



**YILDIZ TECHNICAL UNIVERSITY  
FACULTY OF ELECTRICAL AND ELECTRONICS  
ENGINEERING  
DEPARTMENT OF BIOMEDICAL ENGINEERING**



**BME 2901 – BIOCHEMISTRY  
2020 – FALL**

**MIDTERM II**

Name:

Surname:

1. Given 4 different nucleotide sequences below, answer the following questions:

X) 5'-GCGGGCCAGCCCGAGTGGGTAGCCCAGG-3'

3'-CGCCCGGTCGGGCTCACCCATCGGGTCC-5'

Y) 5'-ATTATAAAATATTTAGATACTATATTTA-3'

3'-TAATATTTTATAAATCTATGATATAAAT-5'

Z) 5'-AGAGCTAGATCGAT-3'

3'-TCTCGATCTAGCTA-5'

W) 5'-AGCTCGTACCGAATGCCCATTAAGGCTAATTGGCATGAATGAC-3'

3'-TCGAGCATGGCTTACGGGTAATTCCGATTAACCGTACTTACTG-5'

a. The two strands of a DNA double helix can be separated by heating. If you raised the temperature of a solution containing the following four DNA molecules, in what order do you suppose they would “melt”? Explain your reasoning. (7 points)

b. If you run those nucleotides in agarose gel electrophoresis, what would you expect to see on the gel? Draw the appearance of the gel if it is easier for you. (8 points)

2. The largest human chromosome (chromosome 1) is about  $2.4 \times 10^8$  bp; it would be about 8 cm long if it were stretched out in the B conformation. During metaphase (when chromosomes are most condensed) chromosome is about 10  $\mu\text{m}$  long. Histone proteins are involved in the packing of DNA. Given that information what properties would you expect histone proteins to have? (5 points)

Hint: Think about interactions histone proteins and DNA might have.

3. In biochemistry laboratory, you were asked to design an experiment to distinguish:

a) RNA and DNA from each other. What properties of DNA and RNA would you suggest to use? (5 points)

b) Glycerophospholipids and sulfolipids from each other. What properties of them would you suggest to use? (5 points)

3. A migratory bird can travel thousands of kilometers to find the best ecological conditions and habitats for feeding, breeding and raising their young. Long distance flights demand intense muscular activity. Thus, migratory birds are physiologically specialized to accumulate massive fat stores (up to 50-60% of body mass), and to transport and oxidize fats at very high rates to sustain flight for many hours or days. Migratory movements are mainly fueled by the oxidation of fatty acids (FA) stored in the form of energy-rich triglycerides in adipose tissue, which is delivered to muscles by the circulatory system. FA chain length, degree of unsaturation, and placement of double bonds can all affect the rate of mobilization, transport, and oxidation of lipid reserves during flight, thus influencing overall flight endurance.

a. Explain the advantages and disadvantages of fat as a stored form of energy for migratory birds. (8 points)

b. Some of those birds, during their flight route, can pass through some extremely cold environments. Explain the advantage of storing fat for those birds. (7 points)

c. How would you expect the fatty acid composition of migratory birds to be in terms of chain length and saturation? Explain. (5 points)

4. Why do you think you feel full for a longer time when you are on a diet rich in fibers? Think in perspective of the composition of those fibers, the bond types they contain and enzymes required to digest them. (10 points)

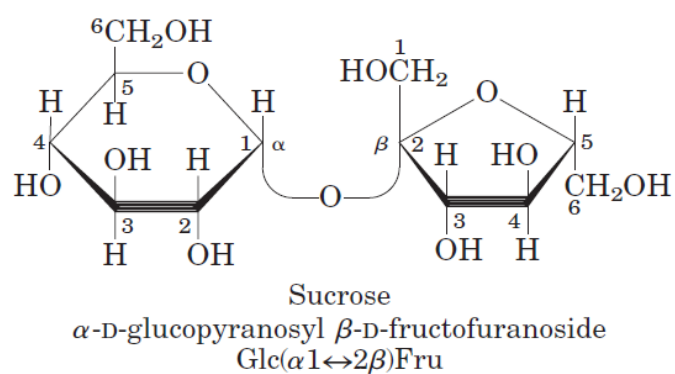
Hint: Ruminant animals have 4 stomach compartments from the same reason.

5. Proteins have N and C terminal and nucleic acids have 5' and 3' ends indicating their directionality. Describe directionality of carbohydrates. (10 points)

6. Olive oil is liquid at room temperature whereas butter is solid. Explain the reason of this difference in their physical state in terms of the structure of lipid molecules they contain. (10 points)

7. Suggest a mechanism for steroid hormones in terms of their function and structure? (10 points)

8.



Given above is the structure of sucrose. It is a disaccharide of glucose and fructose. It is used as table sugar to sweeten our tea, coffee and deserts. Can you detect the concentration of sucrose in a solution by Fehling's test? Why or why not? (10 points)

GOOD LUCK

