

CHEM 2115 Survey of Organic Chemistry

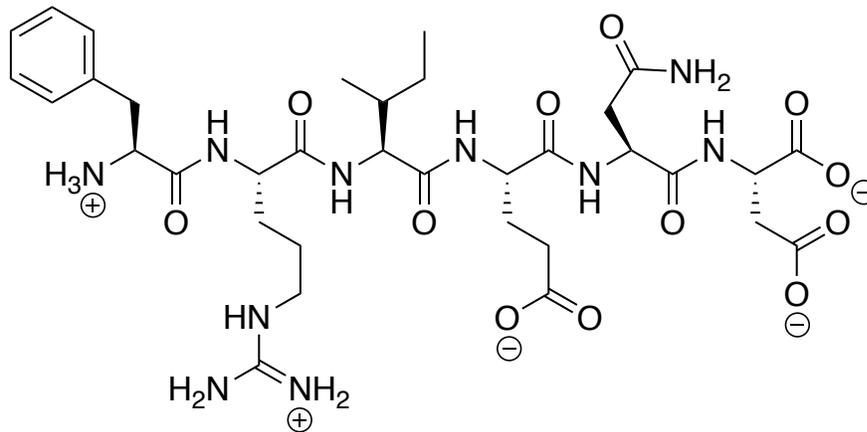
New Mexico State University

Exam 4

April 22nd, 2021

Name \_\_\_\_\_

Question 1. Answer the questions below based on the following polypeptide.



a. From left to right, what is the full name of each amino acid in the sequence above? (12 points)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

b. On the amino acid sequence shown above, label the N-terminus and the C-terminus (2 points).

c. Circle and clearly label one amide in the polypeptide above (2 points)

d. Proteins are described as having 4 levels to their structure. Provide a brief description of each category (4 points).

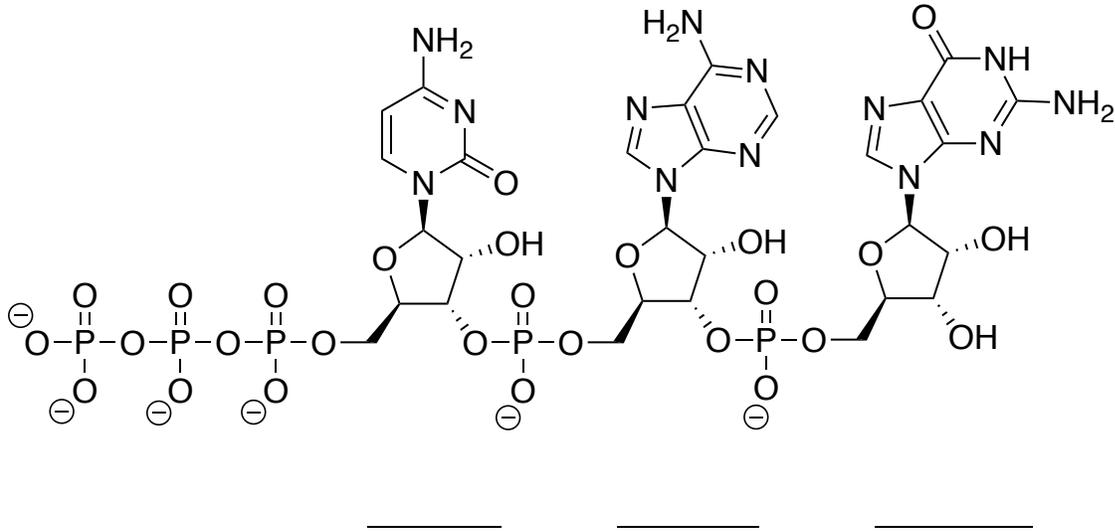
Primary:

Secondary:

Tertiary:

Quaternary:

Question 2. Answer the following questions based on the structure below.



- Identify each nucleic acid with its one letter abbreviation on the lines directly above this question. (6 points).
- Label the 5' and 3' end of the sequence above (2 points).
- Is the molecule above DNA or RNA? How can you tell? (2 points).

d. What would be the complementary nucleic acid sequence? Give the answer from the 5' to the 3' end of the complementary sequence with each nucleic acid abbreviated as the 1 letter abbreviation (6 points).

Complementary sequence

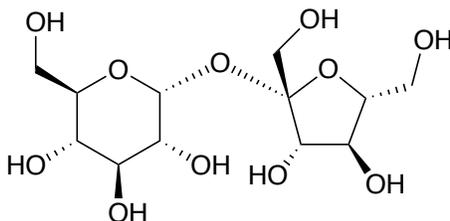
5'

3'

\_\_\_\_\_

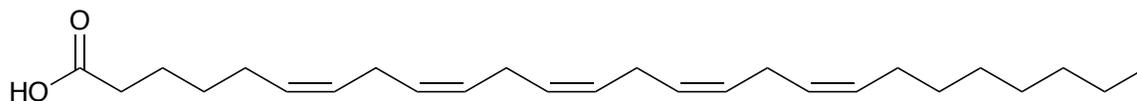
- What type of chemical bond / interaction is integral in holding together 2 strands of DNA? (2 points)
- In the sequence shown above, circle a ribose / sugar unit. (2 points)

Question 3. Sucrose, the scientific name for table sugar, has the chemical structure shown below. Answer the following questions based on this common molecule



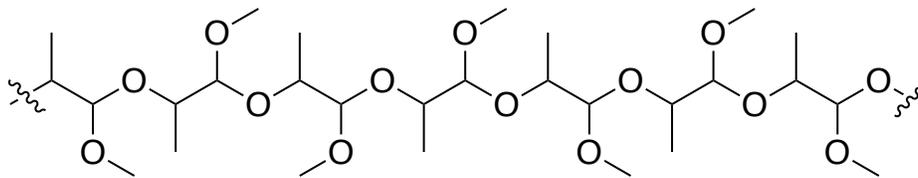
- Is the sugar unit on the left existing in its alpha or beta form? Briefly tell me how you know. (2 points)
- What is the chemical formula of the molecule shown above? (6 points)
- Is the molecule above considered a monosaccharide, disaccharide, trisaccharide or tetrasaccharide? How do you know? (2 points)
- How many stereocenters are in the molecule above? (2 points)
- How many stereoisomers are possible for this molecule? (2 points)
- Draw an arrow to point at the anomeric carbon on the sugar unit on the left in the molecule shown above (2 points).
- Pick any stereocenter from the sugar molecule above, put a star next to it and define it as R or S (2 points).
- As you know, sugars are soluble in water, what functional group is responsible for this property? (2 points)

Question 4. Answer the following questions regarding the molecule shown below.



- The molecule above is an example of what? Be specific (2 points)
- Is the molecule above saturated or unsaturated? How can you tell? (2 points)
- What 2 functional groups are present in the molecule above? (4 points)
- One of these functional groups can exist as *cis* or *trans*, which one is found in the molecule above? (2 points)
- What is the molecular formula for the molecule shown above? (4 points, 6 points possible)
- How does increasing the number of double bonds affect packing and therefore the melting point of a lipid? (3 points).
- What chemical reaction, often performed in food processing, is responsible for the production of *trans* fat? Provide the reagents as we learned them in class (3 points)

Question 5. Answer the questions below based on the polymer shown below

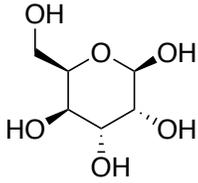


- In the polymer above, circle the smallest repeating unit (2 points).
- Would this be an example of a copolymer or a homopolymer? How can you tell? (2 points)
- How many stereocenters are there in the smallest repeating unit of the polymer? (2 points)
- This is the polymer polymethyl methacrylate, which is used to make plexiglass. Plexiglass is a hard, strong synthetic polymer. What characteristic of polymers can effect the hardness of polymers? Explain how. (5 points).
- Polymethyl methacrylate is formed via free radical polymerization. What are the 2 other types of polymerization we discussed in lecture, and what is the charge associated with each type? (4 points)

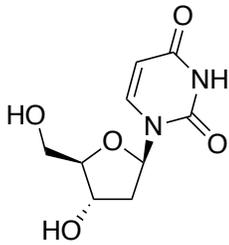
Question 6. Draw a line to match each small unit with the name of its larger unit.

SINGLE UNIT

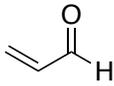
CHAIN OF UNITS



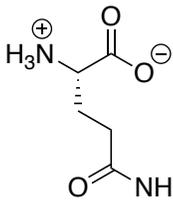
Polymer



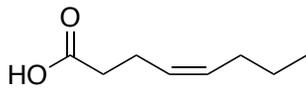
Polysaccharide



Polypeptide

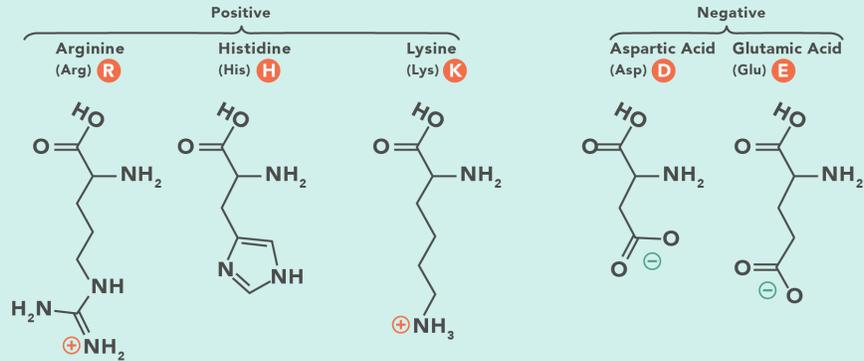


Triglyceride

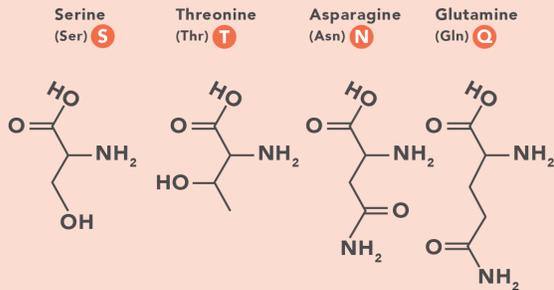


DNA

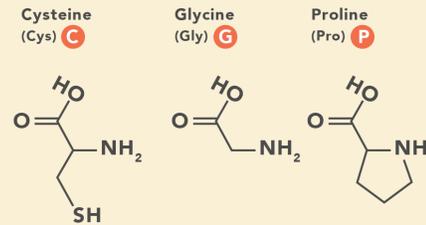
## A. Amino Acids with Electrically Charged Side Chains



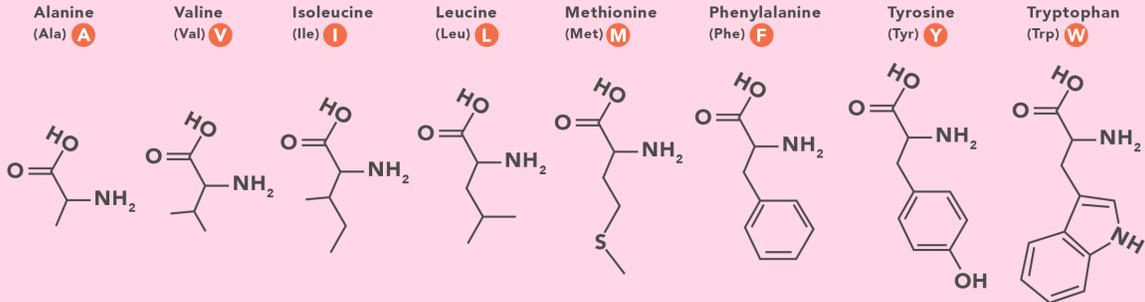
## B. Amino Acids with Polar Uncharged Side Chains



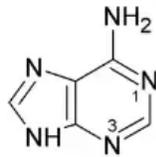
## C. Special Cases



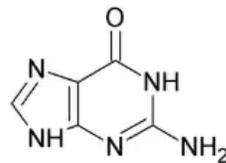
## D. Amino Acids with Hydrophobic Side Chains



### Purines

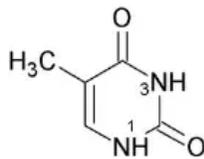


Adenine

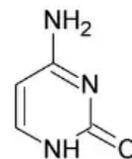


Guanine

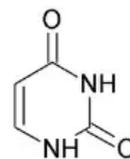
### Pyrimidines



Thymine



Cytosine



Uracil