

SPACES DEGREE COLLEGE
B.Sc. Biochemistry Semester wise Syllabus

SEMESTER-IV

Course: Physiology, Nutritional and Clinical Biochemistry

Code: BCH-1V

Unit-I: Digestion and Blood

12hours

Digestion and absorption of carbohydrates, lipids and proteins. Role of enzymes and gastrointestinal hormones in digestion. Composition of blood, Blood groups, coagulation of blood and disorders of blood coagulation (haemophilia). Hemoglobin and transport of gases in blood (oxygen and CO₂). Types of anemias, haemoglobinopathies-sickle cell anemia.

Unit-II: Nervous system and excretory system

12hours

Introduction to nervous system, general organization of nervous system, Neurons-structure, types, properties and functions; Neurotransmitters, Cerebrospinal fluid-composition and functions, Reflex-types and properties.

Introduction to excretory system. Organisation of kidney, Structure and functions of nephron, Urine formation, Role of kidneys in maintaining acid-base and electrolyte balance in the body.

Unit III: Endocrinology

12 hours

Endocrinology- organization of endocrine system. Classification of hormones. Outlines of chemistry, physiological role and disorders of hormones of thyroid, parathyroid, pituitary and hypothalamus.

Introduction of gastrointestinal hormones. Mechanism of hormonal action- signal transduction pathways for glucocorticoids and insulin. Adrenalin, estrogen and progesterone.

Unit- IV: Nutritional Biochemistry

12hours

Balanced diet. Calorific values of foods and their determination by bomb calorimeter. BMR and factors affecting it. Specific dynamic action of foods. Energy requirements and recommended dietary allowance (RDA) for children, adults, pregnant and lactating women. Sources of complete and incomplete proteins. Biological value of proteins. Malnutrition- Kwashiorkar, Marasmus and PEM.

Vitamins- sources, structure, biochemical roles, deficiency disorders of water and fat soluble vitamins. Introduction to nutraceutical and functional foods. Bulk and trace elements-Ca, Mg, Fe, I, Cu, Mo, Zn, Se and F.

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Unit- V: Clinical Biochemistry

12hours

Plasma proteins in health and disease. Liver diseases-jaundice. Liver function tests- conjugated and total bilirubin in serum, albumin: globulin ratio, Serum enzymes in liver diseases-SGOT, SGPT, GGT,CPK, Acid and alkaline phosphatases. Serum lipids and lipoproteins. Normal and abnormal constituents of urine. Renal function tests-Blood urea, creatinine, GFR, creatinine clearance. GTT and gastric and pancreatic function tests.

Practical – BCH-401: Nutritional and Clinical Biochemistry

45 HRS

List of Experiments:

1. Estimation of calcium by titrimetry
2. Estimation of iron by Wong's method.
3. Estimation of vitamin C by 2, 6 -dichlorophenol indophenol method.
4. Determination of iodine value of an oil.
5. Estimation of hemoglobin in blood.
6. Total count - RBC and WBC. Differential count.
7. Determination of blood group and Rh typing.
8. Visualization of antigen antibody reactions (Ouchterlony technique).
9. Urine analysis for albumin, sugars and ketone bodies.
10. Estimation of urinary creatinine.
11. Estimation of blood Glucose.
12. Estimation of serum total cholesterol.

Recommended books:

1. Essentials of Food and Nutrition, Vol. I & II, M.S. Swaminathan.
2. Text Book of Biochemistry with clinical correlations. Thomas M. Devlin (John Wiley).
3. Harper's Review of Biochemistry, Murray et al (Longman).
4. Biochemical aspects of human disease – R.S. Elkeles and A.S. Tavit. (Blackwell Scientific Publications).
5. Clinical chemistry in diagnosis and treatment–Joan F.Zilva and P.R.Pannall (Lloyd-Luke Medical Books, 1988).
6. Varley's Practical clinical Biochemistry – Ed. Alan W. Gowenlock (Heinemann Medical Books, London, 1988).
7. Clinical diagnosis and management by Lab methods (John Bernard Henry, W.B. Saunders Company, 1984).
8. Clinical Biochemistry – S.Ramakrishnan and Rajiswami.
9. Chemical Biochemistry (Metabolic and clinical aspects) by W.J.Marshall&S.K.Bangert.
10. Text book of clinical Biochemistry by Tietz et al.

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B.Sc. Biochemistry Semester wise Syllabus

Course: Microbiology, Immunology and Molecular biology

Code: BCH-V

Unit-I: Microbiology 12 hours

Introduction to microbiology and microbial diversity. Classification of microorganisms- prokaryotic and eukaryotic microorganisms. Bacterial structure, growth curve and kinetics of growth. Introduction to viruses- plant and animal viruses, structure, life cycle, Food and dairy microbiology.

Unit-II: Nitrogen Fixation

12 hours

Nitrogen cycle, Non-biological and biological nitrogen fixation, photosynthetic and non-photosynthetic systems, Nitrogenase system. Utilization of nitrate ion, Ammonia incorporation into organic compounds. Synthesis of glutamine and regulatory mechanism of glutamine synthase.

Unit-III: Applied Biochemistry 12 hours

Fermentation Technology: Batch, continuous culture techniques, principle types of fermentors. Pasteur effect. Industrial production of chemicals- alcohol, acids (citric acid), solvents (acetone), antibiotics (penicillin), Enzyme Technology: Immobilization of enzymes and cells, industrial applications, enzymes in Bioremediation.

Unit- IV: Immunology 12 hours

Organs and cells of immune system. Innate and acquired immunity, Cell mediated and humoral immunity (T-cells and B-cells). Classification of immunoglobulins, structure of IgG. Epitopes / antigenic determinants. Concept of haptens. Adjuvants. Monoclonal antibodies. Antigen-antibody reactions- agglutination, immunoprecipitation, immunodiffusion. Blood group antigens. Immunodiagnostics- ELISA. Vaccines and their classification. Traditional vaccines- live and attenuated. Modern vaccines- recombinant and peptide vaccines. Outlines of hypersensitivity reactions.

Unit- V: Molecular biology

12 hours

Types of RNA and DNA, DNA replication- leading and lagging strands, okazaki fragments, inhibitors of DNA replication. Genetic code, Protein synthesis- transcription, translation, inhibitors of protein synthesis. Outlines of cloning technology, vectors, restriction enzymes, PCR, applications of cloning in agriculture, industry and medical fields.

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Practical – BCP-501: Microbiology and immunology

List of Practical Experiments⁰

1. Biosafety and good laboratory practices (GLP) of Microbiology.
2. Sterilization of microbial media by autoclave.
3. Isolation of pure cultures: (i) Streak plate method. (ii) Serial dilution method.
4. Demonstration of alcohol fermentation.
5. Antibiotic sensitivity by paper disc method.
6. Effect of nitrogen sources on growth of E. coli
7. Immunodiffusion by Ouchterlony method.
8. Blood group analysis.
9. Isolation of DNA from plant tissues.
10. Spotters.

Recommended books:

1. Willey MJ, Sherwood, LM & Woolverton C J (2013) Prescott, Harley and Klein's Microbiology by. 9th Ed., McGrawHill.
2. Atlas RM. (1997). Principles of Microbiology. 2nd edition. W.M.T. Brown Publishers.
3. Pelczar MJ, Chan ECS and Krieg NR. (1993). Microbiology. 5th edition. McGraw Hill Book Company.
4. Fermentation Technology (2nd ed.) Standury (Pergman press)
5. Biotechnology: Textbook of Industrial microbiology 2nd Edit. By Crueger and Crueger (2000).
6. Principles of Biochemistry, White. A, Handler, P and Smith.
7. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.
8. Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.
9. Watson JD, Baker TA, Bell SP, Gann A, Levine M and Losick R (2008) Molecular Biology of the Gene, 6th edition, Cold Spring Harbour Lab. Press, Pearson Publication.
10. Molecular biology by David Freifelder