CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF BACHELOR OF SCIENCE IN BIOCHEMISTRY

BIOC 417: MEDICAL BIOCHEMISTRY

STREAMS: BSc. BIOCHEMISTRY Y4 S2 **TIME: 2 HOURS**

DAY/DATE: MONDAY 20/04/2020 **8.30 A.M – 10.30 A.M.**

INSTRUCTIONS

- Answer Question One and any other Two Questions
- Do not write anything on the question paper

QUESTION ONE [30 MARKS]

	Normal Reference Ranges for Males
Hemoglobin	12 – 15.5 g/dl
Serum albumin	3.5 – 5.0 g/ml
Serum folic acid	3 – 20ng /ml
Serum ferritin	40 -200 ng/ml
Vitamin B12	180 – 914 pg /ml
Blood pH	7.37 – 7.43

a.In the hospital, it was learned that Mr. Maputo had lost 32 lb in the 8 months since his last visit to his family physician. On admission, his hemoglobin was 10.7 g/dL, his serum ferritin was 4 ng/mL, and other hematologic indices that reflect nutritional status were also abonormal. His serum folic acid level was 0.9 ng/Ml. His vitamin B12 level was 190 pg/mL and his serum albumin was 3.2 g/dL. Deducing from normal reference ranges in the table above, explain what these values obtained from the patient are indicative of. [5 Marks]

b. A patient with cirrhosis is having mental status changes owing to elevated ammonia levels in his blood. His diet is mainly constituting ethanol, lipids, proteins, carbohydrates and water

soluble vitamins. In prescribing a diet to reduce ammonia production in this patient, which class of nutrients should be most restricted? Explain. [5 Marks]

c. Mr. Ivan's total cholesterol level is now 315 mg/dL, slightly higher than his previous level of 296 mg/dL. His triacylglycerol level is 250 mg/Dl, LDL is 210 mg/Dl, and HDL is 27 mg/dL. Explain what this lipid levels indicate and the most probable consequence they may have on Ivan. [5 Marks]

d. Dianne had an elevated blood glucose level of 684 mg/Dl. What is the molar concentration of glucose in Dianne's blood ? [5 Marks]

e. The laboratory reported that Dianne's blood pH was 7.08. What was the $[H^+]$ in her blood compared with the concentration at a normal pH of 7.4 ? [5 Marks]\

f. Describe he clinical applications of aspartate aminotransferase (AST) and indicate the normal reference values in males and females. [5 Marks]

QUESTION TWO [20 MARKS]

a. Differentiate between total bilirubin and direct bilirubin and hence provide the normal reference ranges. [5 Marks]

b. Describe blood urea nitrogen test and creatinine test as measures of kidney function. [7 Marks]

c. Describe the differences between urea clearance test and urine osmolality test and hence explain the impact of protein diet on the test results. [8 Marks]

QUESTION THREE [20 MARKS]

a. Describe biochemical basis of sickle cell anemia. [10 Marks]

b. Explain the mechanism through which sickle cell trait confers partial protection against *plasmodium falciparum.* [10 Marks]

QUESTION FOUR [20 MARKS]

a. Describe the molecular basis, laboratory values and clinical features associated with a Thalassemia syndrome. [10 Marks]

b. Describe Osmotic Fragility Test (OFT) as a screening technique for thalassemia. [10 Marks]

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