

Subject No. 4
NUTRITION AND BIOCHEMISTRY
SECTION 'B'- BIOCHEMISTRY

Total Hours: 30

Theory Hours: 30

AIM:

- This course gives the students a broad understanding of biochemistry and to apply this knowledge in clinical nursing practice

OBJECTIVES:

At the end of course students are able to:

- The general chemical actions and reactions of the body as a whole
- The normal biochemistry of the human body and the changes occurring in illness and assist with simple biochemical tests, interpret the results and draw inferences.

COURSE CONTENT:

Unit I – Introduction:

- Definition and importance of Biochemistry in Nursing. Study of cell and its various components. Prokaryotes and Eukaryotes Cells organization. **Microscopy. Review of structure, composition and functions of cell**

Unit II – Structure and function of cell membrane:

- **Fluid mosaic Model tight junction, cytoskeleton.** Transport mechanism; diffusion, osmosis filtration, active channel, sodium pump. Acid base balance –Maintenance and diagnostic test, **PH buffers.**

Unit III - Composition and metabolism of carbohydrate:

- Types, structure, composition and uses. Monosaccharide. Disaccharides. Polysaccharides. Oligosaccharides Metabolism.
- **Pathways of glucose:**
- Glycolysis. Glyconeogenesis:-Cori's cycle. Tricarbolxylic acid (TCA) cycle Glycogenolysis. **Pentose phosphate pathways (Hexose mono phosphate).** Regulation of blood glucose level. Investigation and their interpretations.

Unit IV - Composition and metabolism of lipid:

- Types, structure, composition and uses: fatty acids. Nomenclature, Roles and prostaglandins. Metabolism of fatty acids, Breakdown and synthesis. Metabolism Tri acyclo glycerol. Cholesterol metabolism. Bio synthesis and its regulation. Bile salt and billirubin, **Vit. D**, Steroids and hormones. Lipoproteins and their functions –VLDL's, IDLS's, LDL's, HDL's. **Transport of lipids**, Atherosclerosis, investigations and their interpretations.

Unit V - Composition and metabolism amino acids and proteins:

- Types, structure, composition and uses of amino acids and proteins. Metabolism of amino acids and proteins. Biosynthesis of proteins in the cells and Role of nucleic acids in protein synthesis

.Targeting and glycosylation, chromatography, electrophoresis, sequencing. Metabolism of nitrogen, Fixation and assimilation, urea cycle, hemes and chlorophylls Enzymes and co-enzymes. Classifications properties, kinetics and inhibition, control. Investigation and their interpretation.

Unit VI - Composition of vitamin and minerals:

- Structure, classification, properties absorption, storage and transportation, normal concentration, **investigation and their interpretation.**

Unit VII – Immunochemistry:

- Immune response, structure and classification of immune globins. Mechanism of antibody production. Antigen, HLA typing, **-Free radical and anti oxidants. Specialized protein; collagen, elastin, keratin, myosin, lense protein. Electrophoretic and quantitative determination of immunoglobulin's, ELISA etc Investigation and their interpretation.**

SECTION 'B'-BIOCHEMISTRY

| Unit No. & total hours | Objectives | Contents with distributed hours | | | | | | | |
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| | | Must know | | Desirable to know | Nice to know | | | | |
| I (3 hours) | At the end of unit students are able to Knowledge: Understand and explain importance of biochemistry. Skill: Identify technique of microscopy | <ul style="list-style-type: none"> Definition and importance of Biochemistry in Nursing Review of structure, composition and functions of cell. Prokaryotes and Eukaryotes Cells organization. (2 hour) | | <ul style="list-style-type: none"> Microscopy. (1 hour) | | | | | |
| Course Outcome | | | Program Outcome | | | | | | |
| Unit-1 - Introduction to Biochemistry | | | Clinical / Nurse Educator | Professional | Communicator | Leader & member of the health care team & system | Lifelong learner | Critical Thinker | Researcher |
| | | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
| CO-1: Define Biochemistry and explain the importance of biochemistry in Nursing. | | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-2: Draw a labeled diagram of cell and describe its various components. | | | 3 | 3 | 2 | 2 | 3 | 2 | 1 |
| CO-3: Explain the structure and function of cell with well labeled diagram. | | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-4: Differentiate between prokaryotes and eukaryotes Cells. | | | 3 | 3 | 1 | 1 | 3 | 1 | 1 |
| II | At the end of unit students are able | <ul style="list-style-type: none"> Transport mechanism; diffusion, osmosis filtration, active | <ul style="list-style-type: none"> Fluid mosaic model | | <ul style="list-style-type: none"> PH buffers | | | | |

| (06 hours) | to Knowledge: Understand and describe structure and functions of cell and its components. | channel, sodium pump. • Acid base balance –Maintenance and diagnostic test. (3 Hours) | tight junction • Cytoskeleton (2 hours) | (1 Hour) | | | | |
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| Course Outcome | | Program Outcome | | | | | | |
| Structure and function of cell membrane | | Clinical / Nurse Educator | Professional | Communicator | Leader & member of the health care team & system | Lifelong learner | Critical Thinker | Researcher |
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
| CO-1: Describe fluid mosaic model of cell membrane with well labeled diagram. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-2: Explain tight junction with reference to definition, function and its structure. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-3: Explain cytoskeleton. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-4: Describe transport mechanism with respect to definition, classification, characteristics of each transport mechanism and uses of different transport mechanisms. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-5: Explain diffusion with regards to definition, factors that affect diffusion, functions, types and its applications. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-6: Describe osmosis with respect to definition, its application and how osmosis affects cells. | | 3 | 3 | 2 | 1 | 3 | 2 | 1 |
| CO-7: Explain solvents and solutes and types of Solutions. | | 3 | 3 | 2 | 1 | 3 | 2 | 1 |

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| CO-8: Explain osmotic pressure. | | 3 | 3 | 2 | 1 | 3 | 2 | 1 |
| CO-9: Differentiate between osmosis and diffusion. | | 3 | 3 | 2 | 1 | 3 | 2 | 1 |
| CO-10: Explain filtration with reference to definition, types and its function. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-11: Explain Sodium pump. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-12: Describe the acid base balance, mechanism to maintain it and related diagnostic test. | | 3 | 3 | 2 | 1 | 3 | 3 | 1 |
| CO-13: Explain the pH and buffer systems of human body. | | 3 | 3 | 2 | 1 | 3 | 3 | 1 |
| CO-14: Explain buffer and its types. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| III (06 hours) | At the end of unit students are able to Knowledge: Understand and describe composition of metabolism of carbohydrates. Attitude: Incorporate this knowledge in nursing practice. | <ul style="list-style-type: none"> Types, structure, composition and uses: Monosaccharide, Disaccharides, Polysaccharides. Oligosaccharides. Metabolism. Pathways of glucose: <ul style="list-style-type: none"> Glycolysis. Glycogenolysis. Regulation of blood glucose level. Investigation and their interpretations. (3 Hours) | <ul style="list-style-type: none"> Glyconeogenesis:- Cori's cycle. ricarbolxylic acid (TCA) cycle. (2 hours) | <ul style="list-style-type: none"> Pentose phosphate pathways (Hexose mono phosphate). (1 Hour) | | | | |
| Course Outcome | | Program Outcome | | | | | | |
| Composition and metabolism of carbohydrate | | Clinical / Nurse Educator | Professional | Communicator | Leader & member of the health care team & system | Lifelong learner | Critical Thinker | Researcher |
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |

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| CO-1: Explain carbohydrate with reference to definition, functions, composition, uses and its classification in detail. | | 3 | 3 | 3 | 1 | 3 | 1 | 1 | |
| CO-2: Describe the clinical importance of carbohydrate. | | 3 | 3 | 3 | 1 | 3 | 3 | 1 | |
| CO-3: Describe monosaccharide, disaccharides, polysaccharides and oligosaccharides in detail. | | 3 | 3 | 3 | 1 | 3 | 1 | 1 | |
| CO-4: Explain the digestion and absorption of carbohydrate. | | 3 | 3 | 3 | 1 | 3 | 3 | 1 | |
| CO-5: Explain the fate of carbohydrate after absorption. | | 3 | 3 | 3 | 1 | 3 | 3 | 1 | |
| CO-6: Describe glycolysis with reference to definition, steps involved in glycolysis and its energetic. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 | |
| CO-7: Explain glycolytic pathway (Embden-Meyerh of pathway) with schematic representation. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 | |
| CO-8: Describe Glyconeogenesis and its significance. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 | |
| CO-9: Describe Cori's cycle with schematic representation. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 | |
| CO-10: Explain Tricarboxylic acid (TCA) cycle and its energetic. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 | |
| CO-11: Describe glycogenolysis with schematic representation. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 | |
| CO-12: Describe Pentose phosphate pathways (Hexose mono phosphate) with schematic representation and its significance. | | 3 | 3 | 2 | 1 | 3 | 1 | 1 | |
| CO-13: Explain the regulation of blood glucose level, its related investigations and their interpretations. | | 3 | 3 | 3 | 3 | 3 | 3 | 1 | |
| IV (04 hours) | At the end of unit students are able to Knowledge: Understand and explain composition, metabolism and types of lipids. Attitude: Incorporate this knowledge in nursing practice. | Composition and metabolism lipids: • Types, structure, composition and uses: fatty acids. Nomenclature, Roles and prostaglandins. Metabolism of fatty acids. Breakdown and synthesis. Metabolism Triacylglycerol. Cholesterol metabolism. Bio synthesis and its regulation. Bile salt and bilirubin, Steroids and hormones. Lipoproteins and their functions –VLDL's, IDLS's, LDL's, HDL's.. | | | • Vit. D • Transport of lipids (1 Hour) | | | Atherosclerosis Investigations and their interpretations (1 hour) | |

| | | • (2 hours) | | | | | | |
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| Course Outcome | | Program Outcome | | | | | | |
| Composition and metabolism of lipid | | Clinical / Nurse Educator | Professional | Communicator | Leader & member of the health care team & system | Lifelong learner | Critical Thinker | Researcher |
| | | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
| CO-1: Explain lipids with reference to definition, classification, structure, composition, uses and its function. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-2: Determine the physical properties of fat. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-3: Describe the tests to check the purity of fats & oils. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO- 4: Determine the digestion and absorption of lipids and its abnormalities. | | 3 | 3 | 3 | 3 | 3 | 2 | 1 |
| CO-5: Describe the transport of lipids. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-6: Explain fatty acids with reference to definition, classification, structure, composition, uses and its function. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |

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| CO-7: Describe the essential fatty acids with regards to definition, functions and its deficiency. | | 3 | 3 | 2 | 2 | 3 | 3 | 1 |
| CO- 8: Determine the metabolism of fatty acid. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-9: Describe beta oxidation of fatty acid with schematic representation. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO- 10: Explain the biosynthesis of fatty acids. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-11: Explain roles and functions of prostaglandins. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-12: Describe triacylglycerols with regards to definition, properties and its metabolism. | | 3 | 3 | 3 | 3 | 3 | 2 | 1 |
| CO-13: Explain cholesterol with reference to definition, structure, occurrence, properties, functions, metabolism, bio synthesis, regulation and its degradation. | | 3 | 3 | 3 | 3 | 3 | 2 | 1 |
| CO- 14: Explain the synthesis of bile salt and bilirubin | | 3 | 3 | 3 | 3 | 3 | 2 | 1 |
| CO-15: Explain the synthesis of steroid hormones. | | 3 | 3 | 2 | 3 | 3 | 1 | 1 |
| CO-16: Describe vitamin D with reference to structure, sources, RDA, absorption, transportation, storage and synthesis of biological active form of vitamin-D, regulation of activation of vitamin-D, functions, deficiency and its toxicity. | | 3 | 3 | 3 | 3 | 3 | 2 | 1 |
| CO-17: Describe atherosclerosis and identify investigations and their interpretations done in atherosclerosis. | | 3 | 3 | 3 | 3 | 3 | 2 | 1 |
| CO- 18: Describe lipoproteins and their functions in detail. | | 3 | 3 | 3 | 3 | 3 | 2 | 1 |
| V (06 hours) | At the end of unit students are able to Knowledge: Understand and describe composition and metabolism of amino acids. Attitude: Incorporate this | Composition and metabolism of Amino acids and proteins: • Types, structure, composition and uses of amino acids and proteins. Metabolism of amino acids and proteins. Protein synthesis: Targeting and glycosylation. Metabolism of nitrogen: | | | Chromatography, Electrophoresis, Sequencing. (2 hours) | | • Investigation and their interpretation (1 hour) | |

| | knowledge while rendering care to the patients. | <ul style="list-style-type: none"> Fixation and assimilation. Urea cycle. Hems and chlorophylls. Enzymes and co-enzymes. Classifications, properties, kinetics and inhibition, control. (3 Hours) | | | | | |
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| Course Outcome | | Program Outcome | | | | | |
| Composition and metabolism amino acids and proteins | Clinical / Nurse Educator | Professional | Communicator | Leader & member of the health care team & system | Lifelong learner | Critical Thinker | Researcher |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
| CO-1: Explain protein with reference to definition, structure, classification and its functions. | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-2: Explain denaturation and its biological importance. | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO-3: Describe amino acid with regards to definition, structure, classification and its properties. | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-4: Classify amino acid with suitable examples. | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-5: Classify protein with suitable examples. | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO- 6: Determine the stages of protein digestion. | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-7: Explain the digestion of amino acids. | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-8: Describe biosynthesis of proteins in the cells and role of nucleic acids in protein synthesis. | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-9: Explain the metabolism of amino acids. | 3 | 3 | 2 | 2 | 3 | 1 | 1 |

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| CO-10: Explain the metabolism of proteins. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-11: Describe urea cycle with schematic representation. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO- 12: Describe chromatography. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO- 13: Explain electrophoresis. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO-14: Explain protein sequencing. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO-15: Describe nitrogen fixation. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO- 16: Explain hemes and chlorophylls. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO-17: Differentiate between enzymes and coenzymes. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO- 18: Describe enzymes with reference to definition and classification, chemical nature and factors affecting enzyme activity. | | 3 | 3 | 2 | 2 | 3 | 1 | 1 |
| CO-19: Explain the mechanism of enzyme action. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO-20: Explain enzyme specificity. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO-21: Describe enzyme inhibition. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO- 22: Explain the diagnostic importance of enzymes. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| CO-23: Describe coenzymes with regards to definition, classification and its functions. | | 3 | 3 | 1 | 2 | 3 | 1 | 1 |
| VI (02 hours) | At the end of unit students are able to Knowledge: Understand and explain the importance of vitamin and minerals. Attitude: Incorporate this knowledge in day today's work. | Vitamins and minerals: <ul style="list-style-type: none"> • Structure, Classification, Properties, Absorption, Storage and transportation, Normal concentration. • Investigation and their interpretation (2 hours) | | | | | | |

| Course outcome | Program Outcome | | | | | | |
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| | Clinical / Nurse Educator | Professional | Communicator | Leader & member of the health care team & system | Lifelong learner | Critical Thinker | Researcher |
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
| Composition of vitamin and minerals | | | | | | | |
| CO-1: Explain the Structure, classification, properties, absorption, storage and transportation, normal concentration, investigation and interpretation of water soluble vitamins. | 3 | 3 | 3 | 2 | 3 | 2 | 1 |
| CO-2: Describe the Structure, classification, properties, absorption, storage and transportation, normal concentration, investigation and interpretation of fat soluble vitamins. | 3 | 3 | 2 | 2 | 3 | 2 | 1 |
| CO- 3: Differentiate between fat soluble and water soluble vitamins. | 3 | 3 | 2 | 2 | 3 | 2 | 1 |
| CO-4: Classify vitamins with suitable examples. | 3 | 3 | 2 | 2 | 3 | 2 | 1 |
| CO-5: Explain water soluble vitamins. | 3 | 3 | 2 | 2 | 3 | 2 | 1 |
| CO-6: Describe fat soluble vitamins. | 3 | 3 | 2 | 2 | 3 | 3 | 1 |
| CO-7: Give the dietary sources, RDA, functions and deficiency symptoms of vitamin A. | 3 | 3 | 3 | 3 | 3 | 3 | 1 |
| CO-8: Give the dietary sources, RDA, functions and deficiency symptoms of vitamin D | 3 | 3 | 3 | 3 | 3 | 3 | 1 |
| CO-9: Give the dietary sources, RDA, functions and deficiency symptoms of vitamin E. | 3 | 3 | 3 | 3 | 3 | 3 | 1 |

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| CO-10: Give the dietary sources, RDA, functions and deficiency symptoms of vitamin K. | | 3 | 3 | 3 | 3 | 3 | 3 | 1 | | |
| CO-11: Give the dietary sources, RDA, functions and deficiency symptoms of vitamin C. | | 3 | 3 | 3 | 3 | 3 | 3 | 1 | | |
| CO-12: Give the dietary sources, RDA, functions and deficiency symptoms of vitamin B12. | | 3 | 3 | 3 | 3 | 3 | 3 | 1 | | |
| CO-13: Give the dietary sources, RDA, functions and deficiency symptoms of folic acids. | | 3 | 3 | 3 | 3 | 3 | 3 | 1 | | |
| CO-14: Explain the Structure, classification, properties, absorption, storage and transportation, normal concentration, investigation and interpretation of minerals. | | 3 | 3 | 3 | 2 | 3 | 3 | 1 | | |
| VII (03 hours) | At the end of unit students are able to Knowledge: Know the immune chemistry. | <ul style="list-style-type: none"> • Immune response • Structure and classification of immunoglobulin • Mechanism of antibody production • Antigen; HLA typing • Electrophoretic and quantitative determination of immunoglobulin ELISA etc, • Investigation and their interpretation • Specialized protein; collagen, Elastin, Keratin, Myosin, Lens Protein | | | <ul style="list-style-type: none"> • Free radical and anti oxidants (1hr) | | | | | |
| Course Outcome | | | | Program Outcome | | | | | | |
| Immunochemistry | | | | Clinical / Nurse Educator | Professional | Communicator | Leader & member of the health care team & system | Lifelong learner | Critical Thinker | Researcher |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
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| CO-1: Explain the immune response in human body. | 3 | 3 | 3 | 1 | 3 | 3 | 1 |
| CO-2: Describe immunoglobulin with reference to definition, functions, structure and its classification. | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-3: Explain the Mechanism of antibody production. | 3 | 3 | 2 | 1 | 3 | 3 | 1 |
| CO-4: Describe antigen with reference to definition and its types. | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-5: Explain antigens- HLA typing and indications for HLA typing. | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-6: Explain Free radical and anti oxidants. | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-7: Explain Specialized protein; collagen, elastin, keratin, myosin, lens protein. | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-8: Describe electrophoretic and quantitative determination of immunoglobulins. | 3 | 3 | 2 | 1 | 3 | 1 | 1 |
| CO-9: Illustrate ELISA test and its interpretation. | 3 | 3 | 3 | 1 | 3 | 3 | 1 |

TEACHING STRATEGY:

Lecture : 30 Hours

Total Hours: 30

TEACHING METHODS:

- Lectures, Demonstration and **Modified tutorial**

A.V. Aids:

- Blackboard. Model and specimens. Overhead Projector. Computer Assisted learning.

ASSIGNMENTS:**Theory:**

Theory:

| Sr. No | Assignments | No./Quantity | Marks Per Assignment | Total Marks |
|--------|-----------------|--------------|----------------------|-------------|
| 1 | Home assignment | Two | 20 | 40 |

- While calculating Internal Assessment –Marks obtained in the assignments of Nutrition and Biochemistry shall be amalgamated as one subject, ‘Nutrition and Biochemistry.

LIST OF RECOMMENDED TEXT BOOKS:

- E. Duncan Robert, Biochemical values in Clinical Medicine
- Chandlish J.K .Lecture notes on Biochemistry
- Klein S Israel , Human Biochemistry
- V Harold, Practical chemical Biochemistry.
- Pankaja Kale, Essentials of Biochemistry.
- Jacob Anthikod, Biochemistry for Nurses.