MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER

SCHOOL OF PURE, APPLIED AND HEALTH SCIENCES
DIPLOMA IN NUTRITION AND DIETETICS

COURSECODE : DND 1102
COURSE TITLE: BASIC BIOCHEMISTRY

DATE: 31ST MAY, 2021 **TIME: 0830 – 1030 HRS**

INSTRUCTIONS TO CANDIDATES

- section "A " and B is Compulsory
- Answer any Two (2) Questions from Section "C"

This paper consists of 6 printed pages. Please turn over.

SECTION A: ANSWER ALL QUESTIONS (20 Mrks)

1. Which of the following **INCORRECTLY** pairs a metabolic process with its site of occurrence?
   A. Glycolysis - cytosol
   B. Citric acid cycle - outer mitochondrial membrane
   C. ATP phosphorylation - cytosol and mitochondria
   D. Electron transport chain - inner mitochondrial membrane

2. Which of the following is digestible by humans and is made up of only one type of monosaccharide?
   A. Lactose
   B. Sucrose
   C. Maltose
   D. Cellobiose

3. Which of the following enzymes is activated by dephosphorylation?
   A. Glucose 6-phosphatase
   B. UDP-glucose pyrophosphorylase
   C. Glycogen phosphorylase
   D. Glycogen synthase

4. What role does peptidyl transferase play in protein synthesis?
   A. It transports the initiator aminoacyl-tRNA complex.
   B. It helps the ribosome to advance three nucleotides along the mRNA in the 5′ to 3′ direction.
   C. It holds the protein in its tertiary structure.
   D. It catalyses the formation of a peptide bond.

5. Which of the following best characterizes the process of fatty acid synthesis?
   A. Two reductions followed by a dehydration and bond formation.
   B. Reduction followed by activation, bond formation, dehydration, and reduction.
   C. Activation followed by bond formation, reduction, dehydration, and reduction.
   D. Activation followed by bond formation, oxidation, dehydration, and reduction.

6. An α-helix is most likely to be held together by:
   A. Disulfide bonds.
   B. Hydrophobic effects.
   C. Hydrogen bonds.
   D. Ionic attractions between side chains.

7. The unique enzymes of gluconeogenesis are used to circumvent specific irreversible steps of glycolysis. Which of the following correctly pairs an enzyme from glycolysis with its corresponding enzyme(s) used in gluconeogenesis?
   A. Phosphofructokinase-1 / fructose-1, 6-bisphosphatase
   B. Pyruvate dehydrogenase / pyruvate carboxylase and phosphoenolpyruvate carboxykinase
   C. Hexokinase / glucokinase
   D. Pyruvate kinase / glucose-6-phosphatase

8. Which of the following is NOT a type of glycolipid?
   A. Cerebroside
   B. Globoside
   C. Ganglioside
   D. Sphingomyelin

9. Fatty acids enter the catabolic pathway in the form of:
   A. Glycerol.
   B. Adipose tissue.
   C. Acetyl-CoA.
   D. Ketone bodies.

10. Some enzymes require the presence of a nonprotein molecule to behave catalytically. An enzyme devoid of this molecule is called a(n):
   A. Holoenzyme.
   B. Apo enzyme.
   C. Coenzyme.
   D. Zymoenzyme.

11. Where does β-oxidation of fatty acids occur within the cell?
   A. Cytosol
   B. Mitochondria
   C. Smooth endoplasmic reticulum

D. Plasma membrane

12. Topoisomerases are enzymes involved in:
A. DNA replication and transcription.
B. Posttranscriptional processing.
C. RNA synthesis and translation.
D. Posttranslational processing.

13. Kinases are a class of enzymes that incorporate a phosphate onto their substrates. The catalytic activity of kinases classifies them as members of which of the following enzyme families?
A. Hydrolases
B. Isomerases
C. Oxidoreductases
D. Transferases

14. In a neutral solution, most amino acids exist as:
A. Positively charged compounds.
B. Zwitterions.
C. Negatively charged compounds.
D. Hydrophobic molecules.

15. The majority of triacylglycerol stored in adipocytes originates from:
A. Synthesis in the adipocyte.
B. Dietary intake.
C. Ketone bodies.
D. Synthesis in the liver.

16. In a single strand of a nucleic acid, nucleotides are linked by:
A. Hydrogen bonds.
B. Phosphodiester bonds.
C. Ionic bonds.
D. Van der Waals forces.

17. After a large, well-balanced meal, all of the following substances would be expected to be elevated EXCEPT:
A. Fatty acids.
B. Insulin.
C. Glucose.
D. Glucagon.

18. Which one of the following amino acids may be considered a hydrophobic amino acid at physiological pH of 7.4?

A. Arginine
B. Aspartic acid
C. Glycine
D. Isoleucine

19. Which of these statements concerning peptide bonds is **FALSE**?

A. Their formation involves a reaction between an amino group and a carboxyl group.
B. They are the primary bonds that hold amino acids together.
C. They have partial double bond character.
D. Their formation involves hydration reactions.

20. Enzymes increase the rate of a reaction by:

A. Decreasing the activation energy.
B. Increasing the overall free energy change of the reaction.
C. Increasing the activation energy.
D. Decreasing the overall free energy change of the reaction.

SECTION B: Answer ALL questions (40 mrks)

1. Illustrate the components of an enzyme (4 mrks)

2. Show the hydrolysis of ATP and its main product (4 mrks)

3. Elucidate the different classes of carbohydrates (4 mrks)

4. What are biological functions of cholesterol in the human body (4 mrks)

5. What is the basic structure of an amino acid (4 mrks)

6. Discuss the **FOUR** major properties of muscle tissue (4 mrks)

7. Describe the general properties of lysosomal storage disorders (4 mrks)

8. Discuss the disorders associated with growth hormone (4 mrks)

9. Draw a flow diagram of the oxidative phase of pentose phosphate pathway (4 mrks)

10. Elucidate the physical properties of proteins (4 mrks)

SECTION C: Choose only TWO questions (40 mrks)

1a. International Union of Biochemistry and Molecular Biology established six major classes of enzymes. Discuss the biochemical activities of **ALL** the six classes (10 mrks)

b. Lipids carry out different functions depending on the body's metabolic requirements. Use an flow diagram show the lipids function and metabolism summary (10 mrks)

2a. Mineralocorticoid deficiency, glucocorticoid deficiency and Addison's disease are three of the four abnormalities of adrenal hormone secretion. Discuss each of this deficiency (10 mrks)

b. Transcription is one of the four stages in protein synthesis and involves three phases. Name the phases and highlight the biochemical reactions that take place during each of the phases (10 mrks)

3a. Muscles are made up of specialised proteins that facilitate their contractions and relaxation. Discuss the macroscopic structure of skeletal muscles (10 mrks)

b. Nucleic acids are divided into two namely Deoxyribonucleic acids (DNA) and Ribonucleic acid (RNA). Outline the function for the important nucleotides, DNA and RNAs (10 mrks)

4a. Tyrosinaemia is one of the disorders of amino acid metabolism. Discuss in detail this in born error of metabolism (10 mrks)

b. Glycolysis and gluconeogenesis pathways are regulated to allow one to operate at a time. Show the combined mechanism for the regulation of both. (10 mrks)

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