KISII UNIVERSITY

UNIVERSITY EXAMINATION

FIRST YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN NURSING

SECOND SEMESTER, 2021/2022

MAY 2022

NUR 116: MEDICAL BIOCHEMISTRY II

TIME: 3 HOURS

SECTION A **(20 Marks)**

Attempt all questions

1. Which of the following statement about glycolysis is **correct**?
   (a) Occurs only in mammalian cells
   (b) Occurs in mitochondria
   (c) Occurs in the presence and absence of oxygen
   (d) Occurs when ATP concentration is high

2. What is the best description for the energetics of glycolysis?
   (a) Each step of glycolysis has a negative free-energy change
   (b) Each step of glycolysis has a positive free-energy change
   (c) Overall under typical cellular conditions, glycolysis has a positive free-energy change, though there are steps of both positive and negative free-energy change.
   (d) Overall under typical cellular conditions, glycolysis has a negative free-energy change, though there are steps of both positive and negative free-energy change.

3. A blood sample is taken from a 45 year old man after he has broken his overnight fast by eating three slices of toast and a boiled egg. Which one of the following will be at a higher concentration than if the blood sample had been taken before breakfast?
   (a) Glucose
   (b) Ketone bodies
   (c) Glucagon
   (d) Free fatty acids

4. Which of the following statements about glycogen metabolism is **correct**?
   (a) A key step in the synthesis of glycogen is the formation of UDP-glucose
   (b) Glycogen is stored in the liver and brain
   (c) Insulin inhibits the synthesis of glycogen
   (d) Glucagon increases the synthesis of glycogen

5. What important reducing agent is a vital product of the pentose phosphate pathway?
   (a) NADPH
   (b) NAD+
   (c) NADP+
   (d) NADH

6. What high energy phosphate compound is formed in the citric acid cycle through substrate level phosphorylation?
   (a) ATP
   (b) GTP
   (c) PPI
   (d) TTP

7. Transfer of fatty acids from the cytoplasm to the intra-mitochondrial space involves:
   (a) Choline
   (b) 3-hydroxy-4-trimethylamine-lysine
   (c) Carnitine
   (d) Phosphoarginine

8. Which of the following hormones decreases blood glucose and increases the uptake of glucose in various tissues like skeletal muscle, adipose tissues?
   (a) Insulin
   (b) Cortisol
   (c) Glucagon
   (d) Epinephrine

9. McArdle syndrome involves a deficiency of which of the following enzymes?
   (a) Hepatic phosphorylase
   (b) Debranching enzyme
   (c) Muscle phosphorylase
   (d) Hepatic glycogen synthase

10. β-oxidation of fatty acids in the liver:
   (a) Requires fatty acids with an even number of carbon atoms
   (b) Produces only acetyl-CoA
   (c) Occurs in the mitochondria
   (d) Degrades fatty acids into CO_2 and H_2O

11. Which of the following ketone bodies cannot be metabolized in the human body?
   (a) Acetoacetate
   (b) β-hyrodxybutyrate
   (c) Acetone
   (d) None of the above

12. Dietary lipids are transported from intestinal mucosal cells in form of?
   (a) Chylomicrons
   (b) VLDL
   (c) HDL
   (d) LDL

13. The enzyme that regulates the biosynthesis of cholesterol also serves as the druggable target for the reduction of hypercholesterolemia (increase blood cholesterol). Identify the regulatory enzyme from the following options:
    (a) HMG-CoA synthase
    (b) HMG- CoA reductase
    (c) Lansterol oxidase
    (d) Cholesterol synthase

14. All of the following are intermediates formed by amino acid degradation, ***except*?**
    (a) Citrate
    (b) Fumarate
    (c) Oxaloacetate
    (d) α-Ketoglutarate

15. Histamine is generated from histidine in a process known as?
    (a) Transamination
    (b) Deamination
    (c) Decarboxylation
    (d) Reduction

16. In Maple-syrup urine disease, which of the following compounds is accumulated?
    (a) Homogentisate
    (b) Methylmalonyl-CoA
    (c) Branched chain α-keto acids
    (d) Homocysteine

17. In alkaptonuria, which of the following accumulates abnormally in the urine?
    (a) Phenylalanine
    (b) Acetoacetate
    (c) Fumarate
    (d) Homogentisate

18. The reactions of urea cycle occur in?
    (a) The cytosol
    (b) The mitochondria
    (c) The mitochondrial matrix and the cytosol
    (d) Lysosomes

19. Ammonia that is generated from the deamination of amino acids is highly toxic. In what form is ammonia transported in the blood?
    (a) Valine
    (b) Glutamate
    (c) Glutamine
    (d) Arginine

20. During starvation, blood or tissue levels of all of the following are elevated, **except?**
    (a) Free fatty acids
    (b) Ketone bodies
    (c) Glucagon
    (d) Insulin

SECTION B **(40 marks)**

Attempt all questions

1. Describe the oxidation of the following types of fatty acids:
   a) Odd chain fatty acids (4 Marks)
   b) Unsaturated fatty acids (4 Marks)
2. List the effects of the following eicosanoids on tissues upon which they act:
   a) Prostaglandins (3 Marks)
   b) Leukotriens (1 Mark)
   c) Thromboxanes (1 Mark)
3. In the absence of dietary carbohydrate intake, glycogen is degraded by the human liver to provide glucose. Briefly, describe the process of glycogenolysis. (8 Marks)
4. Calculate the amount of ATP molecules produced in one cycle of the Krebs' cycle. (4 Marks)
5. State the name and functions of four biogenic amines generated by the decarboxylation of amino acids. (8 Marks)
6. Describe the Cori's cycle and state its metabolic significance (7 Marks)

SECTION C **(40 Marks)**

Attempt any two questions

1. Amino acid nitrogen is eliminated from the body in the form of urea. Describe the urea cycle, its regulation and three inborn errors associated with the urea cycle. (20 Marks)
2. Describe how glucose is catabolised to pyruvate and highlight the key regulatory steps. (20 Marks)
3. Explain the metabolic changes that occur during short-term and prolonged starvation. (20 Marks)