



**THIRD-YEAR, SECOND SEMESTER EXAMINATIONS
FOR THE DEGREE OF
BACHELOR OF MEDICAL LABORATORY SCIENCES**

SCHOOL: Public Health, Biomedical Sciences and Technology

DEPARTMENT: Medical Laboratory Sciences

COURSE: BML 322 **COURSE TITLE:** Systemic Clinical Chemistry

DATE: 11TH DECEMBER 2020

TIME: 8.00 -10.00AM

General Instructions

- Exam duration is **2 Hrs**
- This paper has sections A, B and C and carries a maximum of Sixty(60) marks
- Answer the questions under each sections according to the accompanying instructions
- Answer the questions on the provided MMUST examinations booklets
- Identify yourself by your only your university registration number
- Write your university registration number on each page you write an answer to the questions

SECTION A: MULTIPLE CHOICE QUESTIONS (MCQs)

- **This section has fifteen (15) questions carrying a maximum of twenty (20) marks**
 - **Indicate the correct answer by circling the corresponding to the concerned options**
 - **Use only your university registration number to identify yourself on the examination booklets you use to answer all the questions**
1. In emergent technological advances in chemical pathology, an increasingly requested hepatobiliary dysfunction marker is the *International Normalized Ratio* (INR). Truth about this is that it
 - (a) Measures hepatocellular biosynthetic functional status
 - (b) Is based on measurement of prothrombin time
 - (c) Enables diagnosis of cholestatic hepatobiliary disease
 - (d) It indicates the status of the hepatocellular detoxifying ability
 2. Suppose a clinician sought your opinion as to the most specific diagnostic marker kidney ability of the kidney to promote blood solute and fluid balance. Which of the following renal function biomarkers would you recommend?
 - (a) Serum creatinine
 - (b) Glomerular filtration rate (GFR)
 - (c) Blood urea
 - (d) Blood urea nitrogen (BUN)
 3. A laboratory requisition for the pathological laboratory test profile, Renal Function Tests (RFTs) yielded results: Urinary protein +, Normal serum levels; Serum Creatinine and Urea, Normal; Na⁺, slight hypernatraemia, with normal chlorides and potassium. These results point towards
 - (a) Normal renal function
 - (b) Likelihood of urethral trauma
 - (c) Possible glomerular damage
 - (d) Likely adrenal cortex hypo-function
 4. With regard to the test profile for the laboratory diagnosis diabetes mellitus mediated myocardial disease the analytes with deranged assay values besides, blood glucose, cholesterol, cardiac troponins will include the pair
 - (a) Serum triglycerides, high density lipoprotein
 - (b) Serum low density lipoprotein level, Serum brain natriuretic peptide level
 - (c) Serum aspartate aminotransferase (AST) activity, Serum acid phosphatase activity
 - (d) Plasma Alkaline phosphatase activity, Lactate dehydrogenase activity
 5. Abnormally high concentration of fecal fat, indicates steatorrhea, associated with lipid intestinal malabsorption mostly secondary to various conditions, like
 - (a) Biliary tract lithiasis
 - (b) Pancreatic bicarbonates secretion insufficiency
 - (c) Inability of gastric parietal cells to produce HCL
 - (d) Ulceration of the gastric mucosa
 6. Functional interconnections among body organs is the norm. In this regard microcytic hypochromic anaemia, in the absence of intestinal hookworm infestation (Ancylostomiasis) could be due to gastric problem?
 - (a) Autoimmune ulceration of gastric mucosae

- (b) Bicarbonate secretion challenges by gastric surface
 - (c) Excessive HCL absorption by gastric mucosae
 - (d) Inadequate HCL production
7. Renal hypertension is to be suspected in the face of which of the following laboratory test results?
- (a) Hyperkalaemia, Hyperglycaemia, Albuminuria
 - (b) Hypochloraemia, Hypernatraemia, Hyperuraemia
 - (c) Hypernatraemia, Hyperchloaemia, Hyperuraemia
 - (d) Lowered serum creatinine, hypernatraemia, hypochloraemia
8. Clinical chemistry provides non-invasive means of screening for malignancy through tumor marker detection, and regarding the hepatobiliary and gastrointestinal structures
- a) α -fetal protein is a hepatic tumor marker
 - b) The Carcinoembryonic antigen suggests colonic carcinoma
 - c) Alkaline phosphatase activity can denote prostate cancer
 - d) Elevated blood β -fetal protein levels signal gastric wall carcinoma
9. Thyroid gland dysfunction maybe diagnosed from certain changes in blood chemistry, and
- a) Elevated serum iodine levels may signal euthyroidism
 - b) Hyperthyroidism follows thyroid tissue inflammation
 - c) Grave's disease arises from increased TSH levels
 - d) Thyroid hormones include TSH and TBG
10. In the thyroid dysfunction Hashimoto's disease common experience is that
- a) One of its features is reduction in T₃ and T₄ levels
 - b) It is a form of thyroid malignancy
 - c) This is the leading cause hypothyroidism
 - d) Its most commonly provoked by thyroid autoantibodies
11. In endocrine chemical pathology, the truth about antimicrobial (antiperoxidase) antibody
- a) Is a marker for pituitary gland underproduction of thyroid stimulating hormone
 - b) Is linked to hypothyroidism
 - c) Massively stimulates hormone synthesis
 - d) Suppresses thyrotoxicosis behind goitre
12. Cerebrospinal fluid (CSF) chemical analysis is a basic investigation for the cause of unexplainable coma, and the laboratory features, "slightly cloudy and colorless, with normal glucose and trace protein levels, and mainly lymphocytic leukocytosis, suggests diagnosis for
- a) Bacterial meningitis
 - b) Mechanical trauma to the meninges
 - c) Fungal invasion of the CNS
 - d) Viral meningitis
13. Intracranial bleeding can involve subarachnoid haemorrhage, accompanied with **chemical meningitis**, meningeal inflammation manifesting as acute severe headache. In this case the CSF assay profile could have the features
- a) Discoloration due to erythrocytosis
 - b) Lowered glucose concentration
 - c) Normal chemistry with leukocytosis
 - d) Elevated total protein from resultant Hb

14. A routine urinalysis profile with ketonuria, zero glucose, trace protein, low P^H and haematuria could mean
- Urinary bladder trauma with carbohydrate starvation
 - Bacterial infection with diabetes mellitus
 - Possible urethral non-pyogenic bacterial infection from fasting urine
 - An indeterminate diagnosis in the absence of further tests
15. In neoplasm chemical pathology, a number of oncofetal glycoproteins have been found helpful investigations for certain cancers
- These proteins are useful in cancer screening
 - The proteins include the prostate specific antigens (PSA)
 - Human chorionic gonadotropin is one of the markers
 - ELISA-based techniques are unsuitable for their assay

SECTION B: SHORT ANSWER QUESTIONS (SAQs)

Instructions

- This section has EIGHT (8) questions carrying a maximum of FORTY (40) marks**
- Answer all the questions**
- Answer the questions in the university examination booklets provided**

Q1. Immunoassays currently comprise the commonly preferred technology in laboratory biochemical testing for oncofetal tumor markers.

- What is there about the chemistry of these substances that suits them for immunoassay (**2 marks**)
- Why is assay for these substances employed only for cancer screening, but rather are for confirming diagnosis and monitoring therapy (**2 marks**)

Q2. Suppose a routine urinalysis profile was obtained consisting of elevated SG, ketonuria, proteinuria and glucosuria.

- Why would accompaniment of such a urinalysis profile with elevated serum urea and electrolytes suggest possible renal complication concurrent of diabetogenic cardiovascular pathology? (**4 marks**)
- What are any four (4) additional biochemical investigations (**2marks**)

Q3. Indicate in no more than five (5) sentences why gastric ulceration (peptic ulcers) is one of the causes of iron deficiency and hence microcytic, hypochromic anaemia necessary (**4marks**)

Q4. In the investigation coma of unknown aetiology, it is common to estimate serum urea and electrolytes, among others.

- What would be the pathological condition targeted by the two assays in the investigation of the comatose case? (**4marks**)
- What confirmatory biochemical test (s) would you find necessary for the condition for which these initial tests are meant to investigate, and why? (**4Marks?**)

Q5. Explain the role of dyslipidaemia in the aetiology of myocardial infarction (**4marks**)

Q6. Bilirubin assay is a basic diagnostic test in hepatobiliary chemical pathology

- What are the two basic differences between *Direct* and *Indirect* bilirubin variants? (**3Marks**)
- Which of the two variants would you expect to find in urine and under what clinical situation? (**4marks**)

Q7. What is the connection between vitamin D deficiency and blood calcium levels? (**3 marks**)

Q8. By what mechanism does deranged glucose metabolism cause vascular sclerosis? (4marks)

SECTION C: LONG ANSWER ESSAY QUESTIONS (LAQs)

Instructions

- This section has two long answer questions carrying a maximum of FOURTY(40) marks
- Answer all the questions

Question (1):

(a) Suppose the biochemical laboratory assay results for an adult patient with a history of chronic alcohol and injecting substance abuse were: *Severe jaundice without bilirubinuria and no urobilinogenuria, plus severe hypoproteinaemia.*

- What is the likely diagnosis for this patient's condition? (4marks)*
- What other biochemical investigations would be necessary to firm up your suspicion as to the diagnosis for the patient's condition, and what would be the possible findings?(4marks)*
- What would you propose as the pathophysiochemical explanations for your findings above? (4marks)*

Question 2: In connection with the known biliary-intestinal function inter-linkage, especially food digestion and nutrient absorption, a certain adult patient presented to the gastroenterologist with a history of chronic diarrhea. This physician requested for laboratory biochemical investigations, proving the information:

Ho: Chronic loose frothy stool, persistent passaging of deeply yellow/greenish urine and a general feeling of illness; no evidence of intravascular hemolysis. Accompanying abdominal CT scan suggests biliary lithiasis.

?Dx: Steatorrhoea due to Cholestasis arising from possible biliary Lithiasis

- Define the terms *Steatorrhoea, Lithiasis* (2marks)
- Describe the pathophysiological interconnection among the clinical conditions to which the terms refer (6marks)
- What are the principal biochemical diagnostic parameters (biomarkers) the gastroenterologist should target in the requisition for laboratory investigation of the patient's condition, and why? (10marks)
- What principal findings should you generate for the investigations on the biomarkers were you to confirm the provisional clinical diagnosis of *steatorrhoea due to cholestasis arising from possible biliary lithiasis, and why?* (10marks)