

Topic: I Basic Biochemistry

Number		Specific Learning Objective (K/S/A-c)	Domain	Level (K/KH/SH/P)	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assessment Method	Number Required to Certify P	Vertical Integration	Horigental Integration
BI1.1	Describe the molecular and functional organisation of a cell and its subcellular components	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture and small group Discussion	Written Assesment MCQs Viva Voce			Physiology
		1 Define Cell								
		2 Enumerate the different types of cell								
		3 Describe the structural organisation of a prokaryotic cell								
		4 Describe the structural organisation of a eukaryotic cell								
		5 Differentiate between prokaryotic and eukaryotic cells								
		6 Discus the chemical component of cells								
		7 Define macromolecules								
		8 Define Colloids								
		9 Classify Colloids								
		10 Define the properties of Colloids								
		11 Enumerate the different types of subcellular organelles								
		12 Describe the structure of Nucleus								
		13 Describe the functions of Nucleus								
		14 Describe the structure of Endoplasic Reticulum								
		15 Describe the different types of Endoplasmic Reticulum								
		16 Describe the functions of Endoplasmic Reticulum								
		17 Describe the structure of Mitochondria								
		18 Describe the functions of Mitochondria								
		19 Describe the structure of Golgi Complex								
		20 Describe the functions of Golgi Complex								
		21 Describe the structure of Lysosomes								
		22 Describe the functions of Lysosomes								
		23 Describe the structure of Peroxisomes								
		24 Describe the functions of Peroxisomes								
		25 Describe the structure of Plasma Membrane								
		26 Describe the functions of Plasma Membrane								
		27 Enumerate the different types of Transport Mechanisms								
		28 Describe Passive Transport								
		29 Describe Active Transport								
		30 Describe Exocytosis								
		31 Describe Endocytosis								
		32 Describe Ionophores								
		33 Describe Donnan membrane Equilibrium								
		34 Define different types of Cellular Receptors								
		35 Define Adhesion molecules with examples								
		36 Define Cell Junction								
		37 Classify Cell Junction								
		38 Discuss the Structure of Microtubules								
		39 Describe the Functions of Microtubules								
		40 Describe the Structure of Intermediate Filaments								
		41 Desacibe the Functions of Intermediate Filaments								
		42 Describe the Structure of Microfilaments								
43 Describe the Functions of Microfilaments										

Topic:2 Enzymes										
Number		Specific Learning Objective (K/S/A-c)	Domain	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 2.1	Explain fundamental Concepts of enzyme, Isoenzyme, alloenzyme, coenzyme & cofactor. Enumerate the main classes of IUBMB nomenclature	At the end of session the phase I MBBS students must be able to:-								
		1 Define an enzyme								
		2 Discuss the chemical nature of enzyme								
		3 Discuss the properties of enzyme								
		4 Define an isoenzyme								
		5 Describe the formation of isoenzyme								
		6 Describe the distribution of isoenzymes								
		7 Describe the separation of isoenzyme								
		8 Describe the biomedical importane of isoenzyme								
		9 Define alloenzyme								
		10 Define Cofactor								
		11 Define Coenzyme								
		12 Describe the role of a coenzyme correctly								
		13 Define activators								
		14 Describe the role of activators in enzyme catalysis								
15 Describe the enzyme classification with suitable example										
BI 2.2	Observe the estimation of SGOT and SGPT	At the end of session the phase I MBBS students must be able to:	K	K	Y	Demonstration	Viva Voce			
		1 Describe the estimation of SGOT correctly								
BI2.3	Describe and explain the basic principle of enzyme activity	At the end of session the phase I MBBS students must be able to:	K	KH	Y	Lecture, Case Discussion	Written/ Viva Coce			
		1 Describe the steps of enzyme catalysis								
		2 Define activation energy								
		3 Define the active site(s) of enzymes								
		4 Describe the features of the active site(s) of enzymes								
		5 Describe the mechanism of enzyme action								
		6 Describe the factors affecting enzyme activity								
		7 Define Km								
		8 Derive Km								
BI2.4	Describe and discuss enzyme inhibitor as poisons and drugs as therapeutic enzymes	At the end of session the phase I MBBS students must be able to:	K	KH	Y	Lecture and small group Discussion			Pathology, General Medicine	
		1 Define inhibition								
		2 Define inhibitors								
		3 Enumerate inhibitors								
		4 Describe the reversible competitive inhibitors with examples								
		5 Describe the reversible noncompetitive inhibitors with examples								
		6 Describe the reversible uncompetitive inhibitors with examples								
		7 Describe the irreversible inhibitors								
		8 Describe the suicidal inhibitors								
		9 Describe the feedback inhibitors								
		10 Describe the transition state analogue inhibitors								
		11 Describe inhibitors as poisons								
		12 Describe inhibitors as drugs								
13 Describe inhibitors as therapeutics										

B12.5	Describe and discuss the clinical utility of various serum enzymes as markers of pathological conditions	At the end of session the phase I MBBS students must be able to:		K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology General Medicine
		1	Enumerate serum enzymes							
		2	List the enzyme to assess liver diseases							
		3	Describe the enzyme to assess liver disease							
		4	List the enzymes to assess AMI							
		5	Describe the enzymes to assess AMI							
6	Describe the enzyme to assess the pancreatic disease									
B12.6	Discuss use of enzyme in laboratory investigation (enzyme based assays)	At the end of session the phase I MBBS students must be able to:		K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology General Medicine
		1	Enumerate the enzymes used in laboratory investigations							
		2	Describe the enzymes of diagnostic importance							
B12.7	Interpret laboratory results of enzyme activities & describe the clinical utility of various enzymes as markers of pathology conditions	At the end of session the phase I MBBS students must be able to:		K	KH	Y	Lecture, small group Discussion, DOAP Sessions	Written/Viva Voce		Pathology General Medicine
		1	Describe the laboratory results of enzyme activity							
		2	Describe the clinical utility of various enzymes							
		3	Interpret laboratory results of enzymes correctly							

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Topic: 3 Carbohydrate Chemistry and Metabolism

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration	
BI 3.1	Discuss and differentiate monosaccharides, disaccharides and polysaccharides giving examples of main carbohydrates as energy fuel, structural elements and storage in the human body	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture and small Group Discussion	Written Assesment MCQs Viva Voce			Physiology	
		1									Classify carbohydrates
		2									Describe the biomedical importance of carbohydrates
		3									Describe the structure of monosaccharides
		4									Enumerate the isomers of monosaccharides
		5									Discuss the reactions of carbohydrate
		6									Describe the derivatives of monosaccharides
		7									Describe the structure of disaccharides
		8									Describe the structure of homopolysaccharides
		9									Explain the biomedical importance of homopolysaccharides
		10									Describe the structure of heteropolysaccharides
		11									Explain the biomedical importance of heteropolysaccharides
		12									Describe the different classes of glycosylated proteins
BI 3.2	Describe the processes involved in the digestion and assimilation of carbohydrates and storage.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture and small group Discussion	Written Assesment MCQs Viva Voce				
		1									Describe the different types of transport mechanisms
		2									Define active transport with suitable examples
		3									Define passive transport with suitable examples
		4									Describe the features of facilitated diffusion
		5									Define secondary active transport with suitable examples
		6									Define symport with suitable examples
		7									Define antiport with suitable examples
BI 3.3	Describe and discuss the digestion and assimilation of carbohydrates from food.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture and small group Discussion	Written/Viva Voce				
		1									Enlist the enzymes involved in the digestion of carbohydrates
		2									Describe the digestion of carbohydrates
		3									Describe the absorption of carbohydrates
		4									Enlist the disorders of carbohydrate digestion
		5									Discuss the lactose intolerance
		6									List the causes of lactose intolerance
		7									Discuss the biochemical basis of oral rehydration therapy
		8									Give an account of glucose transporters
BI 3.4	Define and differentiate the pathways of carbohydrate metabolism (glycolysis, gluconeogenesis, glycogen metabolism, HMP shunt).	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture and small group Discussion	Written/Viva Voce		General Medicine		
		1									Discuss the overview of carbohydrate metabolism
		2									Define glycolysis
		3									discuss the significance of glycolysis
		4									Enumerate the reactions of glycolysis
		5									Give an account of energetics of glycolysis
		6									Describe the disorders of glycolysis
		7									Give a short note on Rapport Luebering Pathway
		8									Discuss the Fate of Pyruvate
		9									Discuss the Fate of Acetyl CoA
		10									Describe the significance of pyruvate oxidation
11	Describe the disorders of pyruvate oxidation										

		12 Discuss the disorders of pentose phosphate pathway								
		13 Describe the uronic acid pathway								
		14 Define gluconeogenesis								
		15 Discuss the significance of gluconeogenesis								
		16 Describe the pentose phosphate pathway								
		17 Discuss the significance of pentose phosphate pathway								
		18 Describe glycogenesis								
		19 Describe the significance of glycogenesis								
		20 Discuss the disorders of glycogenesis								
		21 Describe glycogenolysis								
		22 Describe the significance of glycogenolysis								
		23 Describe the disorders related to glycogenolysis								
		24 Discuss the metabolism of fructose								
		25 Discuss the metabolism of galactose								
		26 Discuss the metabolism of amino sugars								
		27 Describe the pyruvate oxidation								
		28 Describe the significance of pyruvate oxidation								
		29 Describe the disorders associated with pyruvate oxidation								
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 3.5	Describe and discuss the regulation, functions and integration of carbohydrate along with associated diseases/disorders	At the end of session the phase I MBBS students must be able to:- 1 Discuss the regulation of glycolysis 2 Discuss the regulation of gluconeogenesis 3 Discuss the regulation of glycogen metabolism 4 Describe the regulation of HMP pathway 5 Give an account of metabolic adaptation in fed state 6 Give an account of metabolic adaptation in fasting state 7 Discuss the biochemical changes in Diabetes Mellitus 8 Discuss the disorders of fructose metabolism 9 Discuss the disorders of galactose metabolism 10 Discuss the alcohol metabolism 11 Discuss the regulation of pyruvate metabolism	K	KH	Y	Lecture and small group Discussion	Written/Viva Voce		General Medicine	
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 3.6	Describe and discuss the concept of TCA cycle as an amphibolic pathway and its regulation	At the end of session the phase I MBBS students must be able to:- 1 Define citric acid cycle 2 Discuss the significance of citric acid cycle 3 Give an account of reactions of citric acid cycle 4 Describe the regulation of citric acid cycle 5 Discuss the of energetics of citric acid cycle 6 Define Anapleurotic reactions 7 Enlist the disorders of citric acid cycle	K	KH	Y	Lecture and small group Discussion	Written/Viva Voce			
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 3.7	Describe the common poisons that inhibit the crucial enzymes of carbohydrate metabolism (eg fluoride, arsenate)	At the end of session the phase I MBBS students must be able to:- 1 Describe the inhibitors of glycolysis 2 Describe the inhibitors of citric acid cycle	K	KH	Y	Lecture and small group Discussion	Written/Viva Voce			Physiology
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 3.8	Discuss and interpret laboratory results of analytes associated with metabolism of carbohydrates.	At the end of session the phase I MBBS students must be able to:- 1 Describe the clinical significance of reducing substances in urine 2 Describe the dignostic approach for identification of reducing subst	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology, General Medicine	

		3	Describe the inborn errors of carbohydrate metabolism								
		4	Describe the pathway of fructose metabolism								
		5	Discuss lab investigations in Diabetes Mellitus								
		6	Discuss the significance of glycated haemoglobin								
		7	Discuss biochemical aspect of Diabetes Mellitus								
		8	Discuss the clinical aspect of Diabetes Mellitus								
Number	Competency	Specific Learning Objective (K/S/A-c)		Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 3.9	Discuss the mechanism and significance of blood glucose regulation in health and disease.	At the end of session the phase I MBBS students must be able to:-		K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	
		1	Describe the significance of blood glucose regulation								
		2	Describe the mechanisms of blood glucose regulation								
		3	Discuss the hormonal control of blood glucose regulation								
		4	Enlist the disorders of blood glucose regulation								
Number	Competency	Specific Learning Objective (K/S/A-c)		Domain K/S/A/C	Level (K/KH/SH/P)	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 3.10	Interpret the results of blood glucose levels and other laboratory investigations related to disorders of carbohydrate metabolism	At the end of session the phase I MBBS students must be able to:-		K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	
		1	Describe the significance of glucose tolerance test								
		2	Discuss the different types of glucose tolerance tests								
		3	Enlist the indications of oral glucose tolerance test								
		4	Discuss the procedure of oral glucose tolerance test								
		5	Discuss the interpretation of oral glucose tolerance test								
		6	Describe the lab tests to diagnose Diabetes Mellitus								
		7	Describe the laboratory tests to diagnose fructose intolerance								
		8	Describe the laboratory tests to diagnose lactose intolerance								

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Topic 4: Chemistry and Metabolism of Lipids

Number	COMPETENCY The student should be able to	Specific learning objectives	Domain K/S/A/C	Level K/KH/S H/P	Core (Y/N)	Suggested Teaching Learning method	Suggested Assessment method	Number required to certify P	Vertical integration	Horizontal Integration
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.	At the end of session, the phase I MBBS students must be able to- 1. Define lipids 2. Classify lipids correctly. 3. Discuss biomedical importance of lipids in human beings. 4. Discuss simple lipids. 5. Define triacylglycerol with their functions. 6. Define waxes with examples. 7. Discuss chemical reactions of triacylglycerol. 8. Define saponification number with its significance. 9. Define iodine number with its significance. 10. Define acid number with its significance. 11. Define Reichert- Meissl number with its significance. 12. Enumerate two parameters used for analysis of triacylglycerol. 13. Describe compound lipids with suitable examples. 14. Differentiate between phospholipids and sphingolipids. 15. Discuss biomedical importance of phospholipids with examples. 16. Discuss phosphatidyl choline with its significance. 17. Discuss cardiolipin. 18. Discuss glycolipids with examples. 19. Discuss fatty acids. 20. Discuss properties of fatty acids. 21. Enumerate essential fatty acids. 22. Define steroids with suitable examples. 23. Discuss chemistry of cholesterol with their functions. 24. Define amphipathic lipids with their biomedical importance. 25. Define micelles with their biomedical importance.	K	KH	Y	Lecture/ Small group discussion	Written/Viva-voce			General medicine
BI 4.2	Describe the processes involved in digestion and absorption of dietary lipids and also the key features of their metabolism	At the end of session, the phase I MBBS students must be able to- 1. Discuss role of bile salts in absorption of lipids. 2. Describe the hormonal regulation of lipid digestion. 3. Enumerate different types of lipases involved in fat metabolism. 4. Differentiate between different type of lipases in terms of reactions and their activation. 5. Describe the beta- oxidation of fatty acids. 6. Describe the regulation of fatty acids. 7. Discuss the energetics of palmitic acid oxidation. 8. Describe the carnitine shuttle in beta-oxidation. 9. Describe the disorders of beta oxidation. 10. Describe the alpha- oxidation of fatty acids. 11. Discuss Refsum Disease. 12. Describe the omega-oxidation of fatty acids. 13. Describe very long chain fatty acid metabolism. 14. Discuss fatty acid synthesis. 15. Describe fatty acid synthase complex. 16. Discuss the regulation of fatty acid synthesis. 17. Enumerate the ketone bodies formed in the body. 18. Describe the ketone bodies formation. 19. Describe ketone bodies utilization. 20. Discuss the clinical significance of ketone bodies. 21. Differentiate between diabetic ketosis and ketosis induced by starvation. 22. Discuss the synthesis of triacylglycerol. 23. Discuss adipose tissue metabolism. 24. Discuss metabolism of phospholipids. 25. List different types of Phospholipases with reactions catalyzed by them. 26. Discuss metabolism of glycolipids. 27. Discuss Niemann-Pick Disease with its clinical features. 28. Discuss Gaucher's Disease with its clinical features. 29. Discuss Tay-Sachs Disease with its clinical features. 30. Discuss biosynthesis of cholesterol with its regulation.	K	KH	Y	Lecture/ Small group discussion	Written/Viva-voce			General medicine

BI 4.3	Explain the regulation of lipoprotein metabolism & associated disorders.	<p>At the end of session, the phase I MBBS students must be able to-</p> <ol style="list-style-type: none"> 1. Define Lipotropic factors with suitable examples. 2. Describe the mechanism of fatty infiltration of liver. 4. Discuss the regulation of Lipoprotein synthesis. 5. Enumerate the various risk factors associated with cardiovascular disease. 6. Discuss the role of apolipoproteins in cardiovascular diseases. 7. Discuss the Tangier's Disease with its biochemical defects. 8. Classify the hypolipoproteinemias with their biochemical defects. 9. Classify primary hyperlipidemias with their metabolic defects. 10. Discuss primary hyperlipidemias specifically with their biochemical findings. 11. Enumerate the causes of secondary hyperlipidemias. 	K	KH	Y	Lecture/ Small group discussion	Written/Viva-voce	General medicine
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BI 4.4	Describe the structure and functions of lipoproteins, their functions, interrelations & relations with atherosclerosis	<p>At the end of session, the phase I MBBS students must be able to-</p> <ol style="list-style-type: none"> 1. Classify lipoproteins correctly. 2. Define various types of apolipoproteins with their functions. 3. Describe the synthesis of various lipoproteins with the help of flow diagram. 4. Describe the functions of various lipoproteins. 5. Discuss the clinical significance of various lipoproteins. 6. Differentiate the Good and Bad cholesterol with reasoning. 7. Discuss the role of LDL in atherosclerosis. 8. Enumerate the conditions that leads to increased levels of seum cholesterol. 9. List the various factors which are responsible for the slowing of progression of atherosclerosis. 	S	KH	Y	Lecture/ Small group discussion	Written/Viva-voce	1	General Medicine
BI 4.5	Interpret laboratory results of analytes associated with metabolism of lipids	<p>At the end of session, the phase I MBBS students must be able to-</p> <ol style="list-style-type: none"> 1. Discuss Plasma Lipid Profile. 2. Discuss the role of increased serum cholesterol in cardioascular disease. 3. Discuss the role of serum LDL-cholesterol in cardioascular disease. 4. Discuss the role of serum HDL-cholesterol in cardioascular disease. 5. Discuss the role of serum Apolipoprotein levels in cardioascular disease. 6. Discuss the role of serum Lipoprotein(a) in cardioascular disease. 7. Discuss the role of serum Triglycerides in cardioascular disease. 8. Discuss the role of Non-HDL cholesterol in cardiac risk evaluation. 9. Discuss the role of atherogenic indices in cardiac risk evaluation. 	K	KH	Y	Lecture/ Small group discussion	Written/Viva-voce		General Medicine

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BI 4.6	Describe the therapeutic uses of prostaglandins and inhibitors of eicosanoid synthesis.	At the end of session, the phase I MBBS students must be able to- 1. Enumerate the different classes of eicosanoids. 2. Discuss the biosynthesis of prostaglandins. 3. Discuss regulation of the biosynthesis of prostaglandins. 4. Describe biomedical importance of eicosanoids. 5. Discuss the role of aspirin in regulation of prostaglandins synthesis.	K	KH	Y	Lecture/ Small group discussion	Written/Viva-voce		General medicine
BI 4.7	Interpret laboratory results of analytes associated with metabolism of lipids.	At the end of session, the phase I MBBS students must be able to- 1. Discuss Plasma Lipid Profile. 2. Discuss the role of increased serum cholesterol in cardiovascular disease. 3. Discuss the role of serum LDL-cholesterol in cardiovascular disease. 4. Discuss the role of serum HDL-cholesterol in cardiovascular disease. 5. Discuss the role of serum Apolipoprotein levels in cardiovascular disease. 6. Discuss the role of serum Lipoprotein(a) in cardiovascular disease. 7. Discuss the role of serum Triglycerides in cardiovascular disease. 8. Discuss the role of Non-HDL cholesterol in cardiac risk evaluation. 9. Discuss the role of atherogenic indices in cardiac risk evaluation.	S	KH	Y	Lecture/ Small group discussion	Written/Viva-voce		General medicine

Topic: 5 Chemistry and Metabolism of Proteins

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level (K/KH/SH/P)	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horigental Integration
BI 5.1	Describe and discuss structural organisation of proteins	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce			
		1 Enumerate the amino acids.								
		2 Discuss properties of different amino acids.								
		3 Describe primary structure of proteins.								
		4 Describe secondary structure of proteins.								
		5 Describe tertiary structure of proteins.								
		6 Describe quaternary structure of proteins.								
		7 Discuss the structural organization of proteins.								
		8 Describe protein folding.								
		9 Discuss prion diseases.								
10 Describe structural organization of collagen.										
BI 5.2	Describe and discuss functions of proteins and structure-function relationships in relevant areas eg., hemoglobin and selected hemoglobinopathies	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology, General Medicine	Physiology
		1 Describe the structure of proteins.								
		2 Discuss the structure-function relationship of hemoglobin								
		3 Describe structure of myoglobin.								
		4 Describe Met Hemoglobin.								
		5 Discuss hemoglobinopathies.								
6 Discuss thalassemias.										
BI 5.3	Describe the digestion and absorption of dietary proteins	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written /Viva Voce		Pediactrics	
		1 Describe digestion of proteins correctly.								
		2 Describe absorption of amino acids correctly.								
		3 Discuss biochemical basis of food allergy.								

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level (K/KH/SH/P)	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horigental Integration
BI 5.4	Describe common disorders associated with protein metabolism	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pediatrics	
		1 Describe general metabolism of amino acids.								
		2 Describe formation of ammonia.								
		3 Describe transamination.								
		4 Describe trans-deamination.								
		5 Describe detoxification of ammonia.								
		6 Describe urea cycle.								
		7 Discuss the disorders of urea cycle								
		8 Discuss acquired hyperammonemia.								
		9 Describe creatine metabolism.								
		10 Describe metabolism of glycine.								
		11 Describe metabolism of serine.								
		12 Describe metabolism of methionine.								
		13 Describe metabolism of cysteine.								
		14 Describe metabolism of glutamic acid.								
		15 Describe metabolism of glutamine.								
		16 Describe metabolism of aspartic acid.								
		17 Describe metabolism of branched chain amino acids								
		18 Describe metabolism of histidine.								
		19 Describe metabolism of phenylalanine.								
		20 Describe metabolism of tyrosine.								
		21 Describe metabolism of tryptophan.								
		22 Discuss Non ketotic hyperglycinemia.								
		23 Discuss Primary hyperoxaluria								
		24 Discuss Homocystinuria								
		25 Discuss Cystinuria								
		26 Discuss Hypermethioninemia								
		27 Discuss Homocystinurias								
		28 Discuss Maple syrup urine disease								
		29 Discuss Phenylketonuria								
		30 Discuss Alkaptonuria								
		31 Discuss Albinism								
		32 Discuss Hypertyrosinemia								
		33 Discuss Hartnup's disease								
34 Discuss Amino acidurias										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level (K/KH/SH/P)	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horigental Integration
BI 5.5	Interpret laboratory results of analytes associated with metabolism of proteins	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	
		1 Interpret laboratory results of analytes associated with Metabolism of proteins.								
		2 Interpret FIGLU excretion test.								
		3 Interpret Ferric Chloride test.								

Topic: 6 METABOLISM AND HOMEOSTASIS

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain	Level	Core	Suggested Teaching	Suggested Assesment	Number Required	Vertical	Horizontal
BI 6.1	Discuss the metabolic processes that take place in specific organs in the body in the fed and fasting states.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	
		1 Define the well fed state								
		2 Define the fasting state (stages of fasting)								
		3 Describe the fate of dietary fuels in the well fed state								
		4 Describe the metabolic changes in fasting state								
		5 Describe the regulation of enzymes involved in fasting								
6 Describe the regulation of enzymes involved in well fed state										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.2	Describe and Discuss the metabolic processes in which nucleotides are involved.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce			
		1 Define Nucleotides								
		2 Differentiate/Classify the nucleotides								
		3 Describe the chemical/structural make-up of nucleotides								
		4 Enumerate the atypical/modified bases								
		5 Enumerate metabolic processes in which nucleotides are involved								
6 Describe the uses of synthetic nucleotide analogues										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.3	Describe the common disorders associated with nucleotide metabolism	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce			Physiology
		1 Describe the metabolism of purines								
		2 Describe the metabolism of pyrimidines								
		3 Describe the metabolic disorders of purine metabolism								
4 Describe the metabolic disorders of pyrimidine metabolism										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.4	Discuss the laboratory results of analytes associated with gout and lesch-nyhan syndrome	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written /Viva Voce		General Medicine	
		1 Discuss the uric acid metabolism								
		2 Enumerate the lab tests used to diagnose gout								
3 Enumerate the lab tests used to diagnose Lesch-Nyhan syndrome										

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.5	Describe the biochemical role of vitamins in the body and explain the manifestations of their deficiency	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	
		1 Define vitamin								
		2 Enlist the vitamins correctly on the basis of water-solubility								
		3 Enumerate the RDA of vitamin B ₁								
		4 Enumerate the Sources of vitamin B ₁								
		5 Describe the Biochemical Role of vitamin B ₁								
		6 Discuss the deficiency manifestations of vitamin B ₁								
		7 Enumerate the RDA of vitamin B ₂								
		8 Enumerate the Sources of vitamin B ₂								
		9 Describe the Biochemical Role of vitamin B ₂								
		10 Discuss the deficiency manifestations of vitamin B ₂								
		11 Enumerate the RDA of vitamin B ₃								
		12 Enumerate the Sources of vitamin B ₃								
		13 Describe the Biochemical Role of vitamin B ₃								
		14 Discuss the deficiency manifestations of vitamin B ₃								
		15 Enumerate the RDA of vitamin B ₆								
		16 Enumerate the Sources of vitamin B ₆								
		17 Describe the Biochemical Role of vitamin B ₆								
		18 Discuss the deficiency manifestations of vitamin B ₆								
		19 Enumerate the RDA of vitamin B ₇								
		20 Enumerate the Sources of vitamin B ₇								
		21 Describe the Biochemical Role of vitamin B ₇								
		22 Discuss the deficiency manifestations of vitamin B ₇								
		23 Enumerate the RDA of vitamin Pantothenic Acid								
		24 Enumerate the Sources of vitamin Pantothenic Acid								
		25 Describe the Biochemical Role of vitamin Pantothenic Acid								
		26 Discuss the deficiency manifestations of Pantothenic Acid								
		27 Enumerate the RDA of vitamin Lipoic Acid								
		28 Enumerate the Sources of vitamin Lipoic Acid								
		29 Describe the Biochemical Role of vitamin Lipoic Acid								
		30 Discuss the deficiency manifestations of Lipoic Acid								
		31 Enumerate the RDA of vitamin choline								
		32 Enumerate the Sources of vitamin choline								
		33 Describe the Biochemical Role of vitamin choline								
		34 Discuss the deficiency manifestations of choline								
		35 Enumerate the RDA of vitamin folic acid								
		36 Enumerate the Sources of vitamin folic acid								
		37 Describe the Biochemical Role of vitamin folic acid								
		38 Discuss the deficiency manifestations of folic acid								
		39 Enumerate the RDA of vitamin Cobalamine (B ₁₂)								
		40 Enumerate the Sources of vitamin Cobalamine (B ₁₂)								
		41 Describe the Biochemical Role of vitamin Cobalamine (B ₁₂)								
		42 Discuss the deficiency manifestations of Cobalamine (B ₁₂)								
		43 Enumerate the RDA of vitamin ascorbic acid								
		44 Enumerate the Sources of vitamin ascorbic acid								
		45 Describe the Biochemical Role of vitamin ascorbic acid								
		46 Discuss the deficiency manifestations of ascorbic acid								
47 Enumerate the RDA of vitamin-A										

		48 Enumerate the Sources of vitamin-A								
		49 Describe the Biochemical Role of vitamin-A								
		50 Discuss the deficiency manifestations of vitamin-A								
		51 Enumerate the RDA of vitamin-D								
		52 Enumerate the Sources of vitamin-D								
		53 Describe the Biochemical Role of vitamin-D								
		54 Discuss the deficiency manifestations of vitamin-D								
		55 Enumerate the RDA of vitamin-E								
		56 Enumerate the Sources of vitamin-E								
		57 Describe the Biochemical Role of vitamin-E								
		58 Discuss the deficiency manifestations of vitamin-E								
		59 Enumerate the RDA of vitamin-K								
		60 Enumerate the Sources of vitamin-K								
		61 Describe the Biochemical Role of vitamin-K								
		62 Discuss the deficiency manifestations of vitamin-K								
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.6	Describe the Biochemical processes involved in the generation of energy in the cells	At the end of session the phase I MBBS students must be able to:- 1 Enlist the high energy compounds 2 Describe the Chemiosmotic theory of ATP generation 3 Discuss of uncouplers of ETC 4 Describe the Oxidative Phosphorylation 5 Describe the ATP-Synthase 6 Describe the Cytochrome oxidase	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce			
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.7	Describe the processes involved in the maintenance of normal pH, water and electrolyte balance of body fluids and the derangements associated with these.	At the end of session the phase I MBBS students must be able to:- 1 Define pH 2 Define Buffers 3 Enumerate the body buffer systems 4 Describe the mechanism of regulation of pH by the buffer systems 5 Describe the mechanism of regulation of pH by the respiratory syst 6 Describe the mechanism of regulation of pH by the renal system 7 Define respiratory alkalosis 8 Define metabolic alkalosis 9 Define respiratory acidosis 10 Define metabolic acidosis 11 Define anion gap 12 Describe anion gap	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	Physiology
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.8	Discuss and interpret the results of ABG analysis in various disorders	At the end of session the phase I MBBS students must be able to:- 1 Define ABG 2 Enumerate the tests performed under ABG 3 Enumerate the disorders in which the ABG is to be performed. 4 Interpret the results of ABG analysis in various disorders	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.9	Describe the functions of various minerals in the body, their metabolism and homeostasis	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	Physiology
		1 Enumerate the macronutrients								
		2 Enumerate the micronutrients								
		3 Enumerate the RDA of the calcium								
		4 Enumerate the sources of calcium								
		5 Describe the biochemical role of calcium								
		6 Describe the homeostasis of calcium								
		7 Enumerate the RDA of the phosphorus								
		8 Enumerate the sources of phosphorus								
		9 Describe the biochemical role of phosphorus								
		10 Describe the homeostasis of phosphorus								
		11 Enumerate the RDA of the iron								
		12 Enumerate the sources of iron								
		13 Describe the biochemical role of iron								
		14 Describe the homeostasis of iron								
		15 Enumerate the RDA of the copper								
		16 Enumerate the sources of copper								
		17 Describe the biochemical role of copper								
		18 Describe the homeostasis of copper								
		19 Enumerate the RDA of the magnesium								
		20 Enumerate the sources of magnesium								
		21 Describe the biochemical role of magnesium								
		22 Describe the homeostasis of magnesium								
		23 Enumerate the RDA of the zinc								
		24 Enumerate the sources of zinc								
		25 Describe the biochemical role of zinc								
		26 Describe the homeostasis of zinc								
		27 Enumerate the RDA of the selenium								
		28 Enumerate the sources of selenium								
		29 Describe the biochemical role of selenium								
		30 Describe the homeostasis of selenium								
		31 Enumerate the RDA of the cobalt								
		32 Enumerate the sources of cobalt								
		33 Describe the biochemical role of cobalt								
		34 Describe the homeostasis of cobalt								
		35 Enumerate the RDA of the manganese								
		36 Enumerate the sources of manganese								
		37 Describe the biochemical role of manganese								
		38 Describe the homeostasis of manganese								
		39 Enumerate the RDA of the iodine								
		40 Enumerate the sources of iodine								
		41 Describe the biochemical role of iodine								
		42 Describe the homeostasis of iodine								
		43 Enumerate the RDA of the fluoride								
		44 Enumerate the sources of fluoride								
		45 Describe the biochemical role of fluoride								
46 Describe the homeostasis of fluoride										

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assessment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.10	Enumerate and describe the disorders associated with mineral metabolism	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	
		1 Enumerate the disorders associated with calcium								
		2 Describe the disorders associated with calcium								
		3 Enumerate the disorders associated with phosphorus								
		4 Describe the disorders associated with phosphorus								
		5 Enumerate the disorders associated with iron								
		6 Describe the disorders associated with iron								
		7 Enumerate the disorders associated with copper								
		8 Describe the disorders associated with copper								
		9 Enumerate the disorders associated with magnesium								
		10 Describe the disorders associated with magnesium								
		11 Enumerate the disorders associated with zinc								
		12 Describe the disorders associated with zinc								
		13 Enumerate the disorders associated with selenium								
		14 Describe the disorders associated with selenium								
		15 Enumerate the disorders associated with cobalt								
		16 Describe the disorders associated with cobalt								
		17 Enumerate the disorders associated with manganese								
		18 Describe the disorders associated with manganese								
		19 Enumerate the disorders associated with iodine								
		20 Describe the disorders associated with iodine								
		21 Enumerate the disorders associated with fluoride								
		22 Describe the disorders associated with fluoride								
		23 Enumerate the disorders associated with phosphorus								
24 Describe the disorders associated with phosphorus										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assessment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.11	Describe the functions of Haem in the body and describe the processes involved in its metabolism and describe the porphyrin metabolism	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology, General Medicine	Physiology
		1 Define porphyrins								
		2 Describe the biomedical importance of porphyrins								
		3 Define the haem								
		4 Describe the biomedical importance of haem								
		5 Describe the metabolism of porphyrins								
		6 Describe the metabolism of haem								
		7 Define Bilirubin								
		8 Describe the transport of Bilirubin								
		9 Describe the metabolism of bilirubin								
10 Describe in detail the different type of porphyrias										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assessment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.11	Describe the functions of Haem in the body and describe the processes involved in its metabolism and describe the porphyrin metabolism	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology, General Medicine	Physiology
		1 Define porphyrins								
		2 Describe the biomedical importance of porphyrins								
		3 Define the haem								
		4 Describe the biomedical importance of haem								
		5 Describe the metabolism of porphyrins								
		6 Describe the metabolism of haem								
		7 Define Bilirubin								
		8 Describe the transport of Bilirubin								
		9 Describe the metabolism of bilirubin								
10 Describe in detail the different type of porphyrias										

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.12	Describe the different types of haemoglobin and its derivatives found in the body and their physiological/pathological relevance	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology General Medicine	Physiology
		1 Describe the different types of hemoglobin								
		2 Describe the structure of haemoglobin								
		3 Describe the binding of oxygen to haemoglobin								
		4 Describe the transport of oxygen by haemoglobin								
		5 Describe the various types of hemoglobinopathies								
6 Describe the various types of thalassemias										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.13	Describe the functions of kidney, liver, thyroid and adrenal glands	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology General Medicine	Physiology, Human Anatomy
		1 Describe the functions of kidney								
		2 Describe the functions of liver								
		3 Describe the functions of thyroid								
4 Describe the functions of adrenal glands										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.14	Describe the tests that are commonly done in clinical practice to assess the functions of kidney, liver, thyroid and adrenal glands	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology General Medicine	Physiology, Human Anatomy
		1 Describe the LFTs								
		2 Describe the KFTs								
		3 Describe the thyroid function tests								
4 Describe the adrenal function tests										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 6.15	Describe the abnormalities of kidney, liver, thyroid and adrenals	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pathology, General Medicine	Physiology, Human Anatomy
		1 Describe the abnormalities of kidney								
		2 Describe the abnormalities of liver								
		3 Describe the abnormalities of thyroid								
4 Describe the abnormalities of adrenal glands										

Topic: 7 Molecular Biology

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain	Level	Core (Y/N)	Suggested Teaching	Suggested Assesment	Number Required	Vertical	Horizontal
BI 7.1	Describe the structure and functions of DNA and RNA and outline the cell cycle.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce			
		1 Define Purines								
		2 Define Pyrimidines								
		3 Define nucleosides								
		4 Enlist metabolically important nucleosides								
		5 Explain nucleoside analogs								
		6 Define nucleotides								
		7 Define purine nucleotides								
		8 Define pyrimidine nucleotides								
		9 Enlist purine nucleotides								
		10 Enlist pyrimidine nucleotides								
		11 Describe Structure of RNA								
		12 List types of RNA								
		13 Differentiate between prokaryotic and Eukaryotic RNA								
		14 Describe function of RNA								
		15 Describe structure of DNA								
		16 Describe the organization of DNA								
		17 Describe the functions of DNA								
		18 Describe the properties of DNA								
		19 Differentiate between DNA & RNA								
		20 Describe packaging of genome								
		21 Enlist types of sequences in DNA								
		22 Explain DNA repair								
		23 Explain DNA combination								
		24 Describe DNA Denaturation								
25 Explain cell cycle										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level (K/KH/SH/P)	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 7.2	Describe the processes involved in replication & repair of DNA and the transcription & translation mechanisms.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce			
		1 Define replication								
		2 List types of replication								
		3 List factors required for replication								
		4 Describe replication event/process								
		5 Explain Telomere replication								
		6 Describe post replicative modification of DNA								
		7 Describe fidelity of replication								
		8 Describe DNA replication in prokaryotes								
		9 Describe DNA replication in eukaryotes								
		10 Enlist inhibitors of replication								
		11 Enumerate clinical significance of DNA replication								
		12 Explain DNA Damage								
		13 Explain DNA Repair								
		14 List causes of DNA damage								
		15 Explain types of DNA damage								
		16 Explain mechanisms of DNA repair								
		17 Explain types of DNA repair								
		18 Define the clinical aspect of DNA repair								
		19 Discuss xeroderma pigmentosa								
		20 List disorders of DNA repair								
		21 Define DNA recombination								
		22 List types of recombination of DNA								
23 Define site specific recombination of DNA										

24	Define transposition of DNA
25	Define gene conversion of DNA
26	Define Transcription
27	List Enzymes of transcription
28	Explain the process of transcription
29	Explain the regulation of RNA synthesis
30	Explain clinical aspects of transcription
31	Describe the post transcriptional modifications
32	Define reverse transcription
33	Describe significance of reverse transcription
34	Describe features of genetic code
35	List the techniques for analysis of mutation
36	Define translation
37	Describe role of ribosomes in translation
38	Enumerate factors required for translation
39	Describe process of translation
40	Describe regulation of translation
41	List inhibitors of translation
42	Describe translation in prokaryotes
43	Describe translation in Eukaryotes
44	Describe the post translational modifications of protein
45	Describe the significance of post translational modifications
46	Describe the targeting of protein for secretory pathway
47	Describe targeting of protein for plasma membrane
48	Describe targeting of protein for sub cellular organelles
49	Describe different mechanisms involved in protein folding
50	Describe the biomedical importance of protein folding
51	Describe biochemical defects in prion diseases

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Number		Specific Learning Objective (K/S/A-c)	Domain	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 7.3	Describe gene mutations and basic mechanism of regulation of gene expression.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pediatrics	
		1 Define mutation								
		2 Enumerate causes of mutation								
		3 Describe different types of mutation with suitable examples								
		4 List chemical mutagens								
		5 List techniques for analysis of mutation								
		6 Describe regulation of gene expression in Eukaryotes								
		7 Describe the regulation of gene expression in prokaryotes								
		8 Describe operon model of gene expression								
		9 Describe Lac operon model of gene expression								
		10 Describe tryptophan operon model of gene expression in prokaryotes								
		11 Describe the regulation of gene expression in prokaryotes								
12 Describe catabolite repression										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 7.4	Describe applications of molecular technologies like recombinant DNA technology, PCR in the diagnosis and treatment of diseases with genetic basis.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Pediatrics, General Medicine	
		1 Define the recombinant DNA technology								
		2 Describe the enzymes used in recombinant DNA Technology								
		3 Describe vectors used in recombinant DNA technology								
		4 Define hosts used in recombinant DNA technology								
		5 Describe isolation of nucleic acids								
		6 Describe electrophoresis of nucleic acids								
		7 Describe hybridization techniques								
		8 Describe DNA sequencing								
		9 Describe polymerase chain reaction								
		10 Describe restriction fragment polymorphism (RFLP)								
		11 Define DNA fingerprinting								
		12 Define DNA footprinting								
		13 Define DNA cloning								
		14 Discuss the human genome project								
		15 Discuss the Bioinformatics								
		16 Describe the medical applications of recombinant biotechnology								
		17 Describe the medical applications of molecular biology techniques								
18 Enlist the different molecular biology techniques										

Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integregration	Horizontal Integregration
BI 7.5	Describe the role of xenobiotics in disease	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce			Physiology
		1 Describe different types of reaction involved in metabolism of xenobiotics with examples								
		2 Describe major organs involved in detoxification								
		3 List factors affecting biotransformation								
		4 Describe biomedical importance of therapeutic drug monitoring								
		5 Describe biomedical importance of drug over dosage								
		6 List the drug of abuse								
		7 Describe biochemical bases of drug abuse								
		8 Enlist the features of alcohol abuse								
		9 Describe the metabolic changes induced by ethanol								
		10 Describe the metabolism of alcohol								
		11 Describe the biochemical consequences of ethanol metabolism								
		12 Describe the importance of occupational and industrial hazards								
		13 Describe biomedical importance of toxicants in food								
14 Discuss lead toxicity										

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Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 7.6	Describe the anti-oxidant defence systems in the body.	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce			
		1 Define free radicals								
		2 Describe the enzyme involved in the generation of free radicals								
		3 Describe the reactions involved in free radical generation								
		4 Define intracellular signaling of free radicals								
		5 Describe the cellular defense mechanisms								
		6 Define the respiratory bursts								
		7 List harmful free radicals								
		8 Define Antioxidants								
		9 Define the action of antioxidants								
		10 Enumerate types of antioxidants								
		11 Describe the types of antioxidant systems								
		12 Describe the enzymes involved in antioxidant system								
		13 Describe interrelationship between antioxidant and reactive oxygen species (ROS)								
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain K/S/A/C	Level K/KH/SH/P	Core (Y/N)	Suggested Teaching Learning Method	Suggested Assesment Method	Number Required to Certify P	Vertical Integration	Horizontal Integration
BI 7.7	Describe the role of oxidative stress in the pathogenesis of conditions such as cancer, complications of diabates and atherosclerosis	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine, Pathology	Physiology
		1 Define oxidative stress correctly								
		2 Define a prooxidant correctly								
		3 Discuss of role of oxidative stress in pathogenesis of cancer								
		4 Discuss role of oxidative stress in pathogenesis of diabetes mellitus								
		5 Discuss role of oxidative stress in pathogenesis of atherosclerosis								

Topic: 8 Nutrition										
Number	Competency	Specific Learning Objective (K/S/A-c)	Domain	Level	Core (Y/N)	Suggested Teaching	Suggested Assesment	Number Required	Vertical	Horizontal
B18.1	Discuss the importance of various dietary components and explain importance of dietary fibre	At the end of session the phase I MBBS students must be able to:-	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine, Pediatrics, Pathology	
		1 Define Nutrients								
		2 Classify nutrients								
		3 Describe the function of macronutrients								
		4 Define dietary fibre								
		5 Discuss the biochemical importance of dietary fibre								
6 Describe specific dynamic action										
B18.2	Describe the types and cause of protein energy malnutrition and its effects	At the end of session the phase I MBBS students must be able to:	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine, Pediatrics, Pathology	
		1 Define malnutrition								
		2 Describe the different types of malnutrition								
		3 Describe the causes of protein energy malnutrition								
4 Discuss the effects of protein energy malnutrition										
B18.3	Provide dietary advice for optimal health in childhood and adult, in disease conditions like diabetes mellitus, coronary artery disease and pregnancy	At the end of session the phase I MBBS students must be able to:	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine	
		1 Define balanced diet								
		2 Describe balanced diet for optimal health in childhood								
		3 Describe balanced diet for optimal health in adults								
		4 Describe balanced diet for a diabetec Patient								
		5 Describe balanced diet for coronary artery disease patient								
6 Describe balanced diet in Pregnancy										
B18.4	Describe the cause (including dieatry Habits), effects and health risks associated with being overweight/obesity	At the end of session the phase I MBBS students must be able to:	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		General Medicine, Pathology	
		1 Define obesity								
		2 Define the Basal Metabolic Rate								
		3 Classify obesity								
		4 Describe the causes of obesity								
		5 Describe the effects of obesity								
6 Describe the complications associated with obesity										
B18.5	Summarize the nutritional importance of commonly used items of food including fruits and vegetables (macromolecules and its importance)	At the end of session the phase I MBBS students must be able to:	K	KH	Y	Lecture, small group Discussion	Written/Viva Voce		Community Medicine, General Medicine, Pediatrics	
		1 Describe the nutritive value of commonly used cereals								
		2 Describe the nutritive value of commonly used fruits								
		3 Describe the nutritive value of nonvegetarian food items								
		4 Describe the nutritive value of milk and milk products								
		5 Describe the nutritive value of lipids								
		6 Describe the glycaemic index of various foods								
7 Describe total parenteral nutrition (TPN)										