiological Basis of Medical Practice by Best, Charles Herbert, Taylor, Norman Burke, John Bernard, 12th edition; United States; William and Wilkins, Baltimore.
- Basic Pathology by V. Kumar, R. S. Cotran and S. L. Robbins, 6th edition; Philadelphia; WB Saunders Company.

**Recommended Journals**

- The Journal of Pathology. ISSN: 1096-9896 (Online).
- The American Journal of Pathology. ISSN: 0002-9440.
- Pathology. 1465-3931 (Online).
- Indian Journal of Pathology and Microbiology. ISSN-0377-4929.
BP205T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hours (2 Hours/Week)

Course content:

Unit-I
Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary, binary addition, binary subtraction – One’s complement, Two’s complement method, binary multiplication, binary division.

Concept of Information Systems and Software: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.

Unit-II
Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products. Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database.

Unit-III

Unit-IV
Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery.

Unit-V
Computers as data analysis in Preclinical development:
Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).
BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools.
4. Creating mailing labels Using Label Wizard, generating label in MS WORD.
5. Create a database in MS Access to store the patient information with the required fields using access.
6. Design a form in MS Access to view, add, delete and modify the patient record in the database.
7. Generating report and printing the report from patient database.
10. Creating and working with queries in MS Access.
11. Exporting Tables, Queries, Forms and Reports to web pages.
12. Exporting Tables, Queries, Forms and Reports to XML pages.

Recommended books (Latest edition):

- Computer Application in Pharmaceutical Research and Development by Sean Ekins, Wiley-Interscience, A John Willey and Sons, INC., Publication, USA.
BP206T. ENVIRONMENTAL SCIENCES (Theory)  

30 hours

Course content:

Unit-I  
The multidisciplinary nature of environmental studies.  
Natural Resources.  
Renewable and non-renewable resources: Natural resources and associated problems  
a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e)  
Energy resources; f) Land resources: Role of an individual in conservation of natural  
resources.

Unit-II  
Ecosystems  
Concept of an ecosystem.  
Structure and function of an ecosystem.  
Introduction, types, characteristic features, structure and function of the ecosystems:  
Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds,  
streams, lakes, rivers, oceans, estuaries).

Unit-III  
Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books (Latest edition):

- Environmental Science by Singh, Y.K., New Age International Pvt. Publishers,  
  Bangalore.
- The Biodiversity of India by Bharucha Erach, Mapin Publishing Pvt. Ltd.,  
  Ahmedabad, India.
- Environmental Encyclopedia, by Cunningham, W.P. Cooper, T.H., Gorhani, E. &  
- Environmental Chemistry by De A.K., Wiley Eastern Ltd.
- Down of Earth, Centre for Science and Environment, Editor Sunita Narain.