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UNIVERSITY EXAMINATIONS 2023/2024

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MEDICAL LAB

HML 3124: MEDICAL BIOCHEMISTRY

DATE: APRIL 2024 **TIME: 2 HOURS**

INSTRUCTIONS:

Part I: Short Answer Questions

Part II: Long Answer Questions

Part III: Multiple Choice Questions (MCQs

PART I: SHORT ANSWER (40 MARKS)

1. Describe the structure of RNA (6 Marks)
2. Explain the transcription process (6 Marks)
3. Describe the levels of protein structure (6 Marks)
4. Explain the roles of five components of the cell membrane (6 Marks)
5. Draw the chemical structure of a disaccharide (6 Marks)
6. Describe the mechanisms of DNA damage repair (6 Marks)
7. Describe an anomer using chemical structures (4 Marks)

PART II (40 MARKS) – Long Answer questions

1. Enzymes play major roles in diagnosis and treatment of various diseases
   a) Explain the use of enzymes as diagnostic markers (10 Marks)
   b) Describe the forms of enzyme inhibition and their role in therapy (10 Marks)
2. Brian is diagnosed with a genetic disease Y that is caused by a point mutation. Describe the types of point mutations and their effect on amino acid sequence. (10 Marks)
3. Explain the molecular basis of sickle cell disease (10 Marks)

PART III (20 MARKS) – Multiple Choice Questions

1. Witch of the following is a statement of the first law of thermodynamics'?
   a. Energy cannot be created or destroyed. B. The entropy of the universe is decreasing.
   b. The entropy of the universe is constant.
   c. Kinetic energy is stored energy that results from the specific arrangement of matter.
2. Water has the following properties EXCEPT
   a. High heat capacity
   b. Hydrogen bonding
   c. Low dielectric constant
   d. Low heat capacity
3. The mathematical expression for the change in free energy of a system is $\Delta G = \Delta H - T\Delta S$. Which of the following is (are) correct?
   a. ΔS is the change in enthalpy, a measure of randomness.
   b. ΔH is the change in entropy, the energy available to do work.
   c. ΔG is the change in free energy.
   d. T is the temperature in degrees Celsius.
4. The bonds found in DNA between the ribose sugar and the phosphate group is
   a. Glycosidic bond
   b. Phosphordiester bond
   c. Peptide bond
   d. Ester bond

5. Which of the following statements regarding enzymes is true?
    a. Enzymes decrease the free energy change of a reaction.
    b. Enzymes increase the rate of a reaction.
    c. Enzymes change the direction of chemical reactions.
    d. Enzymes are permanently altered by the reactions they catalyze.

6. According to the induced fit hypothesis of enzyme catalysis, which of the following is correct?
    a. The binding of the substrate depends on the shape of the active site.
    b. Some enzymes change their structure when activators bind to the enzyme.
    c. A competitive inhibitor can outcompete the substrate for the active site.
    d. The binding of the substrate changes the shape of the enzyme's active site.

7. A nucleoside consists of
    a. Nitrogenous base
    b. Purine or pyrimidine base + sugar
    c. Purine or pyrimidine base + phosphorous
    d. Purine + pyrimidine base + sugar + phosphorous

8. In RNA molecule guanine content does not necessarily equal its cytosine content nor does its adenine content necessarily equal its uracil content since it is a
    a. Single strand molecule
    b. Double stranded molecule
    c. Double stranded helical molecule
    d. Polymer of purine and pyrimidine ribonucleotides

9. AUG, the only identified codon for methionine is important as
    a. A releasing factor for peptide chains
    b. A chain terminating codon
    c. Recognition site on tRNA
    d. A start codon

10. In biosynthesis ofproteins the stop codons are
    a. UAA, UAG and UGA
    b. UGG, UGU and AGU

c. AAU, and GAU

d. GCG, GCA and GCU

11. The region of DNA known as TATA BOX is the site for binding of

a. DNA polymerase

b. DNA topoisomerase

c. DNA dependent RNA polymerase

d. Polynucleotide phosphorylase

12. Ultraviolet light can damage a DNA strand causing

a. Two adjacent purine residue to form a covalently bounded dimer

b. Two adjacent pyrimidine residues to form covalently bonded dimer

c. Disruption of phosphodiesterase linkage

d. Disruption of non-covalent linkage

13. RNA primer is formed by the enzyme:

a. Ribonuclease

b. Primase

c. DNA polymerase I

d. DNA polymerase Ill

14. Anticodons are present on

a. Coding strand of DNA

b. mRNA

c. tRNA

d. rRNA

15. The following statement is correct about pH

a. pH is the log of hydrogen ion concentration

b. pH and POH must always add up to 14

c. Buffers are useful in preventing fluctuations in pH

d. pH can be calculated if OH concentration is known

16. Phospholipids are important cell membrane components because

a. They have glycerol

b. They can form bilayers in water

c. They have both polar and non polar potions

d. They combine covalently with proteins

17. In some viruses, RNA serves as the storage of genetic materials and DNA is synthesized from RNA by the enzyme known as:

a. DNA synthetase

b. DNA polymerase

c. Reverse transcriptase

d. DNA convertase

18. In humans, the major fat in adipose tissues is

a. Phospholipid

b. Cholesterol

c. Sphingolipids

d. Triacylglycerol

19. In protein structure the a -helix and - pleated sheets are example of

a. Primary structure

b. Secondary structure

c. Tertiary structure

d. Quaternary structure

20. The side chain of which of the following amino acid contain sulphur atom?

a. Methionine

b. Threonine

c. Leucine

d. Tryptophan