



KISII UNIVERSITY
UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF
BACHELOR OF CLINICAL MEDICINE AND COMMUNITY HEALTH
THIRD SEMESTER 2022/2023
[MAY-AUGUST, 2023]

PATH 212: CLINICAL BIOCHEMISTRY

STREAM: Y2S3

TIME: 2 HOURS

DAY: MONDAY, 2:00 – 5:00 PM

DATE: 31/07/2023

INSTRUCTIONS

1. Do not write anything on this question paper.

This exam comprises of two Papers (1 &2)

Paper 1 has two sections (A & B);

Answer all questions in section A and two in section B

Paper 2; Answer all questions in this paper

PAPER 1

SECTION A: SHORT ESSAY QUESTIONS **(60**

MARKS)

Answer all questions in this section

1. Discuss the catabolism of heme (10 marks)
2. Briefly explain any 5 hematological changes that occur in disease (10 marks)
3. A patient with a history of gall stones presents with severe abdominal pain. His bilirubin levels are 139 $\mu\text{mol/l}$ (RR 3-20)
 - i. List 4 possible causes of the observed bilirubin result (4 marks)
 - ii. Describe the two types of bilirubin that could be present in plasma (6 marks)
4. a) Define hemostasis (2 marks)
b) Describe 2 disorders of the fibrinolytic system and biochemical tests that can be used to diagnose the mentioned disorders (8 marks)

5. List 5 cardiac enzymes and explain their clinical relevance (10marks)
6. Explain the clinical significance of the following biochemical tests
- a) UECs (5marks)
 - b) TSH levels (2marks)
 - c) Lipid profile (3marks)

SECTION B: ESSAY QUESTIONS

40 MARKS

Answer any two questions only

1. a) Define diabetic ketoacidosis (DKA) and explain its 3 possible causes (8 marks)
- b) Describe the biochemical tests that can be useful in clinical laboratory investigation for the diagnosis of either hyperglycemic or hypoglycemic status of an individual (12 marks)
2. Electrolytes are essential components in the human body and are of great clinical significance. Justify this statement (20 marks)
3. a). Describe any 2 thyroid abnormalities and explain the biochemical tests can be performed to diagnose them (10 marks)
- b) Describe how fluid volume is regulated and maintained in the body (10 marks)

PAPER II:

MULTIPLE CHOICE & T/F

This section comprises of sixty questions, each question having four options; MARK the correct one

1. **A 2-year-old child presented with yellow skin, yellow eyes, dark urine and pale stool. Laboratory results showed high levels of direct (conjugated) and indirect (unconjugated) bilirubin in plasma. What would be the most possible diagnosis?**
- a. Prehepatic jaundice
 - b. Hepatic jaundice
 - c. Post hepatic jaundice
 - d. Neonatal jaundice
2. **Storage of polysaccharide made by humans is by**
- a. Amylopectin
 - b. Glycogen

- c. Cellulose
 - d. Collagen
- 3. Which of the following is the main form of hemoglobin present in human adults?**
- a. Hemoglobin B
 - b. Hemoglobin A
 - c. Hemoglobin F
 - d. Hemoglobin S
- 4. The central event of blood coagulation pathways is the production of**
- a) Fibrinogen
 - b) Fibrin stabilizing factor
 - c) Prothrombin
 - d) Tissue Factor
- 5. Which of the following is NOT an inhibitor of coagulation?**
- a) Protein S
 - b) Protein C
 - c) Antithrombin
 - d) Prothrombin
- 6. Activated Partial Thromboplastin Time assesses the integrity of the**
- a) Intrinsic coagulation pathway
 - b) Extrinsic coagulation pathway
 - c) Common coagulation pathway
 - d) All of the above
- 7. Which antibody causes hemolytic disease of the newborn**
- a) IgA
 - b) IgM
 - c) IgG
 - d) IgE
- 8. Insulin is made and secreted by**
- e) Alpha cells
 - f) Beta cells
 - g) Sertoli cells
 - h) Leydig cells
- 9. The HBA1c test is clinically important for**
- a) Diagnosis of diabetes
 - b) Diagnosis of reactive hypoglycemia
 - c) Monitoring blood sugar control in patients having diabetes mellitus
 - d) All of the above

10. Which of the following is NOT a steroid hormone

- a) Thyroxine
- b) Estrogen
- c) Glucocorticoids
- d) Androgens

11. Thyroid stimulating hormone is secreted by

- a) Thyroid gland
- b) Pituitary gland
- c) Hypothalamus
- d) Adrenal gland

12. An amino acid not found in proteins is

- a) β -Alanine
- b) Proline
- c) Lysine
- d) Histidine

13. Which of the following hormones is not elevated in the ovulatory phase of the menstrual cycle?

- a) Luteinizing hormone
- b) Follicle stimulating hormone
- c) Progesterone
- d) Estradiol

14. Body fluid balance is controlled by the following, except

- e) Angiotensin II
- f) Antidiuretic Hormone
- g) Aldosterone
- h) Atrial Natriuretic Peptide

15. Denaturation of proteins results in

- a) Disruption of primary structure
- b) Breakdown of peptide bonds
- c) Destruction of hydrogen bonds
- d) Irreversible changes in the molecule

16. Control of urea cycle involves the enzyme:

- a) Carbamoyl phosphate synthetase
- b) Ornithine transcarbamoylase
- c) Argininosuccinase
- d) Arginase

17. The chief electrolyte in the intracellular fluid is

- a) Sodium
- b) Bicarbonate
- c) Potassium
- d) Chloride

18. Enzymes are NOT

- e) Present in almost all of the body organs, tissues, and the cells
- f) Biocatalysts
- g) Typically carbohydrates
- h) Protein in nature

19. Following myocardial infarction, which of the following cardiac enzymes do you expect to be invariably elevated

- a) Lactate dehydrogenase
- b) Creatine kinase
- c) Myoglobin
- d) Troponin

20. Catabolism of dietary fats initially forms

- a) Triglycerides
- b) Chylomicrons
- c) Low density lipoprotein cholesterol
- d) High density lipoprotein cholesterol

21. Symptoms of hyperglycemia include the following except

- a) Polyuria
- b) Polydipsia
- c) Blurred vision
- d) Weight gain

22. Glucose tolerance is decreased in one of the following disease:

- a. Diabetics insipidus
- b. Addison's disease
- c. Hypo pituitarisme
- d. Diabetes mellitus

23. Enzymes activity is NOT controlled by

- a) pH of the solution
- b) Temperature
- c) Concentration of the substrate
- d) None of the above

24. In carbohydrate metabolism all of the following hormones is involved except:

- a) Glucagon
- b) ACTH
- c) Vasopressin
- d) Insulin

25. Ketosis is generally associated with the disease:

- a. Nephritis
- b. Diabetes Insipidus
- c. Edema
- d. Diabetes mellitus

26. It is a structural analogue of uric acid
- It can prevent uric acid stones in the kidneys
 - It increases the urinary excretion of xanthine and hypoxanthine
 - It is a competitive inhibitor of xanthine oxidase
 - All of these

27. Which of the following enzyme is secreted by the pancreas?

- Myoglobin
- Cytochrome c
- Ribonuclease
- Lysozyme

28. Besides erythroid precursor cells, which of the following is the site for the synthesis of heme?

- Kidney
- Spleen
- Liver
- Heart

29. Urobilinogen is oxidized to form a colored product and these give the characteristic color of urine and feces. In which type of jaundice, the stool color is clay-colored due to the lack of chemical urobilin?

- Hemolytic jaundice
- Viral hepatitis
- Obstructive jaundice
- Alcoholic cirrhosis

30. The following are the endocrine function of the kidney, Except

- Erythropoietin secretion
- Synthesis of Vit D3
- Synthesis of Prostaglandins
- Synthesis of Angiotensin

31. The rate of filtration in the kidney depends on

- Glomerular Permeability
- Capillary hydrostatic pressure
- Oncotic pressure
- All of the above

- 32. What is Creatinine Clearance?**
- a) Is a sensitive marker for urolithiasis
 - b) Is a sensitive marker of tubular function
 - c) Is a sensitive marker of glomerular function
 - d) Is a sensitive marker for measurement of skeletal muscle mass
- 33. Which of the following statement is true regarding renal plasma flow?**
- a) The renal blood flow is approximately 25% of cardiac output
 - b) Vasoconstriction of renal arterioles leads to a decrease in renal blood flow
 - c) Vasodilatation of renal arterioles leads to an increase in renal blood flow
 - d) All of the above
- 34. Fatty liver is caused by the accumulation/deposition of fats in the liver. Which of the following condition is not the likely cause of fatty liver?**
- a) Obesity
 - b) Starvation
 - c) Pregnancy
 - d) Diabetes mellitus
- 35. Which of the following samples is usually taken for the liver function test?**
- a) Blood sample
 - b) Urine sample
 - c) Intestine Biopsy sample
 - d) Sputum sample
- 36. Which of the following statements is true of warfarin?**
- a) competitive antagonist of vitamin
 - b) co-administration of aspirin is safe
 - c) prolonged prothrombin time
 - d) reduced synthesis of coagulation factor VIII.
- 37. Which of the following enzyme is a sensitive marker of alcoholic liver disease?**
- a) Alanine transaminase
 - b) Aspartate transaminase
 - c) Alkaline phosphatase
 - d) Gamma-Glutamyltransferase

- 38. An essential amino acid in man is**
- Aspartate
 - Tyrosine
 - Methionine
 - Serine
- 39. Which one of the following is semi-essential amino acid for humans?**
- Valine
 - Arginine
 - Lysine
 - Tyrosine
- 40. In proteins the α -helix and β -pleated sheet are examples of**
- Primary structure
 - Secondary structure
 - Tertiary structure
 - Quaternary structure
- 41. Zymogen is**
- An intracellular enzyme
 - Serum enzyme
 - A complete extracellular enzyme
 - An inactivated enzyme
- 42. Isoelectric pH of an amino acid is that pH at which it has a**
- Positive charge
 - Negative charge
 - No charge
 - None of these
- 43. RNA does not contain**
- Uracil
 - Adenine
 - Hydroxy methyl cytosine
 - Phosphate
- 44. A polymeric unit of starch which has a branched structure is**
- Glucose
 - Amylopectin
 - Isomaltose
 - Amylose
- 45. Which of the following statements about enzymes or their function is true?**
- Enzymes do not alter the overall change in free energy for a reaction
 - Enzyme are proteins whose three-dimensional structure is key to their function
 - Enzymes speed up reactions by lowering activation energy
 - All of the above
- 46. Before they can react, many molecules need to be destabilized. This state is typically achieved through**
- Changing the three-dimensional structure of molecules
 - Oxidizing the molecules by removing electrons
 - Changing the reaction from biosynthetic to catabolic pathway

- d. The input of small amount of activation energy
- 47. Phospholipid contains**
- Hydrophilic heads and hydrophobic tails
 - Long water soluble carbon chains
 - Positive charged functional groups
 - Both (b) and (c)
- 48. Bile acid is derived from:**
- Cholesterol
 - Amino acids
 - Fatty acids
 - Bilirubin
- 49. Cholesterol is the precursor of**
- Steroid hormones
 - Vitamin A
 - Bile salts
 - Both (a) and (c)
- 50. Insulin enhances the uptake of triacylglycerols in adipose tissues. Which of the following enzyme is activated that facilitates the uptake?**
- Hormone-sensitive lipase
 - Lipoprotein lipase
 - LCAT
 - Apo C-II
- 51. Which of the following is found on RNA but not DNA?**
- Uracil
 - Deoxyribose
 - Phosphate
 - Adenine
- 52. Glycolytic pathway regulation involves**
- Allosteric stimulation by ADP
 - Allosteric inhibition by ATP
 - Feedback, or product, inhibition by ATP
 - All of the above
- 53. Familial hypercholesterolemia is a genetic disorder of cholesterol metabolism. The defect lies in the**
- Transport of cholesterol from extrahepatic tissue to the liver
 - Impairment of cholesterol degradative pathway
 - Impairment of uptake of cholesterol by tissues
 - Impairment of HDL metabolism due to deficiency of Apo-A
- 54. A glucogenic amino acid is one which is degraded to**
- Keto-sugars
 - Either acetyl CoA or acetoacetyl CoA
 - Pyruvate or citric acid cycle intermediates
 - None of the above
- 55. A ketogenic amino acid is one which degrades to**

- a. Keto-sugars
 - b. Either acetyl CoA or acetoacetyl CoA
 - c. Pyruvate or citric acid cycle intermediates
 - d. Multiple intermediates including pyruvate or citric acid cycle intermediates and acetyl CoA or acetoacetyl CoA
- 56. Transamination is the transfer of an amino**
- a. Acid to a carboxylic acid plus ammonia
 - b. Group from an amino acid to a keto acid
 - c. Acid to a keto acid plus ammonia
 - d. Group from an amino acid to a carboxylic acid
- 57. Albumin (69kDa) is the major plasma protein constituting 60% of total plasma proteins. Which of the following is not the function of albumin?**
- a) Maintenance of osmotic pressure
 - b) Binding and transport of fatty acids and bilirubin
 - c) Transport of iron
 - d) Transport of drugs such as sulphonamides
- 58. Lipid catabolism occurs in**
- a. Nuclei
 - b. Cytoplasm
 - c. Mitochondrion
 - d. Golgi apparatus
- 59. The following statements are correct concerning role of co-factor to an enzyme except**
- a. Help in maintaining and producing active structural conformation of the enzyme.
 - b. Formation of E-S complex.
 - c. Are organic in nature
 - d. Accept or donate electrons.
- 60. During glycolysis, electrons removed from glucose are passed to**
- a. FAD
 - b. NAD⁺
 - c. Acetyl CoA
 - d. Pyruvic acid