University of Diyala
College of Medicine
Dept. of Chemistry and Biochemistry -
Schedule of Curriculum-
Subject-biochemistry

Year Students: 2022-2023
Total weeks of the course 15
Theory hours: 90
Practical hours 60
Units of teaching: 8

Week	Subject (Theory)	objectives	Hours	Practical	objectives	Hours
1	Introduction to Carbohydrate metabolism	- Identify the major saccharides found in the human body and diet. - What is the process of carbohydrate metabolism. - Draw diagram of how glucose transported across intestinal epithelial cells and into the blood stream and describe the protein involved.	3	Laboratory safety.	- To make the students aware about the possible safety issue. - To describe the ideal appearance and attitude of the student during the lab time. - To describe the proper costume that the students should ware during the lab time. - To lean the students what they should do in case of accident.	2
2	Glyco lysis	- Describe the overall purpose of glycolysis, its cellular reactants and products, its cellular localization and its tissue distribution. - Describe the roles of HK/ GK, PFK and PK in glycolysis. - Describe the purpose of the reaction catalyzed by LDH. - Predict the results of a CBC in a person with PK deficiency who is in hemolytic crisis.	3	Collection and handling of blood samples.	- To Describe how to obtain blood samples. - To demonstrate blood draw. - To identify the ideal blood draw sites. - To learn the student what are the blood collection tubes available and which one they should use for each group of tests. - To teach the students what is the anti-coagulant tubes and how does it work.	2

3	TCA Cycle	- Describe the overall purpose of the TCA cycle , its reactants and products ,its cellular localization and its tissue distribution. - Explain the effect of the ATP and citrate on the activity of the TCA cycle. - Describe the role of the TCA Cycle intermediates as sources of reactants for biosynthetic pathways.	3	Collection and handling of urine samples	- To describe what is the properties of the urine - To make the student appreciated the importance of urine analysis - To learn the student the procedure followed to analyse urine sample - What is the basic types of clinically used urine samples?	2
4	Gluconeogenesis	- Differentiate the enzymes involved in glycolysis and gluconeogenesis. - Explain the contribution of gluconeogenesis to blood glucose regulation. - Evaluate the relative importance of different precursors for gluconeogenesis in feeding, fasting and exercise. - Describe the overall purpose of gluconeogenesis, its reactants and products, its cellular localization, and its tissue distribution.	3	Analytical techniques and instrumentation.	- To demonstrate what kind of instrument we used in clinical biochemistry lab. - The explain the principles of each device - Explain the basic concepts of each device - Explain the possible mistake in using in these devices.	2
5	Glycogen metabolism	- Describe the overall purpose of gluconeogenesis and glycogenolysis, their reactants and products, their cellular localization and their tissue distribution. - Explain how glycogen synthesis and glycogenolysis are regulated by insulin, glucagon and catecholamine's. - Select laboratory tests that would contribute to the diagnosis of glycogen storage disease.	3	Glucose.	- Explain the importance of Glucose test - Describe the principles of glucose test - The types of glucose test and the reference range - The clinical significance of glucose test	2

					- Cause and consequence of hyper- and hypo-glycemia	
6	Pentose phosphate pathway	- Describe the overall purpose of the PPP, its reactants and products and its cellular localization. - Describe the role of reduced glutathione in the body. - Explain the biochemical basis of the drug induced hemolytic anemia observed in G6PD deficiency. - Select laboratory tests used to diagnose G6PD deficiency.	3	HbA1c	- Explain the importance of Glucose test - Describe the principles of glucose test - The types of glucose test and the reference range - The clinical significance of glucose test - Cause and consequence of hyper- and hypo-glycemia	2
7	Diabetes Mellitus	- Compare and contrast type 1 and type 2 diabetes mellitus with respect to incidence, age of onset and distinguishing characteristics. - Describe abnormalities in blood glucose homeostasis in patients with type 1 diabetes. - Recognize the clinical presentation of type 1 diabetes mellitus. - Discuss how lifestyle factors impact the development of type 2 diabetes.	3	Glucose tolerance test (GTT)	- Explain the importance of GTT test and what is the result means. - Explain in which health conditions the test should order. - Describe the principles of GGT test. - Learn the student what is the GGT reference range and the interpretations the result for diabetes and non-diabetes patients - The clinical significance of GGT test	2

					- what is the pre-test preparations.	
8	Ethanol metabolism	- Identify the metabolic products of ethanol metabolism including acetyl CoA . - Evaluate the metabolic effects and clinical significance of ethanol and its metabolites. - Explain the biochemical basis for the effects of alcohol ingestion on gluconeogenesis. - Generate aproblem list with potential biochemical causes of hypoglycemia , hepatomegaly or lactic acidosis.	3	Insulin and Glucagon.	- Explain the importance of Insulin and Glucagon test and what is the result means. - Explain why the doctor's order Insulin and Glucagon test. - Describe the principles of Insulin and Glucagon test - Learn the student what is the Insulin and Glucagon reference range and the interpretations the result for diabetes and non-diabetes patients - The clinical significance of Insulin and Glucagon test - what is the pre-test preparations.	2
9	G6PD Deficiency	- Describe the characteristics feature of hemolytic anemia. - Identify G6PD genetic variant. - Recognize the clinical manifestation of G6PD deficiency. - Describe diagnosis of G6PD deficiency. - Discuss the treatment of G6PD deficiency.	3	C-peptide	- Explain the importance of C-peptide test and what is the result means. - Explain why the doctor's order C-peptide test. - Describe the principles of C-peptide test - Learn the student what is the C-peptide reference range and the interpretations the result for diabetes and non-diabetes patients - The clinical significance of C-peptide test	2

					- What is the pre-test preparations.	
10	Inborn errors of metabolism	- Definition of inborn error of metabolism. - Sample collection procedure. - Molecular basis of urea cycle disorders. - Genetic basis of phenylketonuria.	3	Plasma lipids and lipoproteins (Cholesterol and Triglyceride).	- Explain the importance of Cholesterol and Triglyceride test and what is the result means. - Explain why the doctor's order Cholesterol and Triglyceride test. - Describe the principles of Cholesterol and Triglyceride test - Learn the student what is the Cholesterol and Triglyceride reference range. - The clinical significance of Cholesterol and Triglyceride test - What is the pre-test preparations.	2
11	Digestion and absorption of protein	- Identify types of protein. - Describe digestion of protein by gastric secretion. - Illustrate the action of rennin. - Discuss the intestinal secretion of protein.	3	Plasma lipids and lipoproteins (HDL, LDL, and VLDL).	- Explain the importance of HDL, LDL, and VLDL test and what is the result means. - Explain why the doctor's order HDL, LDL, and VLDL test. - Describe the principles of HDL, LDL, and VLDL test - Learn the student what is the HDL, LDL, and VLDL reference range. - The clinical significance of HDL, LDL, and VLDL test	2

					- What is the pre-test preparations.	
12	Mineral metabolism	- Definition of minerals. - Definition of trace element. - Illustrate factors that promote calcium absorption. - Describe function of calcium. - Discuss causes of hypercalcemia.	3	Protein and albumin.	- Explain the importance of Protein and albumin test and what is the result means. - Explain why the doctor's order Protein and albumin test. - Describe the principles of Protein and albumin test. - Learn the student what is the Protein and albumin reference range. - The clinical significance of Protein and albumin test	2
13	Lipid metabolism	- Differentiate the contribution of diet and endogenous synthesis to lipid levels. - Describe the pathway of fatty acid synthesis. - Describe the synthesis of triglycerides. - Distinguish the composition of different sphingolipids.	3	G6PDH	- Explain the importance of G6PDH test and what is the result means. - Explain why the doctor's order G6PDH test. - Describe the principles of G6PDH test . - Learn the student what is the G6PDH reference range.	2

					- The clinical significance of G6PDH test	
14	Fatty acid synthesis	- Describe the pathway of fatty acid synthesis. - Distinguish the effect of the feeding, fasting, exercise and hormonal regulation on body lipid. - Describe endocrine function of adipose tissue.	3	Kidney function test (Urea Test)	- Explain the importance of Urea test and what is the result means. - Explain why the doctor's order Urea test. - Describe the principles of Urea test. - Learn the student what is the Urea reference range. - The clinical significance of Urea test	2
15	Beta -oxidation ,cholesterol and ketone bodys	- Describe the mechanism for activation and transport of fatty acids into mitochondria for catabolism. - Outline the sequence of reactions involved in oxidation of fatty acids in mitochondria. - Explain the mechanism for the formation of KBs and identify the physiological and pathological roles of those molecules. - Distinguish the mechanisms by which cholesterol biosynthesis is	3	Kidney function test (Creatinine Test)	- Explain the importance of Creatinine test and what is the result means. - Explain why the doctor's order Creatinine test. - Describe the principles of Creatinine test. - Learn the student what is the Creatinine reference range.	2

		regulated by hormones and food intake.			- The clinical significance of Creatinine test.	
16	Amino acids and protein	- Describe factors affecting nitrogen balance in health and disease. - Describe the biosynthesis of melanin and catecholamine's hormones from essential amino acids. - Describe the biosynthesis of EAAs and NEAAs from intermediates of glycolytic pathway and TCA cycle. - Describe the role of folic acid. - Compare and contrast dopamine levels in Parkinson's disease. - Describe the role of tyrosinase in albinism. -	3	Gout (Uric acid Test)	- Explain the importance of Uric acid test and what is the result means. - Explain why the doctor's order Uric acid test. - Describe the principles of Uric acid test - Learn the student what is the Uric acid reference range. - The clinical significance of Uric acid test	
17	Urea cycle	- Describe the reactions of the urea cycle. - List the causes of hyperammonemia and treatments to reduce blood ammonia levels. - Identify the connections and common intermediates between the urea cycle and TCA cycle. -	3	Liver function test LFT (Protein synthesis (albumin))	- Explain the importance of albumin test in LFT and what is the result means. - Explain why the doctor's order albumin test for patient has liver disease. - Describe the principles of albumin test - Learn the student what is the albumin reference range. - The clinical significance of albumin test for	2

					patient has liver disease	
18	Porphyrias	- Describe porphyrin and heme synthesis. - Describe the difference between total, direct and indirect bilirubin. - Describe heme catabolism. -	3	Liver function test (Hepatic anion transport (bilirubin))	- Explain the importance of bilirubin test in LFT and what is the result means. - Explain why the doctor's order bilirubin test for patient has liver disease. - Describe the principles of bilirubin test. - What is the difference between direct and in direct bilirubin? - Learn the student what is the bilirubin reference range. - The clinical significance of bilirubin test for patient has liver disease. - How testing direct and indirect bilirubin are important for	2

					distinguish between different types of liver disease.	
19	Vitamins	- Definition of vitamins. - Describe the common classification of vitamins. - Describe the role of vitamin A. - Identify the common problems associated with vitamin A deficiency. -	3	Liver function test (Hepatocellular integrity (GOT and GPT)).	- Explain the importance of GOT and GPT test in LFT and what is the result means. - Explain why the doctor's order GOT and GPT test for patient has liver disease. - Describe the principles of GOT and GPT test. - Learn the student what is the GOT and GPT reference range. - The clinical significance of GOT and GPT test for patient has liver disease	2
20	Water soluble vitamins	- List the water soluble vitamins. - Discuss the problems associated with vitamin B deficiency. - List the causes of vitamin B deficiency. -	3	Liver function test (Presence of cholestasis (alkaline phosphatase ALP))	- Explain the importance of ALP test in LFT and what is the result means. - Explain why the doctor's order ALP test for patient has liver disease. - Describe the principles of ALP test. - Learn the student what is the ALP reference range.	2

					- The clinical significance of ALP test for patient has liver disease.	
21	Disorders of the hypothalamus and pituitary	- Introduction to endocrinology. - Identify the common factors which regulate the release of anterior pituitary hormone. - Describe the hormones that release from the anterior pituitary gland. - Identify clinical problems associated with growth hormone deficiency. -	3	Vitamin (Vitamin D3 Test).	- Explain the importance of Vitamin D3 test and what is the result means. - Explain why the doctor's order Vitamin D3. - Describe the principles of Vitamin D3 test. - Learn the student what is the Vitamin D3 reference range. - The clinical significance of Vitamin D3 test	2
22	Thyroid gland	- Describe the physiology of thyroid gland. - Illustrate the hormones that regulate thyroid hormone secretion. - Discuss thyroid function test. -	3	Trace elements and metals	- Explain the importance of Trace elements and metals test and what is the result means. - Explain why the doctor's order Trace elements and metals test. - Describe the principles of Trace elements and metals test. - Learn the student what is the Trace elements and metals test reference range.	2

					- The clinical significance of Trace elements and metals test	
23	Thyroid gland disease	- Definition of hypothyroidism. - Describe symptoms of hypothyroidism. - Identify the pathophysiology of hypothyroidism. - Diagnosis of hypothyroidism. - Describe factors contribute to hypothyroidism. - Identify the causes of hyperthyroidism. - Pathophysiology of hyperthyroidism. - Describe laboratory investigation of hyperthyroidism. - Describe the treatment of hyperthyroidism.	3	Electrolytes (Calcium)	- Explain the importance of Calcium test and what is the result means. - Explain why the doctor's order Calcium test. - Describe the principles of Calcium test. - Learn the student what is the Calcium test reference range. - The clinical significance of Calcium test.	2
24	Biological membrane and transport	- Describe the function of cell membrane. - Meaning of transport function. - Types of transport mechanisms. - Describe the factors that influence diffusion rates. - Describe osmolarity and tonicity. -	3	Electrolytes (Sodium)	- Explain the importance of Sodium test and what is the result means. - Explain why the doctor's order Sodium test. - Describe the principles of Sodium test. - Learn the student what is the Sodium test reference range.	2

					- The clinical significance of Sodium test.	
25	Liver	- Describe major function of the liver. - Identify the substance that are excreted by the liver. - Describe how jaundice occur. - Describe why unconjugated bilirubin occur. - Identify the disease of the liver. -	3	Electrolytes (Potassium)	- Explain the importance of Potassium test and what is the result means. - Explain why the doctor's order Potassium test. - Describe the principles of Potassium test. - Learn the student what is the Potassium test reference range. - The clinical significance of Potassium test.	2
26	Kidney	- General description of kidney. - Describe the function of kidney. - Identify the causes of impaired renal function. -	3	Electrolytes (Chloride)	- Explain the importance of Chloride test and what is the result means. - Explain why the doctor's order Chloride test. - Describe the principles of Chloride test. - Learn the student what is the Chloride test reference range.	2

					- The clinical significance of Chloride test	
27	Renal Failure	- Definition of acute kidney injury. - Identify the diagnostic feature of acute kidney injury. - Describe the phases of acute kidney injury. - Identify the investigation of low urinary output. - Describe the classification of chronic kidney injury. -	3	Thyroid Function test T3, T4 and TSH	- Explain the importance of T3, T4 and TSH test and what is the result means. - Explain why the doctor's order T3, T4 and TSH test. - Describe the principles of T3, T4 and TSH test. - Learn the student what is the T3, T4 and TSH test reference range. - The clinical significance of T3, T4 and TSH test.	2
28	Cancer and its consequences	- General definition of cancer. - Describe how tumor growth effect on body organs. - Illustrate the symptoms of tumor. - Describe why renal failure occure in patient with tumor. - Identify cancer treatment and its consequences. -	3	Lipase and Amylase.	- Explain the importance of Lipase and Amylase test and what is the result means. - Explain why the doctor's order Lipase and Amylase test. - Describe the principles of Lipase and Amylase test. - Learn the student what is the Lipase and Amylase test reference range.	2

					- The clinical significance of Lipase and Amylase test.	
29	Tumor marker	- Definition of tumor marker. - Illustrate uses of tumor marker. - Identify types of tumor marker. -	3	Cardiac marker (CPK)	- Explain the importance of CPK test and what is the result means. - Explain why the doctor's order CPK test. - Describe the principles of CPK test - Learn the student what is the CPK test reference range. - The clinical significance of CPK test	2
30	Nutrition	- Definition of nutrition . - Illustrate how trauma and sepsis effect on nutrition of individual . - Definition of starvation and under nutrition . - Describe nutrintional assessment .	3	Cardiac marker (Troponin)	- Explain the importance of Troponin test and what is the result means. - Explain why the doctor's order Troponin test. - Describe the principles of Troponin test - Learn the student what is the Troponin test reference range. - The clinical significance of Troponin test	2
