P.R GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

THE PROGRAMME LEARNING OUTCOMES RELATING TO B.SC DEGREE PROGRAMME IN BIOCHEMISTRY.

1. Academic Competence

1.1 Disciplinary knowledge and understanding of biochemistry, structure and function of biological molecules

1.2 explain biological mechanisms, such as the processes and control of bioenergetics and metabolism, as chemical reactions

1.3 explain the biochemical processes that underlie the relationship between genotype and phenotype

1.4 demonstrate an experiential learning and critical thinking of the structure and function of both prokaryotic and eukaryotic cells (including the molecular basis and role of sub-cellular compartmentalization)

1.5 demonstrate an understanding of the principles, and have practical experience of, a wide range of biochemical techniques (e.g. basic molecular biology, cell biology and microbiology methods, spectrophotometery, the use of standards for quantification, enzyme kinetics; macromolecular purification, chromatography electrophoresis, etc.).

1.6 analyze biochemical data (e.g. in enzyme kinetics, molecular structure analysis and biological databases.

2. Personal and Behavioral Competence

2.1 carry out laboratory-orientated numerical calculations (e.g. inter-conversion of masses, moles, and molarity, preparation of solutions and accurate dilutions), be capable in data visualization and analysis, including the application of data transformations (e.g. logarithmic, exponential)

2.2 basic professional skills pertaining to biochemical analysis, carrying out clinical diagnostic tests

2.3 ability to use skills in specific areas related to biochemistry such as industrial production, technology development, clinical, health, agriculture, community development, etc.

2.4 curiosity and ability to formulate biochemistry related problems and using appropriate concepts and methods to solve them.

2.5 ability to use various e-resources in order to solve challenges related to biochemistry.

2.6 articulation of ideas, scientific writing and authentic reporting, effective presentation skills.

2.7 having conversational competence including communication and effective interaction with others, listening, speaking, and observational skills.

3. Entrepreneurial and social competence

3.1 collaboration, cooperation and realizing the power of groups and community, ability to work in a group, community

3.2 the ability to plan and manage projects in order to achieve objectives

3.3 ability to grasp ideas and to turn ideas into action related to biochemical mechanisms and processes related to industries, industrial production, health, agriculture, etc.

3.4 creativity, innovation and risk-taking ability

3.5 social skills to build great teams

3.6 multilevel commitment to health and well being

Biochemistry (BCH S-1):

Introduction to Biochemistry Course-level learning outcomes that a student of this course is required to demonstrate are:

- Understanding of Biochemistry as a discipline and milestone discoveries in life sciences that led to establishment of Biochemistry as separate discipline.
- Fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms.
- Understanding of the concepts of mole, mole fraction, molarity, etc. and to apply them in preparations of solutions of desired strengths.
- Unique property of water as a universal solvent and its importance in biological system.
- Understanding of fundamentals of physical phenomena associated with Adsorption Viscosity, Distribution law, Osmotic pressure, etc. and their importance in living organisms.
- Understanding of concepts of acids, bases, indicators, pKa values, etc. Acquiring skill to determine pKa value of amino acids.
- Fundamental laws relating to photochemistry and applications of UV-visible Fluorescence and IR spectrophotometry in analytical determination and characterization of biomolecules.
- Appreciation of the roles of metals, non-metals, transition metals and coordination compounds in biological systems.
- Apply the principles of radiochemistry to analytical determination of Biomolecules

Biochemistry Practical (BCH S-1P): Introduction to Biochemistry

• Understanding Good laboratory practices in a chemistry/biochemistry laboratory.

- Learn safety and precautionary measures for working in a laboratory.
- Develop skill and proficiency in preparation of laboratory reagents.
- Use of handling of glass wares, minor equipment for conducting experiments.
- Develop skills to prepare standard chemical solutions and secondary standards.
- Demonstration of basic oxidation and reduction reactions
- Apply the principles of radiochemistry to analytical determination of biomolecules and life processes.

Biochemistry (BCH S-2): Bioorganic Chemistry and Metabolites

- Understand the significance of organic reactions with reference to biological systems.
- Apply the principles of electrochemistry to conductance, voltaic, and electrolyticsystems.
- Understanding chemical bonding, strong and weak interactions, hydrogen bondingand to apply these principles in various biomolecules and biological reactions.
- To develop understanding of aliphatic and aromatic compounds, IUPACnomenclature, reactivity of functional groups and the importance of stereoisomers in biological systems.
- Understanding the formation of polymers and their importance; difference betweenbiodegradable and non-biodegradable polymers and biohazards of polymers.
- Apply concept of stereochemistry in determining conformations of Biomolecules

Biochemistry Practical (BCH S-2P) :Bioorganic Chemistry and Metabolites

- Analyse common organic reagents and compounds based on their properties.
- Analyse organic compounds from unknown mixture/origin.
- Apply the properties of functional groups of organic compounds to carry outselective organic reactions.
- Verify reactivity of organic functional groups.
- Develop skills to prepare useful organic compounds in the laboratory.

Biochemistry Core Course -3(BCH C-3) :Cell Biology

- Understanding of the structure of cell and various cellular events.
- Understanding of the function of various subcellular organelles.

- Students will learn about cell theory and techniques for fractionation of sub-cellular organelles. They will be acquainted to various microscopic techniques to visualize subcellular organelles.
- Students will have an understanding of the composition of cytoskeleton and extracellular matrix.
- Students will acquire knowledge of cell cycle, cell division and cell death mechanisms.

Biochemistry Practical (BCH S-3P): Cell Biology

- Students will learn the handling of microscope
- . Obtain hands-on training in basic separation techniques in biochemistry
- Gain expertise in the isolation of various cell organelles and staining of cellular biomolecules.

Biochemistry (BCH S-4): Biochemical Techniques

- Develop competence in handing various chromatographic techniques and apply them in isolating and characterizing different biological molecules.
- Understanding the applications of centrifugation and chromatography in biological investigations.
- Purify proteins by affinity chromatography using epitope tags such as histidine tag, GST tag, Flag tag etc.
- Understanding the principles of Electrophoresis, Spectrophotometry and ELISA and their applications in biological investigations/experiments.

Biochemistry Practical (BCH S-4P): Biochemical Techniques

- The students will obtain hands-on training in basic separation techniques in biochemistry like electrophoresis, chromatography, etc.
- Gain expertise in the isolation of various biomolecules and organelles.

Biochemistry (BCH S-5): Biomolecules

- Exposure with the nature of various biomolecules present in living cells.
- Get exposed to key contributions of scientists such as Hans Kreb, G. N. Ramachandran, Melvin Calvin, Louis Pasteur, HarGobind Khorana, Watson and Crick andVenkyRamakrishnan, etc. in order to create scientific interest amongst students in life processes.
- To understand the properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA, glycoproteins and glycolipids and their importance in biological systems.
- To understand the process of fermentation and manufacture of Biodiesel

.• To develop skills to determine amino acid and nucleotide sequences of proteins and DNA respectively.

Biochemistry Practical (BCH S-5P): Biomolecules

• Exposure to basic reactions of biomolecules

.• Determine presence of biomolecules like carbohydrates, proteins, lipids, etc. in known and unknown samples.

• Determine the extent of adulteration in samples containing biomolecules.

Biochemistry (BCH S-6): Nutrition

- To learn glycemic index, balanced diet, micronutrient deficiencies and the remedies, nutraceuticals and their importance, junk foods and their hazards.
- To understand the need for specialized food for people with special needs diabetes, pregnancy, inherited genetic disorders.
- To know the use of alternate crops cereals and pulses and their importance.
- To know about cattle industry and its contribution to greenhouse gases.
- Understanding merits and demerits of vegetarian and non-vegetarian foods.

Biochemistry Practical (BCH S-6P): Nutrition

- Trainingin the determination of moisture in food.
- To test adulteration in food and determination of minerals, amino acids and sugars in foods.

To acquire training to determine saponification value and iodine value of oil and different types of fats.