Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University) Coimbatore-641 043

Bachelor's Degree Examination – April/May 2019

Semester II

Class : I UG **Time :3 hours**
Major : Physician Assistant **Max. Marks: 10**

18BPAI02 - DSE-II Clinical Biochemistry

Part-A **10 x 1=10**
Choose the correct answer

1. Glassware used to measure 24-hour urine volumes is a:

a. volumetric flask b. beaker c. Erlenmeyer cylinder d. graduated cylinder

2. The destruction of all micro-organisms including spores is called:

a. sanitation b. antisepsis c. sterilization d. disinfection

3. Which of the following is less likely to occur in type II diabetics as opposed to type I diabetics

a. Retinopathy b. Weight gain c. Cardiovascular disease d. Hypoglycemic coma

4. Von Gierke's disease is charecterised by deficiency of which enzyme?

a. glucokinase b. glucose-6-phosphatase
c. glycogen synthase d. fructokinase

5. Pancreatic juice does not contain which of the following?

a. Bile salts b. phospholipase A2 c. lipase and colipase d. lipoprotein lipase

6. The dietary fats are transported as

a. Micelles b.chylomicrons
c. fatty acid – albumin complex d. liposomes

7. Function of proteins is to

a. transport oxygen to hemoglobin b. catalyze biochemical reactions
c. regulate reactions d. all of above

8. Phenyl ketonuria results from the inherited deficiency of

a. tyrosinase b. histidase c. phenyl alanine hydroxylase d.amylase

9. Which of the following hormones promotes hypoglycemia

a. epinephrine b. norepinephrine c. glucagon d.insulin

10. The enzyme predominantly elevated in viral hepatitis is

a.ALT b.AST c. LDH d.CK

Part B **5 X 6=30**

Answer the following

Answer should not exceed 400 words or two pages

11.a. Interpret the normal values of any five biochemical parameters

(or)

11.b. Give a short note on specimen collection by taking any two examples

12.a. Briefly explain about glucose tolerance test

(or)

12.b. Explain the importance of glycosylated hemoglobin

13.a.What do you mean by atherosclerosis? Explain.

(or)

13.b. Briefly explain the classification of lipoprotein

14.a. Interpret the clinical features of gout

(or)

14.b. Give a short note on albinism

15.a. Discuss the clinical significance of phosphatases

(or)

15.b. Discuss the clinical significance of transaminases

Part C **5 x 12=60**

Answer the following

Answer should not exceed 800 words or four pages

16.a. Illustrate the procedure involved in the collection of urine and feces

(or)

16.b. Explain how clinical samples are preserved for various tests in laboratory

17.a. Discuss the types, metabolic changes and complications of diabetes mellitus

(or)

17. b. Explain the consequences of fructose and lactose intolerance

18.a. Analyse the hypo and hyperlipoproteinemia

(or)

18. b. Explain any two inborn errors of metabolism

19.a. Assess the metabolic changes and clinical features of alkaptonuria and maple syrup urine disease

(or)

19. b. Discuss the plasma proteins and their variations in disease

20.a. Describe the importance of amylase

(or)

20. b. Explain the clinical significance of creatine phosphokinase

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Bachelor's Degree Examination – April 2019

II Semester

Class : UG **Time :3 hours**
Major : Physician Assistant **Max. Marks: 10**

18BPA102 - DSE-II Clinical Biochemistry - Answer Key

Part-A **10 x 1=10**
Choose the correct answer

1. d. graduated cylinder
2. c. sterilization
3. d. Hypoglycemic coma
4. b. glucose-6-phosphatase
5. a. Bile salts
6. b.chylomicrons
7. d. all of above
8. c.phenyl alanine hydroxylase
9. d.insulin
10. b.AST

Part B **5 X 6=30**
Answer the following
Answer should not exceed 400 words or two pages

11. a. Laboratory tests are procedures wherein a sample of blood, urine, other bodily fluid or tissue are checked in order to know more about a person's health. The results of the test will show if a person is within the normal lab values. According to the Food and Drug Administration (FDA), normal lab test values are a set of upper and lower limits generally given as a range since normal values vary from person to person. Laboratory tests are commonly administered in discovering the cause of symptoms, confirming a diagnosis and screening for diseases. The information obtained from the test can also help rule out, asses and monitor the progression of a disease and plan for treatment. All laboratory test results should be interpreted within the context of the patient's general health and must be used with additional exams or tests. There are many factors that can affect lab results including sex, age, race, medical history and general health. Food, drugs, laboratory techniques and changes in laboratories may also affect results. In most cases, patients are advised to defer from drinking, eating and taking medication several hours before the tests. The FDA is the regulating body in charge of the development and marketing of laboratory tests that use test kits and equipment commercially manufactured in the United States. Once approved, federal and state agencies ensure that test materials and equipment meet manufacturing and use standards. Any two parameters can be explained with their normal limits.

11.b. Proper specimen collection and handling is an integral part of obtaining a valid and timely laboratory test result. Specimens must be obtained in the proper tubes or containers, correctly labeled, and then promptly transported to the laboratory. Physicians and others responsible for obtaining specimens and transporting them to the laboratory have a vital role in ensuring that laboratory test results are valid. The following are essential safeguards for your patients. 1. Avoid patient identification errors - 2. Draw the tubes in the proper sequence - 3. Use proper containers for collection - 4. Mix all tubes ten times by gentle inversion immediately after collection - 5. Do not decant specimens from one type of container into another - 6. Deliver specimens to the laboratory promptly - For specimens drawn off campus - Laboratory specimen storage temperature requirements - 7. Avoid hemolysis - 8. Drawing samples from a line

12. a. A glucose tolerance test measures how well your body's cells are able to absorb glucose (sugar) after you consume a specific amount of sugar.Doctors use fasting blood sugar levels and hemoglobin A1c values to diagnose type 1 and type 2 diabetes as well as prediabetes.Doctors primarily use a glucose tolerance test to diagnose diabetes during pregnancy (called gestational diabetes).Doctors often diagnose type 1 diabetes quickly because it usually develops rapidly and involves high blood sugar levels and symptoms.Type 2 diabetes, on the other hand, often develops over years. Type 2 diabetes is the most common form of diabetes, and it usually develops during adulthood.Gestational diabetes occurs when a pregnant woman who hasn't had diabetes before pregnancy has high blood sugar levels as a result of the pregnancy. Who needs a glucose tolerance test? - Preparing for a glucose tolerance test - During the test - Oral glucose tolerance test for diabetes - Gestational diabetes testing - Risks of a glucose tolerance test - Results of glucose tolerance test - After the glucose tolerance test

12.b. Glycosylated Hemoglobin Test (Hemoglobin A1c) - Hemoglobin is the substance inside red blood cells that carries oxygen to the cells of the body. Glucose (a type of sugar) molecules in the blood normally become stuck to hemoglobin molecules - this means the hemoglobin has become glycosylated (also referred to as hemoglobin A1c, or HbA1c). As a person's blood sugar becomes higher, more of the person's hemoglobin becomes glycosylated. The glucose remains attached to the hemoglobin for the life of the red blood cell, or about 2 to 3 months. - A blood test can measure the amount of glycosylated hemoglobin in the blood. The glycosylated hemoglobin test shows what a person's average blood glucose level was for the 2 to 3 months before the test. This can help determine how well a person's diabetes is being controlled over time.

13.a. Atherosclerosis -- hardening and narrowing of the arteries -- silently and slowly blocks arteries, putting blood flow at risk.- It's the usual cause of heart attacks, strokes, and peripheral vascular disease -- what together are called cardiovascular disease.- Causes - Plaque Attacks - Coronary artery disease : Cerebrovascular disease Peripheral artery disease- Who Gets This –Prevention – Treatment - Lifestyle changes: Medication: Angiographyand stenting: Bypass surger

13.b. Lipoproteins are classified based on their density, electrophoretic mobility, and nature of apoprotein content. Based on their density, lipoproteins can be classified into chylomicrons, very low-density lipoproteins (VLDL), intermediate density lipoproteins (IDL), low-density lipoproteins (LDL), and high-density lipoproteins (HDL).

14.a. Gout is a common and complex form of arthritis that can affect anyone. It's characterized by sudden, severe attacks of pain, swelling, redness and tenderness in the joints, often the joint at the base of the big toe. - An attack of gout can occur suddenly, often waking you up in the middle of the night with the sensation that your big toe is on fire. The affected joint is hot, swollen and so tender that even the weight of the sheet on it may seem intolerable. Gout symptoms may come and go, but there are ways to manage symptoms and prevent flares. Symptoms - Intense joint pain. Lingering discomfort. Inflammation and redness. Limited range of motion. Causes - Risk factors - Diet. Obesity.Medical conditions. Certain medications. Family history of gout. Age and sex. Recent surgery or trauma.Complications - People with gout can develop more-severe conditions, such as:Recurrent gout. Advanced gout. Kidney stones. Prevention - During symptom-free periods, these dietary guidelines may help protect against future gout attacks:Drink plenty of fluids. Limit or avoid alcohol. Get your protein from low-fat dairy products. Limit your intake of meat, fish and poultry. Maintain a desirable body weight. Symptoms & causes - Diagnosis & treatment

14.b. Albinism is a rare group of genetic disorders that cause the skin, hair, or eyes to have little or no color. Albinism is also associated with vision problems. Types of albinism include: Oculocutaneous albinism (OCA) Ocular albinism Hermansky-Pudlak syndrome causes risk for albinism symptoms of albinism- diagnosis

15.a. Acid phosphatase (EC 3.1.3.2, acid phosphomonoesterase, phosphomonoesterase, glycerophosphatase, acid monophosphatase, acid phosphohydrolase, acid phosphomonoester hydrolase, uteroferrin, acid nucleoside diphosphate phosphatase, orthophosphoric-monoester phosphohydrolase (acid optimum)) is a phosphatase, a type of enzyme, used to free attached phosphoryl groups from other molecules during digestion. It can be further classified as a phosphomonoesterase. Acid phosphatase is stored in lysosomes and functions when these fuse with endosomes, which are acidified while they function; therefore, it has an acid pH optimum. This enzyme is present in many animal and plant species. Different forms of acid phosphatase are found in different organs, and their serum levels are used to evaluate the success of the surgical treatment of prostate cancer. In the past, they were also used to diagnose this type of cancer.It's

also used as a cytogenetic marker to distinguish the two different lineages of Acute Lymphoblastic Leukemia(ALL) : B-ALL (a leukemia of B Lymphocytes) is Acid-Phosphatase negative , T-ALL (originating instead from T Lymphocytes) is acid-phosphatase positive. Acid phosphatase catalyzes the following reaction at an optimal acidic pH (below 7):

Orthophosphoric monoester + $H_2O \rightarrow$ alcohol + H_3PO_4

Phosphatase enzymes are also used by soil microorganisms to access organically bound phosphate nutrients. An assay on the rates of activity of these enzymes may be used to ascertain biological demand for phosphates in the soil. Some plant roots, especially cluster roots, exude carboxylates that perform acid phosphatase activity, helping to mobilise phosphorus in nutrient-deficient soils. Certain bacteria like Nocardia, can degrade this enzyme and utilize it as a carbon source.

15.b. Transaminases or aminotransferases are enzymes that catalyze a transamination reaction between an amino acid and an α-keto acid. They are important in the synthesis of amino acids, which form proteins. Types-Functions. Diagnostic uses

Part C **5 x 12=60**

Answer the following
Answer should not exceed 800 words or four pages

16.a. To collect a stool sample:

- label the container with your name, date of birth and the date
- place something in the toilet to catch the stool, such as a potty or an empty plastic food container, or spread clean newspaper or plastic wrap over the rim of the toilet
- make sure the sample doesn't touch the inside of the toilet
- use the spoon or spatula that comes with the container to place the sample in a clean screw-top container and screw the lid shut
- if you've been given a container, aim to fill around a third of it – that's about the size of a walnut if you're using your own container
- put anything you used to collect the sample in a plastic bag, tie it up and put it the bin
- wash your hands thoroughly with soap and warm running water

If you can't hand the stool sample in immediately, you should store it in a fridge, but for no longer than 24 hours. Place the container in a sealed plastic bag first. For example, a stool sample can be tested to help diagnose: gastroenteritis - inflammatory bowel disease

Diagnosis requires collection of urine generally by 1 of 4 methods: sterile urine bag, urethral catheterization (CATH), suprapubic aspiration (SPA), or clean-catch (CC). Both CATH and SPA are thought to yield the most reliable results by minimizing false-positive results, but these methods are invasive and painful. Random Specimen- First Morning Specimen- Midstream Clean Catch Specimen- Timed Collection Specimen- Catheter Collection Specimen- Suprapubic Aspiration Specimen- Pediatric Specimen- Preservatives for Urinalysis

16.b. Sample preservation is the measure or measures taken to prevent reduction. or loss of target analytes. Analyte loss can occur between sample collection. and laboratory analysis because of physical, chemical, and biological. The most common fixative is formaldehyde, or a formaldehyde and water solution known as formalin. Some specimens may not be fixed before being submersed in the fluid preserve. The fluid preserve: The preserve is commonly alcohol, either ethanol or isopropyl alcohol.The embalming fluid that is used contains formaldehyde. ... Formalin, on the other hand, is a liquid solution that contains formaldehyde. Formalin is a liquid we have used in biology class to preserve our biological specimens.

17.a. Diabetes mellitus (DM), commonly referred to as diabetes, is a group of metabolic disorders in which there are high blood sugar levels over a prolonged period. Symptoms of high blood sugar include frequent urination, increased thirst, and increased hunger. If left untreated, diabetes can cause many complications. Acute complications can include diabetic ketoacidosis, hyperosmolar hyperglycemic state, or death. Serious long-term complications include cardiovascular disease, stroke, chronic kidney disease, foot ulcers, and damage to the eyes.[Prevention and treatment involve maintaining a healthy diet, regular physical exercise, a normal body weight, and avoiding use of tobacco. Control of blood pressure and maintaining proper foot care are important for people with the disease. Type 1 DM must be managed with insulin injections. Type 2 DM may be treated with medications with or

without insulin. Insulin and some oral medications can cause low blood sugar. Weight loss surgery in those with obesity is sometimes an effective measure in those with type 2 DM. Gestational diabetes usually resolves after the birth of the baby. Types - Signs and symptoms –_Complications-_Causes-Prevention-_Management-_Lifestyle-_Medications

17.b. Sugars such as lactose and fructose are simple carbohydrates that your body can use as a quick source of energy. But some people are unable to consume these sugars because they lack the specific enzymes that break them down in the digestive tract or have other problems digesting the sugars. If you have fructose and lactose intolerance, knowing which foods are free of these sugars and safe to eat is an important goal in managing your diet and staying healthy. Foods to Avoid

18.a. Hypolipoproteinemia, hypolipidemia, or hypolipidaemia (British English) is a form of dyslipidemia that is defined by abnormally lowered levels of any or all lipids and/or lipoproteins in the blood. It occurs through genetic disease (namely, Hypoalphalipoproteinemia and Hypobetalipoproteinemia), malnutrition, malabsorption, wasting disease, cancer, hyperthyroidism, and liver disease. Causes-Diagnosis- Critical illness- Treatment Hyperlipidemia is abnormally elevated levels of any or all lipids or lipoproteins in the blood. It is the most common form of dyslipidemia (which includes any abnormal lipid levels). Lipids (water-insoluble molecules) are transported in a protein capsule. The size of that capsule, or lipoprotein, determines its density. The lipoprotein density and type of apolipoproteins it contains determines the fate of the particle and its influence on metabolism. Hyperlipidemias are divided into primary and secondary subtypes. Primary hyperlipidemia is usually due to genetic causes (such as a mutation in a receptor protein), while secondary hyperlipidemia arises due to other underlying causes such as diabetes. Lipid and lipoprotein abnormalities are common in the general population and are regarded as modifiable risk factors for cardiovascular disease due to their influence on atherosclerosis. In addition, some forms may predispose to acute pancreatitis. Classes- Causes- Diagnosis- Critical illness- Treatment.

18.b. Inborn errors of metabolism form a large class of genetic diseases involving congenital disorders of metabolism. The majority are due to defects of single genes that code for enzymes that facilitate conversion of various substances (substrates) into others (products). In most of the disorders, problems arise due to accumulation of substances which are toxic or interfere with normal function, or to the effects of reduced ability to synthesize essential compounds. Inborn errors of metabolism are now often referred to as congenital metabolic diseases or inherited metabolic disorders. The term inborn errors of metabolism was coined by a British physician, Archibald Garrod (1857–1936), in 1908. He is known for work that prefigured the "one gene-one enzyme" hypothesis, based on his studies on the nature and inheritance of alkaptonuria. His seminal text, Inborn Errors of Metabolism was published in 1923 Classification- Signs and symptoms-diagnosis-treatment

19.a. Alkaptonuria (AKU) is a rare disorder of autosomal recessive inheritance. It is caused by a mutation in a gene that results in the accumulation of homogentisic acid (HGA). Characteristically, the excess HGA means sufferers pass dark urine, which upon standing turns black. This is a feature present from birth. Over time patients develop other manifestations of AKU, due to deposition of HGA in collagenous tissues, namely ochronosis and ochronotic osteoarthropathy. Although this condition does not reduce life expectancy, it significantly affects quality of life. The natural history of this condition is becoming better understood, despite gaps in knowledge. Clinical assessment of the condition has also improved along with the development of a potentially disease-modifying therapy. Furthermore, recent developments in AKU research have led to new understanding of the disease, and further study of the AKU arthropathy has the potential to influence therapy in the management of osteoarthritis. Maple syrup urine disease (MSUD) is an autosomal recessive metabolic disorder affecting branched-chain amino acids. It is one type of organic acidemia. The condition gets its name from the distinctive sweet odor of affected infants' urine, particularly prior to diagnosis, and during times of acute illness- Signs and symptoms- Infants- Later onset- Causes-Diagnosis Classification-prevention – management- Maple syrup urine disease (MSUD) is an autosomal recessive metabolic disorder affecting branched-chain amino acids. It is one type of organic acidemia. The condition gets its name from the distinctive sweet odor of affected infants' urine, particularly prior to diagnosis, and during times of acute illness- Signs and symptoms-Infants- Later onset- Causes- Diagnosis- Classification-prevention – management

19.b. Plasma protein. albumin, fibrinogen, prothrombin, and the gamma globulins, which constitute 6% to 7% of the blood plasma. Proteins maintain osmotic pressure, increase blood viscosity, and help maintain blood pressure. All the plasma proteins except the gamma globulins are synthesized in the liver. Serum albumin accounts for 55% of blood proteins, and is a major contributor to maintaining the oncotic pressure of plasma to assist in the transport of lipids and steroid hormones. Globulins make up 38% of blood proteins and transport ions, hormones, and lipids assisting in immune function. Plasma proteins play a dominant role in the pathogenesis of a variety of diseases and clinical syndromes. The names of some proteins have become the names of diseases, e. g., agammaglobulinemia, cryoglobulinemia, and macromolecular syndrome. Consequently, at least slight familiarity with plasma proteins is essential nowadays for the understanding of many diseases and for the diagnosis and intelligent therapy of some.

20.a. Amylase is an enzyme that catalyses the hydrolysis of starch into sugars. Amylase is present in the saliva of humans and some other mammals, where it begins the chemical process of digestion. Amylase is an enzyme that catalyses the hydrolysis of starch into sugars. Amylase is present in the saliva of humans and some other mammals, where it begins the chemical process of digestion. Foods that contain large amounts of starch but little sugar, such as rice and potatoes, may acquire a slightly sweet taste as they are chewed because amylase degrades some of their starch into sugar. The pancreas and salivary gland make amylase (alpha amylase) to hydrolyse dietary starch into disaccharides and trisaccharides which are converted by other enzymes to glucose to supply the body with energy. Plants and some bacteria also produce amylase. As diastase, amylase is the first enzyme to be discovered and isolated (by Anselme Payen in 1833).Specific amylase proteins are designated by different Greek letters. All amylases are glycoside hydrolases and act on α-1,4-glycosidic bonds. Classification- Uses- Hyperamylasemia

20.b. Creatine phosphokinase (a.k.a., creatine kinase, CPK, or CK) is an enzyme (a protein that helps to elicit chemical changes in your body) found in your heart, brain, and skeletal muscles. When muscle tissue is damaged, CPK leaks into your blood. In tissues and cells that consume ATP rapidly, especially skeletal muscle, but also brain, photoreceptor cells of the retina, hair cells of the inner ear, spermatozoa and smooth muscle, PCr serves as an energy reservoir for the rapid buffering and regeneration of ATP in situ, as well as for intracellular energy transport by the PCr shuttle or circuit. Thus creatine kinase is an important enzyme in such tissues.Clinically, creatine kinase is assayed in blood tests as a marker of damage of CK-rich tissue such as in myocardial infarction (heart attack), rhabdomyolysis (severe muscle breakdown), muscular dystrophy, autoimmune myositides, and acute kidney injury