TOPIC : BASIC BIOCHEMISTRY

BI.1.1 Describe the molecular and functional organization of a cell and its sub-cellular components.

I. At the end of the session, Phase-I students must be able to enumerate the cell organelles correctly.
II. At the end of the session, Phase-I students must be able to define the location & function of sub-cellular components correctly.
III. At the end of the session, Phase-I students must be able to describe to process of cell fractionation for separation of cell organelles/ sub-cellular components correctly.
IV. At the end of the session, Phase-I students must be able to list the cellular markers of sub-cellular component correctly.
V. At the end of the session, Phase-I students should be able to draw well labeled diagram of cell indicating the structure and location of sub-cellular components accurately.

TOPIC: ENZYME

BI.2.1 Explain fundamental concepts of enzyme, isoenzyme, alloenzyme & cofactors. Enumerate the main classes of IUBMB nomenclature.

I. At the end of the session, Phase-I students should be able to define enzymes and give its characteristics correctly.
II. At the end of the session, Phase-I students must be able to give the basis and models of enzyme Activity accurately.
III. At the end of the session, Phase-I students must be able to list the units in which the enzyme activity is measured accurately.
IV. At the end of the session, Phase-I students must be able to define isoenzymes and give examples accurately.
V. At the end of the session, Phase-I students must be able to define alloenzymes accurately.
VI. At the end of the session, Phase-I students must be able to define the terms coenzymes and cofactors giving their examples accurately.
VII. At the end of the session, Phase-I students must be able to give the differences between enzymes and coenzymes accurately.
VIII. At the end of the session, Phase-I students must be able to give the main classification of enzymes by IUBMB accurately.
IX. At the end of the session, Phase-I students must be able to describe the trivial names of enzyme and describe the nomenclature of enzymes systematically accurately.

BI. 2.2. Observe the estimation of SGPT & SGOT.

I. At the end of the session, Phase-I students must be able to indicate the reaction catalyzed by SGPT and SGOT correctly.
II. At the end of the session, Phase-I students must be able to enlist the units in which SGPT and SGOT activity can be expressed correctly.
III. At the end of the session, Phase-I students must be able to describe the methods for the estimation of SGOT and SGPT correctly.

BI. 2.3. Describe and explain the basic principle of enzyme activity.

I. At the end of the session, Phase-I students must be able to list the mechanism of action of enzyme activity correctly.

II. At the end of the session, Phase-I students must be able to describe the lowering of activation energy by enzymes correctly.
III. At the end of the session, Phase-I students must be able to describe the types of catalysis by enzymes correctly.
IV. At the end of the session, Phase-I students must be able to explain factors affecting enzyme action correctly.
V. At the end of the session, Phase-I students must be able to describe the regulation of enzyme activity correctly.

BI 2.4. Describe and discuss enzyme inhibitors as poisons and drugs and as therapeutic enzymes.

I. At the end of the session, Phase-I students must be able to define and classify enzyme inhibition correctly.
II. At the end of the session, Phase-I students must be able to differentiate between various types of enzyme inhibition correctly.
III. At the end of the session, Phase-I students must be able to describe the action of enzyme inhibitors as poisons correctly.
IV. At the end of the session, Phase-I students must be able to enlist and describe the therapeutic applications of enzymes correctly.

BI 2.5. Describe and discuss the clinical utility of various serum markers of pathological conditions.

I. At the end of the session, Phase-I students must be able to differentiate between plasma functional and plasma non functional enzymes correctly.
II. At the end of the session, Phase-I students must Know the importance of plasma non functional enzymes as serum marker for various diseases correctly.
III. At the end of the session, Phase-I students must be able to enlist serum marker enzymes correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the normal serum reference interval of these enzymes correctly.
V. At the end of the session, Phase-I students must be able to clinical interpret the diagnosis of various pathological conditions clinically correctly.

BI 2.6. Discuss use of enzymes in laboratory investigations (Enzyme- based

I. At the end of the session, Phase-I students must be able to outline the principle of enzymatic assays correctly.
II. At the end of the session, Phase-I students must be able to differentiate between enzymatic and end point assays correctly.
III. At the end of the session, Phase-I students must be able to enumerate various enzymes used in laboratory investigations correctly.
IV. At the end of the session, Phase-I students must be able to describe the use of enzymes in the analysis of different analytes in laboratory giving suitable examples correctly.

BI 2.7. Interpret laboratory results of enzyme activities and describe the clinical activity of various enzymes as markers of pathological conditions.

I. At the end of the session, Phase-I students must be able to outline the diagnostic importance of enzymes correctly.
II. At the end of the session, Phase-I students must be able to enlist the enzymes of diagnostic importance correctly.

III. At the end of the session, Phase-I students must be able to enumerate the normal reference intervals for enzymes activity correctly.
IV. At the end of the session, Phase-I students must be able to interpret the laboratory results of enzyme activity clinically correctly.
V. At the end of the session, Phase-I students must be able to describe the results obtained for enzyme activity in serum to use them as markers for the diagnosis of disease conditions accurately correctly.

Topic:- Chemistry and metabolism of carbohydrate

BI. 3.1 Discuss and differentiate monosaccharides, di-saccharides and polysaccharides giving examples of main carbohydrates as energy fuel, structural element and storage in the human body

I. At the end of the session, Phase-I students must be able to define carbohydrate correctly.
II. At the end of the session, Phase-I students must be able to list all the types of carbohydrate with the relevant examples correctly.
III. At the end of the session, Phase-I students must be able to differentiate between monosaccharide, disaccharide and polysaccharides giving examples correctly.
IV. At the end of the session, Phase-I students must be able to describe the functions of carbohydrates as energy fuel, structural clement and storage in the human body correctly.
V. At the end of the session, Phase-I students must be able to describe the isomerism of monosaccharide with examples correctly.
VI. At the end of the session, Phase-I students must be able to classify polysaccharide with their composition, examples and functions correctly.

BI. 3.2 Describe the processes involved in digestion and assimilation of carbohydrates and storage.

I. At the end of the session, Phase-I students must be able to list the steps involved in digestion and absorption of carbohydrates correctly.
II. At the end of the session, Phase-I students must be able to list the various mechanisms of absorption of monosaccharides by the intestinal mucosa correctly.
III. At the end of the session, Phase-I students must be able to describe the mechanisms of glucose absorption correctly.
IV. At the end of the session, Phase-I students must be able to describe the storage of carbohydrates in human body correctly.

BI 3.3. Describe and discuss the digestion and assimilation of carbohydrates from food.

I. At the end of the session, Phase-I students must know the process of digestion and assimilation of carbohydrates correctly.
II. At the end of the session, Phase-I students must be able to describe the mechanisms of digestion assimilation and absorption of carbohydrates from the ingested food correctly.

BI 3.4 Define and differentiate the pathways of carbohydrate metabolism, (glycolysis, gluconeogenesis, glycogen metabolism, HMP shunt).

I. At the end of the session, Phase-I students must be able to outline the steps of all the pathways of carbohydrate metabolism (such as Glycolysis, Gluconeogenesis, Glycogen metabolism, HMP shunt) correctly.

II. At the end of the session, Phase-I students must know the energetic of all the metabolic pathways (Glycolysis, Gluconeogensis, Glycogen metabolism, HMP shunt) correctly.
III. At the end of the session, Phase-I students must be able to differentiate the pathways of carbohydrate metabolism (Glycolysis, Gluconegenesis, Glycogen metabolisms, HMP shunt) correctly.
IV. At the end of the session, Phase-I students must be able to describe the energetic of Glycolysis, Gluconeognesis Glycogen metabolism, HMP shunt) correctly.

BI 3.5 Describe and discuss the regulation, functions and integration of carbohydrate along with associated diseases/disorders.

I. At the end of the session, Phase-I students must know about the regulation of all the pathways of carbohydrate metabolism correctly.
II. At the end of the session, Phase-I students must be able to elaborate the regulatory mechanism of the pathways of carbohydrate metabolism correctly.
III. At the end of the session, Phase-I students must be able to describe the interrelationship of the various pathways of carbohydrate metabolism correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the inborn error and other diseases related to carbohydrate metabolism correctly.

BI. 3.6 Describe and discuss the concept of TCA cycle as a amphibolic pathway and its regulation.

I. At the end of the session, Phase-I students must know the concept of TCA cycle as an amphibolic pathway clearly correctly.
II. At the end of the session, Phase-I students must be able to list the precursor and amphibolic intermediates of TCA cycle correctly.
III. At the end of the session, Phase-I students must be able to enumerate all the steps of TCA cycle correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the energetic of TCA cycle correctly.
V. At the end of the session, Phase-I students must be able to describe the regulation of TCA cycle correctly.
VI. At the end of the session, Phase-I students must be able to justify the amphibolic nature of TCA cycle correctly.

BI. 3.7. Describe the common poisons that inhibit crucial enzymes of carbohydrate metabolism (eg; fluoride, arsenate)

I. At the end of the session, Phase-I students must be able to list all the inhibitors of glycolysis correctly.
II. At the end of the session, Phase-I students must be able to list all the inhibitors of TCA cycle correctly.
III. At the end of the session, Phase-I students must be able to describe the mechanism of inhibitors in inhibiting Glycolysis correctly.
IV. Describe the mechanism of inhibitor in inhibiting TCA cycle correctly.

BI 3.8 Discuss and interpret laboratory results of analytes associated with metabolism of carbohydrates.

I. At the end of the session, Phase-I students must be able to list all the analytes associated with metabolism of carbohydrate correctly.
II. At the end of the session, Phase-I students must be able to interpret the laboratory results of analysis associated with laboratory metabolism correctly.

BI. 3.9 Discuss the mechanism and significance of blood glucose regulation in health and disease.

I. At the end of the session, Phase-I students must be able to enumerate the hepatic regulations of blood glucose level correctly .
II. At the end of the session, Phase-I students must be able to enumerate the extra hepatic regulation of blood glucose level correctly.
III. At the end of the session, Phase-I students must be able to enlist the hormones involved in blood glucose regulation correctly.
IV. At the end of the session, Phase-I students must be able to describe the hepatic mechanism of blood glucose regulation correctly.
V. At the end of the session, Phase-I students must be able to describe the extra hepatic mechanism of blood glucose regulation correctly.
VI- At the end of the session, Phase-I students must be able to describe the hormonal regulation of blood glucose.
VII. At the end of the session, Phase-I students must be able to describe the diseases related to failure of blood glucose regulation mechanism correctly.

BI 3.10 Interpret the results of blood glucose levels and other laboratory investigations related to disorders of carbohydrate metabolism.

I. At the end of the session, Phase-I students must be able to enumerate the reference values of plasma glucose correctly.
II. At the end of the session, Phase-I students must be able to enlist all the laboratory investigations related to disorders of carbohydrate metabolism correctly.
III. At the end of the session, Phase-I students must be able to outline the diagnostic criteria of diabetes mellitus (WHO & ADA) correctly.
IV. At the end of the session, Phase-I students must be able to interpret the laboratory results of blood glucose levels test correctly.
V At the end of the session, Phase-I students must be able to interpret the results of glucose tolerance test correctly
VI. At the end of the session, Phase-I students must be able to interpret the laboratory results of HbA1c estimation correctly.
VII. At the end of the session, Phase-I students must be able to discuss all other laboratory investigations related to disorders of carbohydrate metabolism correctly.

TOPIC : Chemistry and Metabolism of lipids

BI. 4.1 Describe and discuss main classes of lipids (Essential/non-essential fatty acids, cholesterol and hormonal steroids, triglycerides, major phospholipids and sphingolipids) relevant to human system and their major functions.

O1. At the end of the phase I students must be able to define lipids correctly.
O2. At the end of the phase I students must be able to enumerate the major functions of lipids correctly.
O3. At the end of the phase I students must be able to classify lipid giving suitable examples in each class correctly.
O4. At the end of the phase I students must be able to classify fatty acids and give their characteristics correctly.
O5. At the end of the phase I students must be able to describe trigycerides and their properties correctly.
O6. At the end of the phase I students must be able to classify phospholipids correctly.

O7. At the end of the phase I students must be able to describe each class of phospholipids with enumerations of their functions correctly.

BI.4.2 Describe the processes involved in digestion and absorption of dietary lipids and also the key features of their metabolism

I- At the end of the phase I students must be able to enumerate the steps involved in digestion and absorption of lipids correctly.
II- At the end of the phase I students must be able to describe the process of digestion and absorption of lipids correctly.

BI 4.3 Explain the regulation of lipoprotein metabolism & associated disorders.

I- At the end of the phase I students must be able to list the various lipoproteins correctly.
II- At the end of the phase I students must be able to list the composition of each lipoprotein accurately.
III- At the end of the phase I students must be able to describe all types of lipoprotein metabolism with its regulation accurately.
IV- At the end of the phase I students must be able to outline the role of lipoprotein in various disorders correctly.
V- At the end of the phase I students must be able to describe the role of defective lipoprotein metabolism in the causation of associated disorder correctly.

BI.4.4 Describe the structure and functions of lipoproteins, their functions.

I- At the end of the phase I students must be able to outline the general structure of a lipoprotein particle correctly.
II- At the end of the phase I students must be able to list the function of lipoproteins correctly.
III- At the end of the phase I students must be able to outline the interrelationships between the metabolism of different lipoprotein correctly.
IV. At the end of the phase I students must be able to discuss the role of lipoproteins in pathwayensis of atherosclerosis correctly

BI.4.5 Interpret laboratory results of analytes associated with metabolism of lipids

I- At the end of the phase I students must be able to give the normal ranges of analytes included in lipoprotein profile correctly.
II- At the end of the phase I students must be able to interpret the laboratory results of analytes associated with metabolism of lipids correctly.

BI.4.6 Describe the therapeutic uses of prostaglandins and inhibitors of eicosanoid synthesis.

I- At the end of the phase I students must be able to define Eicosanoids correctly.
II- At the end of the phase I students must be able to classify Eicosanoids correctly.
III- At the end of the phase I students must be able to give the characteristics and functions of each class of Eicosanoids correctly.
IV. At the end of the phase I students must be able to describe the therapeutic uses of prostaglandins correctly.
V- At the end of the phase I students must be able to list the inhibitors of Eicosanoid synthesis correctly.
VI. At the end of the phase I students must be able to describe the mechanism of action of inhibitors of Eicosanoid synthesis correctly.

BI.4.7 Interpret laboratory results of analytes associated with metabolism of lipids.

I- At the end of the phase I students must be able to give the normal ranges of analytes included in lipoprotein profile correctly.
II- At the end of the phase I students must be able to interpret the laboratory results of analytes associated with metabolism of lipids correctly.

Topic:- Chemistry and metabolism of proteins.

BI. 5.1 Describe and discuss structural organization of proteins

I- At the end of the session, Phase-I students must be able to define amino acids correctly.
II- At the end of the session, Phase-I students must be able to classify amino acids giving examples correctly.
III- At the end of the session, Phase-I students must be able to enlist the different levels of structural organization of protein correctly.
IV- At the end of the session, Phase-I students must be able to describe the properties of amino acids correctly.
V At the end of the session, Phase-I students must be able to describe the structural organization of proteins with suitable diagrams correctly.

BI. 5.2 Describe and discuss functions of proteins and structure-function relationships in relevant areas eg, hemoglobin and selected hemoglobinopathies

I- At the end of the session, Phase-I students must be able to classify proteins on various basis correctly.
II- At the end of the session, Phase-I students must be able to give suitable examples of each class of proteins correctly.
III- At the end of the session, Phase-I students must be able to outline characteristics of globular proteins correctly.
IV- At the end of the session, Phase-I students must be able to enlist the common haemoglobinopathies correctly.
V- At the end of the session, Phase-I students must be able to describe the structure of haemoglobin correctly.
VI- At the end of the session, Phase-I students must be able to describe the functions of haemoglobin correctly.
VII- At the end of the session, Phase-I students must be able to describe the biochemical basis of haemoglobinopathies correctly.

BI. 5.3 Describe the digestion and absorption of dietary proteins.

I- At the end of the session, Phase-I students must be able to enlist the enzymes involved in the digestion of proteins correctly.
II- At the end of the session, Phase-I students must be able to know the process of enzyme activation in the course of protein digestion correctly.
III- At the end of the session, Phase-I students must be able to describe the process of digestion of dietary proteins through alimentary tract correctly.
IV- At the end of the session, Phase-I students must be able to describe the process of absorption of amino acids in intestinal mucosa correctly.

BI. 5.4 Describe common disorders associated with protein metabolism.

I- At the end of the session, Phase-I students must be able to list all the common disorders associated with protein metabolism correctly.

II- At the end of the session, Phase-I students must be able to describe the common disorders associated with protein metabolism correctly.
III- At the end of the session, Phase-I students must be able to describe the biochemical defects in the disorders of protein metabolism correctly.

BI. 5.5 Interpret laboratory results of analytes associated with metabolism of proteins.

I- At the end of the session, Phase-I students must be able to know the reference values of the analytes associated with metabolism of protein viz serum total protein, Albumin, Globulin serum urea, Haemoglobin etc correctly.
II- At the end of the session, Phase-I students must be able to Interpret the laboratory results of the analytes associated with metabolism of protein correctly.

TOPIC: METABOLISM AND HOMEOSTASIS

BI 6.1- Discuss the metabolic processes that take place in specific organs in the body in the fed and fasting states.

I. At the end of the session, Phase-I students must be able to define Absorptive states correctly.
II. At the end of the session, Phase-I students must be able to describe the enzymic changes in the Absorptive states correctly.
III. At the end of the session, Phase-I students must be able to enlist the various pathways taking place in the liver in Absorptive states correctly.
IV. At the end of the session, Phase-I students must be able to describe the various metabolic changes in liver during fasting and absorptive state correctly.
V. At the end of the session, Phase-I students must be able to describe the carbohydrate metabolism in the liver in absorptive state correctly.
VI. At the end of the session, Phase-I students must be able to describe the fat metabolism in the liver in absorptive state correctly.
VII. At the end of the session, Phase-I students must be able to describe the amino acids metabolism in the liver in absorptive state correctly.
VIII. At the end of the session, Phase-I students must be able to define the fasting state correctly.
IX. At the end of the session, Phase-I students must be able to describe the enzymatic changes in the fasting state correctly.
X. At the end of the session, Phase-I students must be able to enlist the various metabolic pathways taking place in the liver in fasting state correctly.
XI. At the end of the session, Phase-I students must be able to describe the carbohydrate metabolism in the liver in fasting state correctly.
XII. At the end of the session, Phase-I students must be able to describe the fat metabolism in the liver in fasting state correctly.
XIII. At the end of the session, Phase-I students must be able to describe the amino acids metabolism in the liver in fasting state correctly.
XIV. At the end of the session, Phase-I students must be able to enlist the various metabolic pathways taking place in the adipose tissue in absorptive state correctly.
XV. At the end of the session, Phase-I students must be able to describe the carbohydrate metabolism in the adipose tissue in absorptive state correctly.
XVI. At the end of the session, Phase-I students must be able to describe the fat metabolism in the adipose tissue in absorptive state correctly.

XVII. At the end of the session, Phase-I students must be able to enlist the various metabolic pathways taking place in the adipose tissue in fasting state correctly
XVIII. At the end of the session, Phase-I students must be able to describe the carbohydrate metabolism in the adipose tissue in fasting state correctly.
XIX. At the end of the session, Phase-I students must be able to describe the fat metabolism in the adipose tissue in fasting state correctly.
XX. At the end of the session, Phase-I students must be able to enlist the various metabolic changes taking place in resting skeletal muscle in the absorptive state correctly.
XXI. At the end of the session, Phase-I students must be able to describe the carbohydrate metabolism in the resting skeletal muscle in absorptive state correctly.
XXII. At the end of the session, Phase-I students must be able to describe the fat metabolism in the resting skeletal muscle in absorptive state correctly.
XXIII. At the end of the session, Phase-I students must be able to describe the amino acids metabolism in the resting skeletal muscle in absorptive state correctly.
XXIV. At the end of the session, Phase-I students must be able to enlist the various metabolic pathways taking place in the resting skeletal muscle in fasting state correctly.
XXV. At the end of the session, Phase-I students must be able to describe the carbohydrate metabolism in the resting skeletal muscle in fasting state correctly.
XXVI. At the end of the session, Phase-I students must be able to describe the fat metabolism in the resting skeletal muscle in fasting state correctly.
XXVII. At the end of the session, Phase-I students must be able to describe the amino acids metabolism in the resting skeletal muscle in fasting state correctly.
XXVIII. At the end of the session, Phase-I students must be able to enlist the various metabolic pathways taking place in the brain in fasting state correctly.
XXIX. At the end of the session, Phase-I students must be able to describe the carbohydrate metabolism in the brain in fasting state correctly.
XXX. At the end of the session, Phase-I students must be able to describe the fat metabolism in the brain in fasting state correctly.
XXXI. At the end of the session, Phase-I students must be able to describe the amino acids metabolism in the brain in fasting state correctly.

BI.6.2. Describe and discuss the metabolic processes in which nucleotides are involved.

I. At the end of the session, Phase-I students must be able to enumerate the steps of pyrimidine synthesis correctly.
II. At the end of the session, Phase-I students must be able to enumerate the steps of degradation of pyrimidines.
III. At the end of the session, Phase-I students must be able to enumerate the steps of De-non synthesis of purines correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the steps of salvage pathways of purine synthesis correctly.
V. At the end of the session, Phase-I students must be able to enumerate the steps of purine catabolism correctly.
VI. At the end of the session, Phase-I students must be able to describe the regulation of pyrimidine synthesis correctly.
VII. At the end of the session, Phase-I students must be able to describe the inhibitors of purine synthesis correctly.

VIII. At the end of the session, Phase-I students must be able to describe the regulation of purine nucleotide biosynthesis correctly.

BI.6.3. Describe the common disorders associated with nucleotide metabolism.

I. At the end of the session, Phase-I students must be able to enlist the common disorders associated with nucleotide metabolism correctly.
II. At the end of the session, Phase-I students must be able to classify gout correctly.
III. At the end of the session, Phase-I students must be able to describe the biochemical basis of the disorders associated with nucleotide metabolism correctly.
B1.6.4. Discuss the laboratory results of analytes associated with gout & Lesch Nyhan syndrome correctly.
I. At the end of the session, Phase-I students must be know the references values of serum uric acid and serum ADA activity correctly.
II. At the end of the session, Phase-I students must be able to interpret the laboratory results of serum uric acid and serum ADA activity correctly.

BI.6.5. Describe the biochemical role of vitamins in the body and explain the manifestations of their deficiency

I. At the end of the session, Phase-I students must be able to classify vitamins correctly.
II. At the end of the session, Phase-I students must be able to enlist the vitamins based on solubility correctly.
At the end of the session, Phase-I students must be able to enlist the sources of RDA for all the vitamins correctly.
III. At the end of the session, Phase-I students must be able to describe the biochemical role of vitamin A in vision correctly.
IV. At the end of the session, Phase-I students must be able to describe the role of vitamin D in calcium homeostasis correctly.
V. At the end of the session, Phase-I students must be able to describe the antioxidant role of vitamin E
At the end of the session, Phase-I students must be able to describe the biochemical role of vitamin K correctly.
VI. At the end of the session, Phase-I students must be able to describe the biochemical role of vitamins C correctly.
VII. At the end of the session, Phase-I students must be able to describe the coenzyme role of vitamin β-complex correctly.
VIII. At the end of the session, Phase-I students must be able to explain the clinical manifestations of the deficiency of all the vitamins correctly.

BI 6.6- Describe the biochemical processes involved in generation of energy in cells.

I. I. At the end of the session, Phase-I students must be able to enlist the various biochemical processes (glycolysis, TCA cycle, β-oxidation and metabolism of amino acids) involved in generation of energy in cells correctly.
II. At the end of the session, Phase-I students must be able to enumerate the steps of glycolysis correctly.
III. At the end of the session, Phase-I students must be able to describe the steps of glycolysis correctly.
IV. At the end of the session, Phase-I students must be able to describe the energy yielding steps in glycolysis correctly.
V. At the end of the session, Phase-I students must be able to calculate the net energy output in glycolysis correctly.
VI. At the end of the session, Phase-I students must be able to describe the regulation of glycolysis correctly.
VII. At the end of the session, Phase-I students must be able to enumerate the steps of TCA cycle correctly.

VIII. At the end of the session, Phase-I students must be able to describe the steps of TCA cycle correctly.
IX. At the end of the session, Phase-I students must be able to describe the energy yielding steps in TCA cycle correctly.
X. At the end of the session, Phase-I students must be able to calculate the net energy output in TCA cycle correctly.
XI. At the end of the session, Phase-I students must be able to describe the regulation TCA cycle correctly.
XII. At the end of the session, Phase-I students must be able to enumerate the steps of β-oxidation
XII. At the end of the session, Phase-I students must be able to describe the steps of β-oxidation correctly.
XIII.At the end of the session, Phase-I students must be able to describe the energy yielding steps in β-oxidation correctly.
XIV. At the end of the session, Phase-I students must be able to calculate the net energy output in β-oxidation correctly.
X V. At the end of the session, Phase-I students must be able to describe the regulation β-oxidation
XVII. At the end of the session, Phase-I students must be able to enumerate the steps of metabolism of amino acids (glucogenic and ketogenic) correctly.
XVIII. At the end of the session, Phase-I students must be able to describe the steps of metabolism of amino acids correctly.
XIX. At the end of the session, Phase-I students must be able to describe the regulation of amino acids metabolism correctly.
XX. At the end of the session, Phase-I students must be able to describe the process of energy generation using FADH2 and NADH + H+ via ETC correctly.

BI.6.7. Describe the processes involved in maintenance of normal pH, water & electrolyte balance of body fluids and the derangements associated with these.

I. At the end of the session, Phase-I students must be able to define pH & buffers correctly.
II. At the end of the session, Phase-I students must be able to enlist all the blood buffers correctly.
III. At the end of the session, Phase-I students must be able to describe the role of blood buffers in maintenance of blood pH correctly.
IV. At the end of the session, Phase-I students must be able to describe the renal mechanism for pH regulation correctly.
V. At the end of the session, Phase-I students must be able to describe the respiratory mechanism for pH regulation correctly.
VI. At the end of the session, Phase-I students must be able to enlist the disorders of Acid Base Balance correctly.
VII. At the end of the session, Phase-I students must be able to describe the clinical causes of Acid Base disorders correctly.
VIII. At the end of the session, Phase-I students must be able to define osmolarity and osmolaity correctly.
IX. At the end of the session, Phase-I students must be able to describe the regulation of electrolyte balance correctly.
X. At the end of the session, Phase-I students must be able to describe dehydration and over hydrates correctly.
XI. At the end of the session, Phase-I students must be able to describe the metabolism of electrolytes correctly.

BI 6.8- Discuss and interpret results of Arterial Blood Gas (ABG) analysis in various disorders.

I. At the end of the session, Phase-I students must be able to enlist the arterial blood gases analyzed in various disorders correctly.

II. At the end of the session, Phase-I students must be able to give the normal reference values of arterial blood gas with appropriate units correctly.
III. At the end of the session, Phase-I students must be able to discuss the significance of analyzing arterial blood gas in various disorder correctly.
IV. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.

BI.6.9. Describe the functions of various minerals in the body, their metabolism and homeostasis.

I. At the end of the session, Phase-I students must be able to classify minerals correctly.
II. At the end of the session, Phase-I students must be able to enumerate the sources & RDA of various minerals correctly.
III. At the end of the session, Phase-I students must be able to describe the biochemical functions of various minerals correctly.
IV. At the end of the session, Phase-I students must be able to describe the calcium homeostasis correctly.
V. At the end of the session, Phase-I students must be able to describe the iron metabolism correctly.

BI.6.10. Enumerate and describe the disorders associated with mineral metabolism.

I. At the end of the session, Phase-I students must be able to enumerate the disorders associated with mineral metabolism correctly.
II. At the end of the session, Phase-I students must be able to describe the abnormalities of calcium metabolism correctly.
III. At the end of the session, Phase-I students must be able to describe the abnormalities of iron metabolism correctly.
IV. At the end of the session, Phase-I students must be able to describe the abnormalities of copper metabolism correctly.
V. At the end of the session, Phase-I students must be able to describe the abnormalities all other mineral metabolism correctly.

BI.6.11. Describe the functions of haem in the body and describe the processes involved in its metabolism and describe porphyrin metabolism.

I. At the end of the session, Phase-I students must be able to enumerate the functions of haem correctly.
II. At the end of the session, Phase-I students must be able to describe the biosynthesis of haem correctly.
III. At the end of the session, Phase-I students must be able to describe the regulation of haem synthesis correctly.
IV. At the end of the session, Phase-I students must be able to describe the degradation of haem to bilirubin correctly.
V. At the end of the session, Phase-I students must be able to define porphyrias correctly.
VI. At the end of the session, Phase-I students must be able to classify porphria correctly.
VII. At the end of the session, Phase-I students must be able to describe the biochemical aspect of various porphyrias correctly.
VIII. At the end of the session, Phase-I students must be able to define jaundice correctly.
IX. At the end of the session, Phase-I students must be able to classify jaundice correctly.
X. At the end of the session, Phase-I students must be able to describe the biochemical basis of various types of jaundice correctly.

XI. At the end of the session, Phase-I students must be able to differential between types of jaundice correctly.

BI.6.12. Describe the major types of haemoglobin and its derivatives found in the body and their physiological/ pathological relevance.

I. At the end of the session, Phase-I students must be know the structure of haemoglobin correctly.
II. At the end of the session, Phase-I students must be able to enlist the various torms of haemoglobin correctly.
III. At the end of the session, Phase-I students must be able to describe the functions of haemoglobin correctly.
IV. At the end of the session, Phase-I students must be able to describe bone effect correctly.
V. At the end of the session, Phase-I students must be able to describe the various haemoglobin terivatives correctly.
VI. At the end of the session, Phase-I students must be able to enlist the various abnormal haemoglobins correctly .
VII. At the end of the session, Phase-I students must be able to describe the silke-cell haemoglobin correctly.
VIII. At the end of the session, Phase-I students must be able to describe thalassunias correctly.

BI.6.13. Describe the functions of the kidney, liver, thyroid and adrenal glands.

I. At the end of the session, Phase-I students must be able to enumerate the functions of kidney correctly.
II. At the end of the session, Phase-I students must be able to enumerate the functions of liver correctly.
III. At the end of the session, Phase-I students must be able to enumerate the functions of thyroid gland correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the functions of adrenal gland correctly.
V. At the end of the session, Phase-I students must be able to describe the functions of kidney correctly.
VI. At the end of the session, Phase-I students must be able to describe functions of liver correctly.
VII. At the end of the session, Phase-I students must be able to describe the functions of thyroid gland correctly.
VIII. At the end of the session, Phase-I students must be able to describe the functions of adrenal gland correctly.

BI.6.14. Describe the tests that are commonly done in clinical practice to assess the functions of these organs (kidney, liver, thyroid and adrenal glands).

I. At the end of the session, Phase-I students must be able to enlist the tests of kidney functions correctly .
II. At the end of the session, Phase-I students must be able to enlist the tests of liver functions correctly.
III. At the end of the session, Phase-I students must be able to enlist the tests of thyroid function correctly.
IV. At the end of the session, Phase-I students must be able to enlist the tests of adrenal functions correctly.
V. At the end of the session, Phase-I students must be able to describe all the tests of kidney function correctly.
Vi. At the end of the session, Phase-I students must be able to describe all the tests liver functions correctly.
VII. At the end of the session, Phase-I students must be able to describe all the tests of thyroid functions correctly.
VIII. At the end of the session, Phase-I students must be able to describe all the tests of adrenal function correctly.

BI.6.15. Describe the abnormalities of kidney, liver, thyroid and adrenal glands.

I. At the end of the session, Phase-I students must be able to enlist various abnormalities of kidney correctly.
II. At the end of the session, Phase-I students must be able to enlist various abnormalities of liver correctly.
III. At the end of the session, Phase-I students must be able to enlist various abnormalities thyroid gland correctly.

IV. At the end of the session, Phase-I students must be able to enlist various abnormalities of adrenal gland correctly.
V. At the end of the session, Phase-I students must be able to describe the abnormalities of kidney correctly
VI. At the end of the session, Phase-I students must be able to describe the abnormalities of liver correctly.
VII. At the end of the session, Phase-I students must be able to describe the abnormalities of thyroid gland correctly.
VIII. At the end of the session, Phase-I students must be able to describe the abnormalities of adrenal glands correctly.

TOPIC : Molecular Biology

BI.7.1.Describe the structure and functions of DNA and RNA and outline the cell cycle.

I. At the end of the session, Phase-I students must be able to enumerate the structural features of DNA correctly.
II. At the end of the session, Phase-I students must be able to list the types of RNA correctly
III. At the end of the session, Phase-I students must be able to outline the phase of the cell cycle correctly.
IV. At the end of the session, Phase-I students must be able to disturguish between DNA and RNA correctly.
V. At the end of the session, Phase-I students must be able to describe the features of various types of RNA correctly.
VI. At the end of the session, Phase-I students must be able to describe the phases of cell cycle correctly.
VII. At the end of the session, Phase-I students must be able to discuss the role of cycle and cycles dependent kinases (CDK's) in regulatory the events of cell cycle correctly.

BI. 7.2 Describe the processes involved in replication & repair of DNA and the transcription & translation mechanisms.

I. At the end of the session, Phase-I students must be able to enumerate the stops of replication correctly.
II. At the end of the session, Phase-I students must be able to list the types of DNA repair mechanisms correctly.
III. At the end of the session, Phase-I students must be able to outline the steps of transcription correctly.
IV. At the end of the session, Phase-I students must be able to list the psost transcriptional modifications correctly.
V. At the end of the session, Phase-I students must be able to outline the requirements and steps of translation correctly.
VI. At the end of the session, Phase-I students must be able to list the types of post translational modifications correctly.
VII. At the end of the session, Phase-I students must be able to describe the process of replication in prokaryotes and eukaryotes correctly.
VIII. At the end of the session, Phase-I students must be able to describe the DNA repair mechanisms correctly.
IX. At the end of the session, Phase-I students must be able to describe the steps of transcription correctly.
X. At the end of the session, Phase-I students must be able to describe the post transcription modifications correctly.
XI. At the end of the session, Phase-I students must be able to detailing of the steps of translation correctly.
XII. At the end of the session, Phase-I students must be able to describe the different types of post translational correctly.
XIII. At the end of the session, Phase-I students must be able to describe the inhibitors of replication, transcription and translations correctly.

BI. 7.3. Describe gene mutations and basic mechanism of regulation of gene

I. At the end of the session, Phase-I students must be able to list the types of gene mutations correctly.
II At the end of the session, Phase-I students must be able to enumerate the various modes of regulation of gene expression in prokaryotes correctly.
III. At the end of the session, Phase-I students must be able to enumerate the various modes of regulation of gene expression in eukaryotes correctly.
IV. At the end of the session, Phase-I students must be able to describe of gene metabolisms with examples correctly.
V. At the end of the session, Phase-I students must be able to describe the regulation of gene expression in prokaryotes correctly.
VI. At the end of the session, Phase-I students must be able to describe the regulation of gene expression in eukaryotes correctly.

BI.7.4 Describe applications of molecular technologies like recombinant DNA technology,PCR in the diagnosis and treatment of diseases with genetic basis.

I. At the end of the session, Phase-I students must be able to list the various application of molecular technologies correctly.
II. At the end of the session, Phase-I students must be able to describe the role of recombinant DNA technology correctly.
III. At the end of the session, Phase-I students must be able to describe the steps of PCR correctly.
IV. At the end of the session, Phase-I students must be able to describe the role of PCR in the diagnosis and treatment of diseases with genetic basis correctly.

BI.7.5. Describe the role of xenobiotics in disease.

I. At the end of the session, Phase-I students must be able to enumerate the phases of detoxification of xenobiotics correctly.
II. At the end of the session, Phase-I students must be able to list the reactions involved in different phases of detoxification of xenobiotics.
III. At the end of the session, Phase-I students must be able to describe in detail the reactions involved in different phases of detoxification of xenobiotics correctly.

BI.7.6 Describe the anti-oxidant defence systems in the body.

I. At the end of the session, Phase-I students must be able to list the various oxygen derived free radical species correctly.
II. At the end of the session, Phase-I students must be able to list the various antioxidant defense mechanism in the body correctly.
III. At the end of the session, Phase-I students must be able to describe the formation of various oxygen derived free radical species correctly.
IV. At the end of the session, Phase-I students must be able to give the details of various antioxidant defense mechanisms in the body correctly.

BI.7.7. Describe the role of oxidative stress in the pathogenesis of conditions such as cancer, complications of diabetes mellitus and atherosclerosis.

I. At the end of the session, Phase-I students must be able to define oxidative stress correctly.

II. At the end of the session, Phase-I students must be able to describe the role of oxidative stress in the pathogenesis of cancer correctly.
III. At the end of the session, Phase-I students must be able to give the details of oxidative stress as a causative factor in the pathogenesis of complications of diabetes mellitus correctly.
IV. At the end of the session, Phase-I students must be able to describe the role of oxidative stress in the pathogenesis of atherosclerosis correctly.

TOPIC: NUTRITION

BI 8.1- Discuss the importance of various dietary components and explain importance of dietary fibre.

I. At the end of the session, Phase-I students must be able to enlist the various dietary components in the diet correctly.
II. At the end of the session, Phase-I students must be able to describe the role of various nutritional components in the diet correctly.
III. At the end of the session, Phase-I students must be able to enlist the various dietary fibres commonly used in diet correctly.
IV. At the end of the session, Phase-I students must be able to classify dietary fibres correctly.
V. At the end of the session, Phase-I students must be able to describe the importance of dietary fibres in a diet correctly.
VI. At the end of the session, Phase-I students must be able to mention the RDA of Dietary fibres correctly.

BI 8.2- Describe the types and causes of protein energy malnutrition and its effects.

I. At the end of the session, Phase-I students must be able to enumerate the functions of dietary proteins correctly.
II. At the end of the session, Phase-I students must be able to enumerate the RDA of various common food proteins correctly.
III. At the end of the session, Phase-I students must be able to define malnutrition correctly.
IV. At the end of the session, Phase-I students must be able to classify protein-energy malnutrition correctly.
V. At the end of the session, Phase-I students must be able to describe the causes of marasmus correctly.
VI. At the end of the session, Phase-I students must be able to describe the causes of kwashiorkor correctly.
VII. At the end of the session, Phase-I students must be able to differential between marasmus and kwashiorkor correctly.

BI 8.3- Provide dietary advice for optimal health in childhood and adult, in disease conditions like diabetes mellitus, coronary artery disease and in pregnancy.

I. At the end of the session, Phase-I students must be able to know how to assess the nutritional deficiencies in childhood according to age groups correctly.
II. At the end of the session, Phase-I students must be able to advice the dietary management of different nutritional deficiencies in childhood correctly.
III. At the end of the session, Phase-I students must be able to advice the appropriate dietary management to the diabetic patients according to the severity of the disease correctly.
IV. At the end of the session, Phase-I students must be able to know how to assess the nutritional deficiencies in coronary artery disease correctly.

V. At the end of the session, Phase-I students must be able to advice the dietary management of different nutritional deficiencies in coronary artery disease patients correctly.
VI. At the end of the session, Phase-I students must be able to advice the appropriate dietary management to the coronary artery disease patients according to the severity of the disease correctly.
VII. At the end of the session, Phase-I students must be able to know how to assess the nutritional deficiencies in pregnancy correctly.
VIII. At the end of the session, Phase-I students must be able to advice the dietary management of different nutritional deficiencies in pregnancy correctly.
IX. At the end of the session, Phase-I students must be able to advice the appropriate dietary management to the pregnancy correctly.

BI 8.4- Describe the causes (including dietary habits), effects and health risks associated with being overweight/ obesity.

I. At the end of the session, Phase-I students must be able to classify obesity according to BMI correctly.
II. At the end of the session, Phase-I students must be able to know how to calculate BMI correctly.
III. At the end of the session, Phase-I students must be able to enumerate the causes of overweight / obesity including the dietary habits correctly.
IV. At the end of the session, Phase-I students must be able to describe the effects and health risk of overweight / obesity on different body systems correctly.
V. At the end of the session, Phase-I students must be able to describe various disuses or disorders related with overweight / obesity correctly.
VI. At the end of the session, Phase-I students must be able to describe the various dietary measures to be taken in overweight / obesity correctly.

BI 8.5- Summarize the nutritional importance of commonly used items of food including fruits and vegetables. (macro-molecules & its importance)

I. At the end of the session, Phase-I students must be able to enlist the commonly used food items correctly.
II. At the end of the session, Phase-I students must be able to classify commonly used food items correctly.
III. At the end of the session, Phase-I students must be able to classify nutriments correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the nutritional contents in different cereals correctly.
V. At the end of the session, Phase-I students must be able to enumerate the nutritional contents in different animal products correctly.
VI. At the end of the session, Phase-I students must be able to enumerate the nutritional contents in different vegetables and fruits correctly.
VII. At the end of the session, Phase-I students must be able to describe the nutritional importance of different cereals in diet correctly.
VIII. At the end of the session, Phase-I students must be able to describe the nutritional importance of different pulses in diet correctly.
IX. At the end of the session, Phase-I students must be able to describe the nutritional importance of different animal products in diet correctly.
X. At the end of the session, Phase-I students must be able to describe the nutritional importance of different fruits and vegetables in diet correctly.

TOPIC: Extracellular matrix.

BI.9.1. List the function and components of extracellular matrix (ECM)

I- At the end of the session, Phase-I students must be able to list the components of extracellular matrix correctly.
II- At the end of the session, Phase-I students must be able to lis the functions of extracellular matrix correctly.
III- At the end of the session, Phase-I students must be able to indicate the major feature of important proteins of the ECM correctly.
IV. At the end of the session, Phase-I students must be able to describe the structural and functional proteins of the major proteins of the ECM correctly.

BI. 9.2. Discuss the involvement of ECM components in health and disease

I At the end of the session, Phase-I students must be able to enumerate the diseases caused by the defects in various components of Extracellular matrix (ECM) correctly.
II- At the end of the session, Phase-I students must be able to describe and apprecrate the importance of the extracellular matrix (ECM) and it's components in health and diseases correctly.

BI.9.3.describe the protein targeting and sorting along with its associated disorders

I- At the end of the session, Phase-I students must be able to define protein targeting and sorting correctly.
II- At the end of the session, Phase-I students must be able to enumerate various specialized signals that are involved in sorting proteins to various organelles correctly.
III- At the end of the session, Phase-I students must be able to enumerate the diseases associated with mutations in genes eucoding proteins involved in transport and sorting of intracellular proteins correctly.
IV. At the end of the session, Phase-I students must be able to discuss the process of protein targeting and sorting correctly.
V. At the end of the session, Phase-I students must be able to understand and describe the specialized signals that are involved in sorting proteins to various organelles correctly.
VI. At the end of the session, Phase-I students must be able to describe in detail the disorders associated with protein targeting and sorting correctly.

Topic : Oncogenesis & Immunity

BI.10.1. Describe the cancer initiation, promotion oncogenes & oncogene activation. Also focus on p53 & apoptosis

I. At the end of the session, Phase-I students must be able to define cancer correctly .
II. At the end of the session, Phase-I students must be able to enumerate the cancer causing agents correctly.
III. At the end of the session, Phase-I students must be able to define Proto-oncogene and Oncogene correctly
IV. At the end of the session, Phase-I students must be able to describe the causation of cancer giving the details of initiation and promotion correctly.
V. At the end of the session, Phase-I students must be able to describe the activation of proto-oncogene to oncogene correctly.
VI. At the end of the session, Phase-I students must be able to define tumour suppressor genes giving examples correctly.
VII. At the end of the session, Phase-I students must be able to describe the role of P53 gene correctly.
VIII. At the end of the session, Phase-I students must be able to describe the process of apopoptosis correctly.

BI. 10.2. Describe various biochemical tumor markers and the biochemical basis of cancer therapy

I. At the end of the session, Phase-I students must be able to enumerate tumour markers correctly.
II. At the end of the session, Phase-I students must be able to indicate tumour markers in relation to the cancers for which they are diagnostic correctly.
III. At the end of the session, Phase-I students must be able to give a detailed description of various types of tumour markers correctly.
IV. At the end of the session, Phase-I students must be able to describe the biochemical basis of cancer therapy accurately.

BI 10.3. Describe the cellular and humoral components of the immune system & describe the types and structure of antibody

I. At the end of the session, Phase-I students must be able to classify the immune system into different components correctly.
II. At the end of the session, Phase-I students must be able to list the various types of antibodies accurately.
III. At the end of the session, Phase-I students must be able to describe the humoral immune system correctly.
IV. At the end of the session, Phase-I students must be able to describe the cell mediated immune system correctly.
V. At the end of the session, Phase-I students must be able to describe the types of antibody in terms of their structure and functions correctly.

BI.10.4. Describe & discuss innate and adaptive immune responses, self/non-self recognition and the central role of T-helper cells in immune responses

I. At the end of the session, Phase-I students must be able to define innate immune system accurately.
II. At the end of the session, Phase-I students must be able to define Adaptive immune system correctly.
III. At the end of the session, Phase-I students must be able to differentiate between innate and adaptive immune system correctly.
IV. At the end of the session, Phase-I students must be able to describe and discuss adaptive immune responses correctly.
V. At the end of the session, Phase-I students must be able to describe self/non self recognition correctly.
VI. At the end of the session, Phase-I students must be able to describe the central role of T cells in immune responses correctly.

BI.10.5. Describe antigens and concepts involved in vaccine development.

I. At the end of the session, Phase-I students must be able to define Antigens correctly.
II. At the end of the session, Phase-I students must be able to describe the features of antigens correctly.
III. At the end of the session, Phase-I students must be able to describe the concepts involved in vaccine development correctly.

TOPIC : Biochemical Laboratory tests.

BI 11.1-Describe commonly used laboratory apparatus and equipments, good safe laboratory practice and waste disposal.

I. At the end of the session, Phase-I students must be able to prepare a comprehensive list of apparatus used in biochemistry laboratory correctly.
II. At the end of the session, Phase-I students must be able to prepare a comprehensive list of equipments used in biochemistry laboratory correctly.
III. At the end of the session, Phase-I students must be able to describe the use application and working of laboratory apparatus and equipments correctly.
IV At the end of the session, Phase-I students must be able to enumerate the safety precautions to be taken in biochemistry laboratory correctly.
V. At the end of the session, Phase-I students must be able to give the details of the safety precautions to be followed in biochemistry laboratory correctly.
VI. At the end of the session, Phase-I students must be able to enumerate the methods of waste disposal in laboratory correctly .
VII. At the end of the session, Phase-I students must be able to list the color coding of bins for waste disposal in laboratory correctly.
VIII. At the end of the session, Phase-I students must be able to describe the entire process of waste disposal in biochemistry laboratory correctly.

BI 11.2-Describe the preparation of buffers and estimation of pH.

I. At the end of the session, Phase-I students must be able to list the important buffers used in biochemistry laboratory correctly.
II. At the end of the session, Phase-I students must be able to enumerate the constituents of buffers correctly.
III. At the end of the session, Phase-I students must be able to list the steps involved in the preparation of different buffers used in biochemistry laboratory correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the steps of measurement of pH in biochemistry laboratory correctly.
V. At the end of the session, Phase-I students must be able to learn to standardize the pH meter for pH measurement of various biological fluids correctly.
VI. At the end of the session, Phase-I students must be able to describe the principle of measurement of pH of different body fluids using pH meter correctly.
VII. At the end of the session, Phase-I students must be able to describe the measurement of pH by universal indicator correctly.

BI 11.3-Describe the chemical components of normal urine.

I. At the end of the session, Phase-I students must be able to list the organic chemical components of normal urine correctly.
II. At the end of the session, Phase-I students must be able to list the inorganic chemical components of normal urine correctly.
III. At the end of the session, Phase-I students must be able to describe the tests to detect the organic components of normal urine correctly.
IV. At the end of the session, Phase-I students must be able to describe the tests to detect the inorganic components of normal urine correctly.

V. At the end of the session, Phase-I students must be able to describe the normal ranges of organic and inorganic components present in normal urine correctly.

BI 11.4-Perform urine analysis to estimate and determine normal and abnormal constituents.

I. At the end of the session, Phase-I students must be able to list the physical characteristics of normal and abnormal urine correctly.
II. At the end of the session, Phase-I students must be able to describe the physical characteristics of normal and abnormal urine correctly.
III. At the end of the session, Phase-I students must be able to list the various types of abnormal constituents which may be present in urine sample correctly.
IV. At the end of the session, Phase-I students must be able to list the tests to detect the various abnormal constituents which may be present in urine sample correctly.
V. At the end of the session, Phase-I students must be able to describe the procedures of tests to detect the presence of various abnormal constituents which may be present in urine sample correctly.
VI. At the end of the session, Phase-I students must be able to Perform different tests to detect the abnormal constituents in different urine samples.
VII. At the end of the session, Phase-I students must be able to analyse and interpret the results obtained for tests for abnormal constituents of urine correctly.
VIII. At the end of the session, Phase-I students must be able to understand the clinical correlation of the results obtained correctly.

BI 11.5-Describe screening of urine for inborn errors & describe the use of paper chromatography.

I. At the end of the session, Phase-I students must be able to prepare a list of inborn errors of amino acid metabolism correctly.
II. At the end of the session, Phase-I students must be able to describe the biochemical basis and clinical features of various inborn errors of metabolism correctly.
III. At the end of the session, Phase-I students must be able to list the requirements of paper chromatography correctly.
IV. At the end of the session, Phase-I students must be able to list the steps required to perform paper chromatography correctly.
V. At the end of the session, Phase-I students must be able to see and understanding the demonstration of steps of paper chromatography using amino acid mixture correctly.
VI. At the end of the session, Phase-I students must be able to analyze and learn to interpret the meaning of the chromatogram using amino acid mixture correctly.

BI 11.6-Describe the principles of Colorimetry.

I. At the end of the session, Phase-I students must be able to define colorimetry correctly.
II. At the end of the session, Phase-I students must be able to give the principle of colorimetry correctly.
III. At the end of the session, Phase-I students must be able to define Beer Lambert's law correctly.

IV. At the end of the session, Phase-I students must be able to derive the equation of Beer Lambert's law correctly.
V. At the end of the session, Phase-I students must be able to discuss the Beer Lambert's law correctly.
VI. At the end of the session, Phase-I students must be able to describe the uses of colorimetry in a biochemistry laboratory correctly.
VII. At the end of the session, Phase-I students must be able to describe the posts of a colorimeter correctly.
VIII. At the end of the session, Phase-I students must be able to describe the function of each part of a colorimeter correctly.
IX. At the end of the session, Phase-I students must be able to give the difference between the parts of a colorimeter and a spectrophotometer correctly.

BI 11.7-Describe the estimation of serum creatinine and creatinine clearance.

I. At the end of the session, Phase-I students must be know what is creatinine correctly.
II. At the end of the session, Phase-I students must be able to know how creatinine is formed in the body correctly.
III. At the end of the session, Phase-I students must be able to give the normal reference interval of serum creatinine correctly.
IV. At the end of the session, Phase-I students must be able to list the conditions in which serum creatinine level is altered correctly.
V. At the end of the session, Phase-I students must be able to give an explanation for the serum creatinine alteration elevation in various clinical
VI. At the end of the session, Phase-I students must be able to enumerate different methods for the determination of serum creatinine in Biochemistry laboratory correctly.
VII. At the end of the session, Phase-I students must be able to outline the principle for the estimation of serum creatinine by different methods correctly.
VIII. At the end of the session, Phase-I students must be able to list the regent requirements for serum creatinine analysis by various methods correctly.
IX. At the end of the session, Phase-I students must be able to enumerate the steps of determination of serum creatinine level by various methods correctly.
X. At the end of the session, Phase-I students must be able to list the precautions to be followed in different assay methods for serum creatinine correctly.
XI. At the end of the session, Phase-I students must be able to learn to independently perform the analysis of serum creatinine by different assay methods in Biochemistry laboratory correctly.
XII. At the end of the session, Phase-I students must be able to define creatinine clearance correctly.
XIII. At the end of the session, Phase-I students must be able to give the formula for the calculation of creatinine clearance correctly.
XIV. At the end of the session, Phase-I students must be able to indicate which renal parameter is measured by the calculation of creatinine clearance correctly.
XV. At the end of the session, Phase-I students must be able to give the units of expression of creatinine clearance correctly.
XVI. At the end of the session, Phase-I students must be able to give the normal ranges of creatinine clearance in males, females and children correctly.
XVII. At the end of the session, Phase-I students must be able to compare and contrast the adventures and disadvantages by the calculation of creatinine clearance with other clearance, viz urea clearance, inulin clearance etc.

XVIII. At the end of the session, Phase-I students must be able to give the clinical interpretation of the result of calculation of creatinine clearance correctly.

BI 11.8-Demonstrate estimation of serum proteins, albumin and A/G ratio.

I. At the end of the session, Phase-I students must be able to enumerate the serum proteins correctly.
II. At the end of the session, Phase-I students must be able to list the human ranges of total protein and serum proteins correctly.
III. At the end of the session, Phase-I students must be able to list the function of serum proteins correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the methods employed for the estimation of total protein and serum albumin correctly.
V. At the end of the session, Phase-I students must be able to outline the principles involved in the estimation of total protein and album in serum correctly.
VI. At the end of the session, Phase-I students must be able to discuss the principles in detail involving the estimation of total protein and albumin correctly.
VII. At the end of the session, Phase-I students must be able to give the normal ranges of serum total protein and serum albumin correctly.
VIII. At the end of the session, Phase-I students must be able to give the units in which the level of serum protein and albumin expressed.
IX. At the end of the session, Phase-I students must be able to detailing of the steps involved in the estimation of total protein and albumin in the given serum sample.
X. At the end of the session, Phase-I students must be able to learn to independently perform the estimation of serum total protein and albumin correctly.
XI. At the end of the session, Phase-I students must be able to clinically interpret the results obtained for serum total protein & albumin level correctly.
XII. At the end of the session, Phase-I students must be able to define hypoproteinemia and hyperproteinemia correctly.
XIII. At the end of the session, Phase-I students must be able to list the causes of hypoproteinemia and hypoproteinemia correctly.
XIV. At the end of the session, Phase-I students must be able to in detail explain the pathogenesis of hypoproteinemia and hypoproteinemia in various clinical conditions correctly.
XV. At the end of the session, Phase-I students must be able to give the meaning of A/G ratio correctly.
XVI. At the end of the session, Phase-I students must be able to give normal reference interval for A/G ratio correctly.
XVII. At the end of the session, Phase-I students must be able to learn to calculate A/G ratio for the given serum sample correctly.
XVIII. At the end of the session, Phase-I students must be able to list various clinical conditions in which A/G ratio can be altered correctly.
XIX. At the end of the session, Phase-I students must be able to discuss the explanation for the alteration of A/G ratio in various clinical conditions correctly.

BI 11.9-Demonstrate the estimation of serum total cholesterol and HDL- cholesterol.

I. At the end of the session, Phase-I students must be able to define what is cholesterol correctly.
II. At the end of the session, Phase-I students must be able to give the various types of cholesterol correctly.

III. At the end of the session, Phase-I students must be able to give the normal ranges of total cholesterol, LDL cholesterol correctly.
IV. At the end of the session, Phase-I students must be able to discuss the chemistry functions and biological importance of cholesterol correctly.
V. At the end of the session, Phase-I students must be able to give the normal reference intervals for total cholesterol, HDL cholesterol and LDL cholesterol correctly.
VI. At the end of the session, Phase-I students must be able to enumerate various methods for quantitation of total cholesterol in serum and HDL cholesterol correctly.
VII. At the end of the session, Phase-I students must be able to describe the principle of various methods for the quantitation of total cholesterol and HDL cholesterol correctly.
VIII. At the end of the session, Phase-I students must be able to independently perform the analysis for the determination of total cholesterol and HDL cholesterol in the given serum sample correctly.
IX. At the end of the session, Phase-I students must be able to learn to express the results in correct units for serum total cholesterol and HDL cholesterol correctly.
X. At the end of the session, Phase-I students must be able to clinically interpret the results obtained for the serum total cholesterol and HDL cholesterol correctly.
XI. At the end of the session, Phase-I students must be able to discuss the uses of hyper & hypocholestrolemia correctly.
XII. At the end of the session, Phase-I students must be able to define altherosclerosis correctly.
XIII. At the end of the session, Phase-I students must be able to discuss the pathophysiology of atherosclerosis correctly.
XIV. At the end of the session, Phase-I students must be able to define various cardiac risk ratios correctly.
XV. At the end of the session, Phase-I students must be able to learn the calculation of various cardiac risk ratios correctly.
XVI. At the end of the session, Phase-I students must be able to clinically interpret the results obtained for various cardiac risk ratios correctly.

BI 11.10- Demonstrate the estimation of triglycerides.

I. At the end of the session, Phase-I students must be able to define triglycerides correctly.
II. At the end of the session, Phase-I students must be able to give the composition of triglycerides correctly.
III. At the end of the session, Phase-I students must be able to give the normal range of serum triglycerides in correct unit correctly.
IV. At the end of the session, Phase-I students must be able to name / list the various methods employed for the determination for the determination of serum triglyceride l evel correctly.
V. At the end of the session, Phase-I students must be able to outline the steps for various methods used for the quantization of serum triglyceride level correctly.
VI. At the end of the session, Phase-I students must be able to perform the determination of serum triglyceride level following sequential steps of various methods correctly.
VII. At the end of the session, Phase-I students must be able to clinically interpret the result obtained for serum triglyceride level obtained correctly.
VIII. At the end of the session, Phase-I students must be able to list the causes for hypertriglyceridemia and hypotriglyceridemia correctly.
IX. At the end of the session, Phase-I students must be able to discuss the pathogenesis of hypertriglyceridemia and hypotriglyceridemia along with the complication involved correctly.

BI 11.11- Demonstrate estimation of calcium and phosphorous

I. At the end of the session, Phase-I students must be able to know the biochemical significance of serum calcium correctly.
II. At the end of the session, Phase-I students must be able to enumerate the normal reference value of Serum calcium correctly.
III. At the end of the session, Phase-I students must be able to enlist the different methods used for the estimation of Serum calcium correctly.
IV. At the end of the session, Phase-I students must be able to enlist the chemicals & reagents required for different methods of serum calcium estimation correctly.
V. At the end of the session, Phase-I students must be able to describe the principles of different methods for estimation of serum calcium correctly.
VI. At the end of the session, Phase-I students must be able to describe the steps of different methods for estimating serum calcium correctly.
VII. At the end of the session, Phase-I students must be able to perform the procedures to estimate the Serum calcium independently.
VIII. At the end of the session, Phase-I students must be able to calculate the serum calcium concentration by various methods from the given serum sample correctly.
IX. At the end of the session, Phase-I students must be able to list the precautions to be followed while estimating the Serum calcium by various methods correctly.
X. At the end of the session, Phase-I students must be able to interpret the laboratory results of serum calcium clinically correctly.
XI. At the end of the session, Phase-I students must be able to know the biochemical significance of serum phosphorus correctly.
XII. At the end of the session, Phase-I students must be able to enumerate the normal reference value of Serum phosphorus correctly.
XIII. At the end of the session, Phase-I students must be able to enlist the different methods used for the estimation of Serum phosphorus correctly.
XIV. At the end of the session, Phase-I students must be able to enlist the chemicals & reagents required for different methods of serum phosphorus estimation correctly.
XV. At the end of the session, Phase-I students must be able to describe the principles of different methods for estimation of serum phosphorus correctly.
XVI. At the end of the session, Phase-I students must be able to describe the steps of different methods for estimating serum phosphorus correctly.
XVII. At the end of the session, Phase-I students must be able to perform the procedures to estimate the Serum phosphorus independently.
XVIII. At the end of the session, Phase-I students must be able to calculate the serum phosphorus concentration by various methods from the given serum sample correctly.
XIX. At the end of the session, Phase-I students must be able to list the precautions to be followed while estimating the Serum phosphorus by various methods correctly.
XX. At the end of the session, Phase-I students must be able to interpret the laboratory results of serum phosphorus clinically correctly.

BI 11.12- Demonstrate the estimation of serum bilirubin

I. At the end of the session, Phase-I students must be know that formation of bilirubin correctly.

II. At the end of the session, Phase-I students must be know about component type of bilirubin correctly.
III. At the end of the session, Phase-I students must be able to give the normal reference valves of serum total bilirubin, direct bilirubin and indirect bilirubin correctly.
IV. At the end of the session, Phase-I students must be able to describe the transport of unconjugated bilirubin correctly.
V. At the end of the session, Phase-I students must be able to describe the conjugation bilirubin correctly.
VI. At the end of the session, Phase-I students must be able to describe the fate of conjugated bilirubin correctly.
VII. At the end of the session, Phase-I students must be able to the different methods for bilirubin estimation correctly.
VIII. At the end of the session, Phase-I students must be know about the van Den Bergh reaction correctly.
IX. At the end of the session, Phase-I students must be able to describe the different types of Van Den Bergh reaction correctly.
X. At the end of the session, Phase-I students must be able to describe the principle of Van Den Bergh reaction correctly.
XI. At the end of the session, Phase-I students must be able to list the reagents requirements for serum bilirubin estimation correctly.
XII. At the end of the session, Phase-I students must be able to describe the procedure of bilirubin estimation correctly.
XIII. At the end of the session, Phase-I students must be able to perform the procedures for estimation of serum total bilirubin and direct bilirubin independently correctly.
XIV. At the end of the session, Phase-I students must be able to calculate the concentration of indirect bilirubin from the estimated total and direct bilirubin accurately.
XV. At the end of the session, Phase-I students must be able to list the precautions to be followed while estimating the different fractions of serum bilirubin concentration correctly.
XVI. At the end of the session, Phase-I students must be able to interpret the laboratory results of serum total bilirubin, direct bilirubin and indirect bilirubin correctly.
XVII. At the end of the session, Phase-I students must be able to list the types of jaundice correctly.
XVIII. At the end of the session, Phase-I students must be able to describe the biochemical changes in the various types of jaundice correctly.
XIX. At the end of the session, Phase-I students must be able to interpret the differential diagnosis of the types of jaundice based on the laboratory results correctly.

BI 11.13- Demonstrate the estimation of SGOT/ SGPT

I. At the end of the session, Phase-I students must be know the enzymatic activity of SGOT&SGPT correctly.
II. At the end of the session, Phase-I students must be able to enumerate the normal reference value of serum activity of SGOT&SGPT correctly.
III. At the end of the session, Phase-I students must be able to enlist the different methods used for the estimation of serum activity of SGOT&SGPT correctly.
IV. At the end of the session, Phase-I students must be able to enlist the chemicals & reagents required for different methods of SGOT&SGPT estimation correctly.
V. At the end of the session, Phase-I students must be able to describe the principles of different methods for estimation of serum SGOT&SGPT activity correctly.
VI. At the end of the session, Phase-I students must be able to describe the steps of different methods for estimating serum SGOT&SGPT activity correctly.

VII. At the end of the session, Phase-I students must be able to perform the procedures to estimate the serum activity of SGOT&SGPT independently correctly.
VIII. At the end of the session, Phase-I students must be able to calculate the serum activity of SGOT&SGPT by various methods from the given serum sample correctly.
IX. At the end of the session, Phase-I students must be able to list the precaution to be followed while estimating the serum activity of SGOT&SGPT by various methods correctly.
X. At the end of the session, Phase-I students must be able to interpret the laboratory results of estimation SGOT&SGPT activity clinically correctly.

BI 11.14- Demonstrate the estimation of alkaline phosphatase

I. At the end of the session, Phase-I students must know the enzymatic activity of Alkaline phosphatase correctly.
II. At the end of the session, Phase-I students must be able to enumerate the normal reference value of serum activity of Alkaline phosphatase correctly.
III. At the end of the session, Phase-I students must be able to enlist the different methods used for the estimation of serum activity of Alkaline phosphatase correctly.
IV. At the end of the session, Phase-I students must be able to enlist the chemicals & reagents required for different methods of Alkaline phosphatase estimation correctly.
V. At the end of the session, Phase-I students must be able to describe the principles of different methods for estimation of serum Alkaline phosphatase activity correctly.
VI. At the end of the session, Phase-I students must be able to describe the steps of different methods for estimating serum Alkaline phosphatase activity correctly.
VII. At the end of the session, Phase-I students must be able to perform the procedures to estimate the serum activity of Alkaline phosphatase independently correctly.
VIII. At the end of the session, Phase-I students must be able to calculate the serum activity of Alkaline phosphatase by various methods from the given serum sample correctly.
IX. At the end of the session, Phase-I students must be able to list the precaution to be followed while estimating the serum activity of Alkaline phosphatase by various methods correctly.
X. At the end of the session, Phase-I students must be able to interpret the laboratory results of estimation Alkaline phosphatase activity clinically accurately.

BI 11.15- Describe & discuss the composition of CSF

I. At the end of the session, Phase-I students must be able to know about the formation and circulation of CSF accurately.
II. At the end of the session, Phase-I students must be able to enumerate the method of CSF collection for analysis accurately.
III. At the end of the session, Phase-I students must be able to list the physical properties of normal CSF accurately.
IV. At the end of the session, Phase-I students must be able to list the chemical composition of normal CSF accurately.
V. At the end of the session, Phase-I students must be able to enumerate the normal reference values of the analytes present in normal CSF accurately.
VI. At the end of the session, Phase-I students must be able to describe the significance of estimation of glucose in CSF sample for differential diagnosis of meningitis accurately.
VII. At the end of the session, Phase-I students must be able to clinically interpret laboratory findings of glucose in the CSF sample accurately.

VIII. At the end of the session, Phase-I students must be able to describe the significance of estimating CSF proteins in the sample for differential diagnosis of CSF related diseases accurately.
IX. At the end of the session, Phase-I students must be able to clinically interpret the laboratory findings of CSF proteins accurately.
X. At the end of the session, Phase-I students must be able to describe the signification of estimating chlorides in CSF sample accurately.
XI. At the end of the session, Phase-I students must be able to clinically interpret the laboratory finding of other biochemical analytes in CSF sample accurately.

B I 11.16- Observe use of commonly used equipments/techniques in biochemistry laboratory including:

pH meter

I. At the end of the session, Phase-I students must be able to list the application of pH meter in Biochemistry Laboratory. List the parts and components of pH meter correctly.
II. At the end of the session, Phase-I students must be able to describe the function of each of the parts of pH meter correctly.
III. At the end of the session, Phase-I students must be able to describe the working principle of pH meter correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the steps for measuring pH of body fluids and buffer by pH meter correctly.
V. At the end of the session, Phase-I students must be able to describe the steps of pH measurement in detail.
VI. At the end of the session, Phase-I students must be able to enlist the the various precautions while measuring pH by pH meter correctly.
VII. At the end of the session, Phase-I students must be able to interpret the laboratory results obtained by pH accurately.

Paper chromatography of amino acid

I. At the end of the session, Phase-I students must be able to define paper chromatography correctly.
II. At the end of the session, Phase-I students must be able to classify paper chromatography in ascending and descending correctly.
III. At the end of the session, Phase-I students must be able to list the uses of paper chromatography of amino acid correctly.
IV. At the end of the session, Phase-I students must be able to give the details of paper chromatography for amino acid separation correctly.
V. At the end of the session, Phase-I students must be able to enlist the requirements for performing paper chromatography correctly.
VI. At the end of the session, Phase-I students must be able to enumerate the steps of paper chromatography for amino acids separation correctly.
VII. At the end of the session, Phase-I students must be able to describe the steps of paper chromatography for amino acids separation correctly.
VIII. At the end of the session, Phase-I students must be able to enlist & follow various precautions while performing paper chromatography correctly.
IX. At the end of the session, Phase-I students must be able to interpret the chromatogram obtained clinically correctly.

Protein electrophoresis

I. At the end of the session, Phase-I students must be able to define electrophoresis correctly.
II. At the end of the session, Phase-I students must be able to classify electrophoresis correctly.
III. At the end of the session, Phase-I students must be able to describe the working principles of electrophoresis correctly.
IV. At the end of the session, Phase-I students must be able to enlist the requirements of Agarose Gel electrophoresis (horizontal) of proteins correctly.
V. At the end of the session, Phase-I students must be able to prepare the reagents required for Agarose Gel electrophoresis correctly.
VI. At the end of the session, Phase-I students must be able to enumerate the steps of performing gel electrophoresis of proteins correctly.
VII. At the end of the session, Phase-I students must be able to describe the steps of performing gel electrophoresis correctly.
VIII. At the end of the session, Phase-I students must be able to enlist & follow the precautions while performing protein electrophoresis correctly.

PAGE

I. At the end of the session, Phase-I students must be able to describe the principle of polyacrylamide gel electrophoresis (PAGE) correctly.
II. At the end of the session, Phase-I students must be able to enlist the requirements of PAGE correctly.
III. At the end of the session, Phase-I students must be able to prepare the reagents required for PAGE correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the steps of performing PAGE correctly.
V. At the end of the session, Phase-I students must be able to describe the steps of PAGE correctly.
VI. At the end of the session, Phase-I students must be able to enlist the precautions while performing PAGE correctly.
VII. At the end of the session, Phase-I students must be able to interpret the electrophoretogram obtained correctly.

Electrolyte analysis by ISE

I. At the end of the session, Phase-I students must be able to outline the principle of ion selective electrode (ISE) correctly.
II. At the end of the session, Phase-I students must be able to describe the principle of ISE correctly.
III. At the end of the session, Phase-I students must be able to understand the working of ISE correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the steps for performing electrolyte analysis by ISE correctly.
V. At the end of the session, Phase-I students must be able to give the reference values of electrolytes of various biological fluids in proper units correctly.
VI. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.
VII. At the end of the session, Phase-I students must be able to outline the principle of blood gas analyzer correctly.
VIII. At the end of the session, Phase-I students must be able to describe the principle of blood gas analyzer correctly.
IX. At the end of the session, Phase-I students must be able to understand the working of blood gas analyzer correctly.

X. At the end of the session, Phase-I students must be able to enumerate the steps for performing blood gas analysis correctly.
XI. At the end of the session, Phase-I students must be able to give the reference values of blood gases in proper units correctly.
XII. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.

ELISA

I. At the end of the session, Phase-I students must be able to define enzyme linked immunosorbent assay (ELISA) correctly.
II. At the end of the session, Phase-I students must be able to classify ELISA correctly.
III. At the end of the session, Phase-I students must be able to outline the working principles of ELISA correctly.
IV. At the end of the session, Phase-I students must be able to list the requirements of ELISA correctly.
V. At the end of the session, Phase-I students must be able to list the steps of ELISA correctly.
VI. At the end of the session, Phase-I students must be able to describe the steps of ELISA correctly.
VII. At the end of the session, Phase-I students must be able to enlist and follow the precautions while performing ELISA correctly correctly.
VIII. At the end of the session, Phase-I students must be able to know the steps to prepare standard curves for ELISA correctly.
IX. At the end of the session, Phase-I students must be able to Iearn to interpret the laboratory results obtained correctly.

Immunodiffusion

I. At the end of the session, Phase-I students must be able to define immuno diffusion correctly.
II. At the end of the session, Phase-I students must be able to enumerate the applications of immuno diffusion correctly.
III. At the end of the session, Phase-I students must be able to enumerate the steps of immuno diffusion correctly.
IV. At the end of the session, Phase-I students must be able to describe the steps of immuno diffusion correctly.
V. At the end of the session, Phase-I students must be able to enlist the precautions while performing immuno diffusion correctly.

Auto analyzer

I. At the end of the session, Phase-I students must be able to define auto analyzer correctly.
II. At the end of the session, Phase-I students must be able to classify auto analyzer correctly.
III. At the end of the session, Phase-I students must be able to understand the applications of auto analyzers correctly.
IV. At the end of the session, Phase-I students must be able to describe the principle of different types of auto analyzers correctly.
V. At the end of the session, Phase-I students must be able to understand the working of auto analyzers

Quality Control

I. At the end of the session, Phase-I students must be able to define quality control (QC) correctly.

II. At the end of the session, Phase-I students must be able to list the types of QC correctly.
III. At the end of the session, Phase-I students must be able to know the details of internal quality control correctly.
IV. At the end of the session, Phase-I students must be able to know the details of external quality control correctly.
V. At the end of the session, Phase-I students must be able to understand the significance of quality control in the biochemistry laboratory correctly.

DNA Isolation from blood/tissue

I. At the end of the session, Phase-I students must be able to know the importance of DNA isolation correctly.
II. At the end of the session, Phase-I students must be able to enlist the requirements of DNA isolation correctly.
III. At the end of the session, Phase-I students must be able to enumerate the steps of DNA isolation from blood/tissue correctly.
IV. At the end of the session, Phase-I students must be able to describe the steps of DNA isolation correctly.
V. At the end of the session, Phase-I students must be able to enlist the precautions while DNA isolation correctly.

BI 11.17-Explain the basis and rationale of biochemical tests done in the following conditions:

Diabetes mellitus

I. At the end of the session, Phase-I students must be able to know the panel of tests for diagnosis of diabetes mellitus (FPG, PPPG, RBS, HbA1C, GTT, mini GTT, GCT) correctly.
II. At the end of the session, Phase-I students must be able to enumerate the normal reference for each analytes correctly.
III. At the end of the session, Phase-I students must be able to list the method of analysis for each of the analytes in diagnosis of DM correctly.
IV. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.

Dyslipidemia

I. At the end of the session, Phase-I students must be able to know the panel of tests for diagnosis of dyslipidemia (total cholesterol, triglycerides, VLDL, LDL, HDL, LDL) correctly.
II. At the end of the session, Phase-I students must be able to enumerate the normal reference values for each analytes correctly.
III. At the end of the session, Phase-I students must be able to list the method of analysis for each of the analytes in diagnosis of dyslipidemia correctly.
IV. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.

Mycardial Infarction (MI)

I. At the end of the session, Phase-I students must be able to know the panel of tests for diagnosis of myocardial infarction (CK-MB, Troponin-I, Serum electrolytes) correctly.

II. At the end of the session, Phase-I students must be able to enumerate the normal reference values for each analytes correctly.
III. At the end of the session, Phase-I students must be able to list the method of analysis for each of the analytes in diagnosis MI correctly.
IV. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.

Renal failure

I. At the end of the session, Phase-I students must be able to know the panel of tests for diagnosis of Renal failure (Serum creatinine, Urea, ALP, electrolytes, calcium, phosphorus) correctly.
II. At the end of the session, Phase-I students must be able to enumerate the normal reference values for each analytes correctly.
III. At the end of the session, Phase-I students must be able to list the method of analysis for each of the analytes in diagnosis of Renal failure correctly.
IV. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.

Gout

I. At the end of the session, Phase-I students must be able to know about the diagnosis of Gout i.e. Serum uric acid estimation correctly.
II. At the end of the session, Phase-I students must be able to enumerate the causes of Gout correctly.
III. At the end of the session, Phase-I students must be able to enumerate the normal reference value of serum uric acid correctly.
IV. At the end of the session, Phase-I students must be able to describe the pathophysiology of Gout correctly.
V. At the end of the session, Phase-I students must be able to list the different methods of serum uric acid estimation correctly.
VI. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.

Protienuria

I. At the end of the session, Phase-I students must be able to define protienuria correctly.
II. At the end of the session, Phase-I students must be able to describe the causes of protienuria correctly.
III. At the end of the session, Phase-I students must be able to know the types of protienuria (micro-proteinuria and overt proteinuria) correctly.
IV. At the end of the session, Phase-I students must be able to enlist the different tests for detecting proteins in urine correctly.
V. At the end of the session, Phase-I students must be able to describe the steps of analyzing protein in urine correctly.
VI. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results obtained correctly.

Nephrotic Syndrome

I. At the end of the session, Phase-I students must be able to define nephrotic syndrome correctly.

II. At the end of the session, Phase-I students must be able to describe pathophysiology of nephrotic syndrome correctly.
III. At the end of the session, Phase-I students must be able to enlist the biochemical findings in a patient of nephrotic syndrome correctly.
IV. At the end of the session, Phase-I students must be able to explain the biochemical findings of nephrotic syndrome correctly.
V. At the end of the session, Phase-I students must be able to enlist the tests to be performed for the diagnosis of nephrotic syndrome in clinical biochemical laboratory correctly.
VI. At the end of the session, Phase-I students must be able to clinically interpret the laboratory finding of nephrotic syndrome correctly.

Edema

I. At the end of the session, Phase-I students must be able to define Edema correctly.
II. At the end of the session, Phase-I students must be able to list the causes of Edema correctly.
III. At the end of the session, Phase-I students must be able to list the biochemical tests for diagnosing Edema (total protein, Albumin, osmolality) in given sample correctly.
IV. At the end of the session, Phase-I students must be able to clinically interpret the laboratory findings of Edema correctly.

Jaundice

I. At the end of the session, Phase-I students must be able to define jaundice correctly.
II. At the end of the session, Phase-I students must be able to classify jaundice correctly.
III. At the end of the session, Phase-I students must be able to describe the biochemical basis of jaundice correctly.
IV. At the end of the session, Phase-I students must be able to define bilirubin correctly.
V. At the end of the session, Phase-I students must be able to classify bilirubin correctly.
VI. At the end of the session, Phase-I students must be able to describe the biochemical basis of different types of bilirubin correctly.
VII. At the end of the session, Phase-I students must be know about the van Den Bergh reaction correctly.
VIII. At the end of the session, Phase-I students must be able to describe the different types of Van Den Bergh reaction correctly.
IX. At the end of the session, Phase-I students must be able to interpret the laboratory results of serum total bilirubin, direct bilirubin and indirect bilirubin correctly
X. At the end of the session, Phase-I students must be able to interpret the differential diagnosis of the types of jaundice based on the laboratory results correctly.

LIVER DISEASES

I. At the end of the session, Phase-I students must be able to enumerate the functions of liver correctly.
II. At the end of the session, Phase-I students must be able to enlist the abnormalities of liver functions correctly.
III. At the end of the session, Phase-I students must be able to enlist the various liver diseases correctly.
IV. At the end of the session, Phase-I students must be able to describe the biochemical basis of various liver diseases correctly.
V. At the end of the session, Phase-I students must be able to enumerate the lists of liver function tests
VI. At the end of the session, Phase-I students must be able to describe the tests of liver function test correctly.

VII. At the end of the session, Phase-I students must be able to diagnose the liver diseases on the basis of LFT correctly.

Pancreatitis

I. At the end of the session, Phase-I students must be able to define pancreatitis correctly.
II. At the end of the session, Phase-I students must be able to enlist the causes of pancreatitis correctly.
III. At the end of the session, Phase-I students must be able to enlist the tests for diagnosis of pancreatitis (serum amylase & serum lipase activity) correctly.
IV. At the end of the session, Phase-I students must be able to enumerate the reference values of serum amylase and serum lipase activity correctly.
V. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results of serum amylase and serum lipase activity in the diagnosis of pancreatitis correctly.

Disorders of Acid-Base

I. At the end of the session, Phase-I students must be able to enlist the acid-base balance disorder correctly.
II. At the end of the session, Phase-I students must be able to enlist the causes of acid-base balance disorder correctly.
III. At the end of the session, Phase-I students must be able to describe the causes of acid-base balance disorder correctly.
IV. At the end of the session, Phase-I students must be able to describe the biochemical changes in acid-base balance disorders (pH, Po2, Pco2) correctly.
V. At the end of the session, Phase-I students must be able to describe the compensatory mechanisms in various acid-base balance disorder correctly.
VI. At the end of the session, Phase-I students must be able to describe anion- gap and its biochemical singificance in the diagnosis of acid-base balance disorders correctly.

Thyroid disorders

I. At the end of the session, Phase-I students must be able to enumerate the function of thyroid gland correctly.
II. At the end of the session, Phase-I students must be able to enlist the various thyroid disorders correctly.
III. At the end of the session, Phase-I students must be able to describe the biochemical basis of various thyroid related disorders correctly.
IV. At the end of the session, Phase-I students must be able to enlist the thyroid function tests correctly.
V. At the end of the session, Phase-I students must be able to discuss the thyroid function tests correctly.
VI. At the end of the session, Phase-I students must be able to clinically interpret the laboratory results of thyroid function tests in differential diagnosis of thyroid disorders correctly.

BI 11.18- Discuss the principles of spectrophotometry.

I. At the end of the session, Phase-I students must be able to define Spectrophotometry correctly.
II. At the end of the session, Phase-I students must be able to give the principle of spectrophotometer correctly.
III. At the end of the session, Phase-I students must be able to discuss the principle of spectrophotometer in view of beer-lambert's law correctly.
IV. At the end of the session, Phase-I students must be able to differentiate between colorimetry and spectrophotometry correctly.

BI 11.19- Outline the basic principles involved in the functioning of instruments commonly used in a biochemistry laboratory and their applications.

I. At the end of the session, Phase-I students must be able to give the comprehensive list of instruments used commonly in the biochemistry laboratory correctly.
II. At the end of the session, Phase-I students must be able to give the basic principles of the instruments used commonly in the biochemistry laboratory correctly.
III. At the end of the session, Phase-I students must be able to describe the functioning of the instruments used commonly in the biochemistry laboratory correctly.
IV. At the end of the session, Phase-I students must be able to list the applications of the instruments used commonly in the biochemistry laboratory correctly.
V. At the end of the session, Phase-I students must be able to describe the applications of the instruments used commonly in the biochemistry laboratory correctly.

BI 11.20- Identify abnormal constituents in urine, interpret the findings and correlate these with pathological states.

I. At the end of the session, Phase-I students must be able to list the various types of abnormal constituents which may be present in urine sample correctly.
II. At the end of the session, Phase-I students must be able to list the tests to detect the various abnormal constituents which may be present in urine sample correctly.
III. At the end of the session, Phase-I students must be able to describe the procedures of tests to detect the presence of various abnormal constituents which may be present in urine sample correctly.
IV. At the end of the session, Phase-I students must be able to Perform different tests to detect the abnormal constituents in different urine samples correctly
V. At the end of the session, Phase-I students must be able to analyse and interpret the results obtained for tests for abnormal constituents of urine correctly.
VI. At the end of the session, Phase-I students must be able to understand the clinical correlation of the results obtained correctly

BI 11.21-Demonstrate estimation of glucose, creatinine, urea and total protein in serum.

Demonstrate estimation of glucose

I. Give the normal reference values of blood sugar levels (FPG, PPPG, RBS) accurately.
II. At the end of the session, Phase-I students must be able to enlist the different methods used for the estimation of blood glucose correctly.
III. At the end of the session, Phase-I students must be able to enlist the chemicals & reagents required for different methods of blood glucose estimation correctly.
IV. At the end of the session, Phase-I students must be able to describe the principles of different methods for estimation of blood glucose correctly.
V. At the end of the session, Phase-I students must be able to describe the steps of different methods for estimating blood glucose correctly.
VI. At the end of the session, Phase-I students must be able to discuss the procedures to estimate the blood glucose independently correctly.
VII. At the end of the session, Phase-I students must be able to calculate the blood glucose by various methods from the given blood sample correctly.

VIII. At the end of the session, Phase-I students must be able to list the precaution to be followed while estimating the blood glucose by various methods correctly.
IX. At the end of the session, Phase-I students must be able to interpret the laboratory results of estimation of blood glucose clinically.

Demonstrate estimation of serum creatinine

I. At the end of the session, Phase-I students must be know what is creatinine correctly.
II. At the end of the session, Phase-I students must be able to know how creatinine is formed in the body correctly.
III. At the end of the session, Phase-I students must be able to give the normal reference interval of serum creatinine correctly.
IV. At the end of the session, Phase-I students must be able to list the conditions in which serum creatinine level is altered correctly.
V. At the end of the session, Phase-I students must be able to give an explanation for the serum creatinine alteration elevation in various clinical
VI. At the end of the session, Phase-I students must be able to enumerate different methods for the determination of serum creatinine in Biochemistry laboratory correctly.
VII. At the end of the session, Phase-I students must be able to outline the principle for the estimation of serum creatinine by different methods correctly.
VIII. At the end of the session, Phase-I students must be able to list the regent requirements for serum creatinine analysis by various methods correctly.
IX. At the end of the session, Phase-I students must be able to enumerate the steps of determination of serum creatinine level by various methods correctly.
X. At the end of the session, Phase-I students must be able to list the precautions to be followed in different assay methods for serum creatinine correctly.

Demonstrate estimation of serum urea

I. At the end of the session, Phase-I students must be know what is urea correctly.
II. At the end of the session, Phase-I students must be able to know how urea is formed in the body correctly.
III. At the end of the session, Phase-I students must be able to give the normal reference interval of serum urea correctly.
IV. At the end of the session, Phase-I students must be able to list the conditions in which serum urea level is altered correctly.
V. At the end of the session, Phase-I students must be able to give an explanation for the serum urea alteration in various clinical conditions correctly.
VI. At the end of the session, Phase-I students must be able to enumerate different methods for the determination of serum urea in Biochemistry laboratory correctly.
VII. At the end of the session, Phase-I students must be able to outline the principle for the estimation of serum urea by different methods correctly.
VIII. At the end of the session, Phase-I students must be able to list the regent requirements for serum urea analysis by various methods correctly.
IX. At the end of the session, Phase-I students must be able to enumerate the steps of determination of serum urea level by various methods correctly.
X. At the end of the session, Phase-I students must be able to list the precautions to be followed in different assay methods for serum urea correctly.

Demonstrate estimation of serum total protein

I. At the end of the session, Phase-I students must be able to enumerate the serum proteins correctly.
II. At the end of the session, Phase-I students must be able to list the human ranges of total protein and serum proteins correctly.
III. At the end of the session, Phase-I students must be able to enumerate the methods employed for the estimation of total protein correctly.
IV. At the end of the session, Phase-I students must be able to outline the principles involved in the estimation of serum total protein correctly.
V. At the end of the session, Phase-I students must be able to discuss the principles in detail involving the estimation of total protein correctly.
VI. At the end of the session, Phase-I students must be able to give the normal ranges of serum total protein correctly.
VII. At the end of the session, Phase-I students must be able to give the units in which the level of serum protein is expressed correctly.
VIII. At the end of the session, Phase-I students must be able to detailing of the steps involved in the estimation of total protein in the given serum sample accurately.
IX. At the end of the session, Phase-I students must be able to learn to independently perform the estimation of serum total protein correctly.
X. At the end of the session, Phase-I students must be able to clinically interpret the results obtained for serum total protein level correctly.
XI. At the end of the session, Phase-I students must be able to define hypoproteinemia and hyperproteinemia correctly.
XII. At the end of the session, Phase-I students must be able to list the causes of hypoproteinemia and hypoproteinemia correctly.
XIII. At the end of the session, Phase-I students must be able to explain in detail the pathogenesis of hypoproteinemia and hypoproteinemia in various clinical conditions correctly.

BI 11.22- Calculate albumin: globulin (AG) ratio and creatinine clearance

Calculate albumin : globulin (A/G)

I. At the end of the session, Phase-I students must be able to give the meaning of A/G ratio correctly.
II. At the end of the session, Phase-I students must be able to give normal reference interval for A/G ratio correctly.
III. At the end of the session, Phase-I students must be able to learn to calculate A/G ratio for the given serum sample correctly.
IV. At the end of the session, Phase-I students must be able to list various clinical conditions in which A/G ratio can be altered correctly.
V. At the end of the session, Phase-I students must be able to discuss the explanation for the alteration of A/G ratio in various clinical conditions correctly.

Calculate creatinine clearance

I. At the end of the session, Phase-I students must be able to define creatinine clearance correctly.
II. At the end of the session, Phase-I students must be able to give the formula for the calculation of creatinine clearance correctly.

III. At the end of the session, Phase-I students must be able to indicate which renal parameter is measured by the calculation of creatinine clearance correctly.
IV. At the end of the session, Phase-I students must be able to give the units of expression of creatinine clearance correctly.
V. At the end of the session, Phase-I students must be able to give the normal ranges of creatinine clearance in males, females and children correctly.
VI. At the end of the session, Phase-I students must be able to compare and contrast the advantages and disadvantages by the calculation of creatinine clearance with other clearance, viz urea clearance, inulin clearance etc correctly.
VII. At the end of the session, Phase-I students must be able to give the clinical interpretation of the result of calculation of creatinine clearance correctly.

BI 11.23- Calculate energy content of different food Items, identify food items with high and low glycemic index and explain the importance of these in the diet

I. At the end of the session, Phase-I students must be able to enlist the different food items correctly.
II. At the end of the session, Phase-I students must be able to mention different methods for calculation of energy contents of different food items correctly.
III. At the end of the session, Phase-I students must be able to describe the different methods of energy calculation correctly.
IV. At the end of the session, Phase-I students must be able to define glycemic index correctly.
V. At the end of the session, Phase-I students must be able to describe glycemic index correctly.
VI. At the end of the session, Phase-I students must be able to calculate to glycemic index correctly.
VII. At the end of the session, Phase-I students must be able to represent the glycemic index graphically correctly.
VIII. At the end of the session, Phase-I students must be able to know the importance of glycemic index of different food items correctly.

BI 11.24- Enumerate advantages and/or disadvantages of use of unsaturated, saturated and trans fats in food.

I. At the end of the session, Phase-I students must be able to classify unsaturated fats with examples correctly.
II. At the end of the session, Phase-I students must be able to describe the chemistry (structure & nomenclature) of unsaturated fats correctly.
III. At the end of the session, Phase-I students must be able to list the essential fatty acids correctly.
IV. At the end of the session, Phase-I students must be able to describe the advantages of essential fatty acids correctly.
V. At the end of the session, Phase-I students must be able to describe the deficiency manifestations of essential fatty acids correctly.
VI. At the end of the session, Phase-I students must be able to enlist the saturated fats with examples correctly.
VII. At the end of the session, Phase-I students must be able to describe the chemistry of saturated fats correctly.
VIII. At the end of the session, Phase-I students must be able to enlist the disadvantages of saturated fats in food correctly.
IX. At the end of the session, Phase-I students must be able to describe the disadvantages of saturated fats in food correctly.
X. At the end of the session, Phase-I students must be able to define Trans fats correctly.
XI. At the end of the session, Phase-I students must be able to enlist various food items containing Trans fats correctly.

XII. At the end of the session, Phase-I students must be able to describe the chemistry of Trans fats correctly.
XIII. At the end of the session, Phase-I students must be able to describe the harmful effects of Trans fats in the food correctly.