

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

**Read each question carefully. Some questions have multiple parts. Answer all questions with complete sentences.**

1. Draw an example of each of the following molecules. Answer any additional questions given.
  - (a) An acidic amino acid (Circle the acidic part)
  - (b) A basic amino acid (Circle the basic part)
  - (c) A hydrophilic amino acid (Explain.)
  - (d) A hydrophobic amino acid (Explain.)
  - (e) Zwitterion of Serine **AND** how it reacts with an acid ( $H^+$ )
  - (f) L-Phe (circle the L part)
  - (g) Zwitterion of Asp and how it would react with a base ( $[OH^-]$ )
  - (h) A Zwitterion. (Define Zwitterion, why do they occur)
  - (i) A salt bridge between Glu and Asn.
  - (j) An example of Hydrogen bonding between Ser and Thr
  - (k) The dipeptide made from Tyr and Cys (What type reaction occurs? What type of bond is created according to biologists? according to chemists?)
  - (l) Draw the Zwitterion of D-Threonine. Show how it would react to neutralize (a)  $H^+$  and (b)  $OH^-$ .
  - (m) Draw the Fischer projection of D-Ser. Draw the zwitterion of D-Ser.
  - (n) A disulfide bond between two amino acids.
2. Define Secondary Structure. What IMF is responsible for secondary structure? What are the two most common examples of secondary structure? Draw a picture between ASP and LYS.
3. Define Tertiary Structure. Draw an example of how GLU and LYS would interact. Which IMF is responsible for the interaction?
4. What is meant by the term complete protein?
5. What is meant by the term essential when discussing lipids and amino acids?
6. Give 1 biologically important use for each of the following classes of compounds
  - (a) Nucleic Acids
  - (b) Amino Acids
  - (c) Proteins
  - (d) Enzymes
7. Define Denaturation. List 4 ways to denature proteins

8. A student performs a chromatography experiment to try and separate the amino acids Leu and Asp. Sketch a picture of the experimental setup. Which AA would move the furthest up to chromatography paper if the solvent is WATER? Explain.
9. A student performs a chromatography experiment to try and separate the amino acids GLU and PHE. Sketch a picture of the experimental setup. Which AA would move the furthest up to chromatography paper if the solvent is HEXANE? Explain.
10. A student performs a chromatography experiment to try and separate the amino acids SER and VAL. Sketch a picture of the experimental setup. Which AA would move the furthest up to chromatography paper if the solvent is HEXANE? Explain.
11. Electrophoresis can be used to separate amino acids and proteins by what two properties of the molecules?
12. A student performs an electrophoresis experiment to try and separate the amino acids shown below. Show the position of the amino acids at the end of the experiment. Explain.

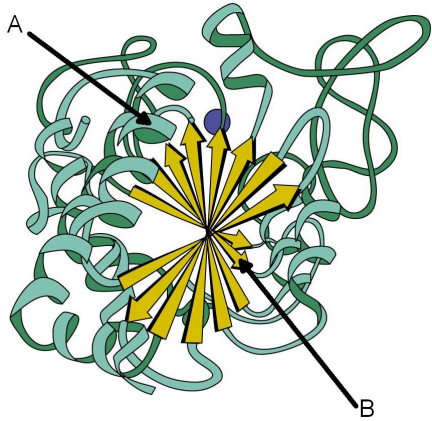


Distribution of Amino Acids (AA) after application of an electric field):

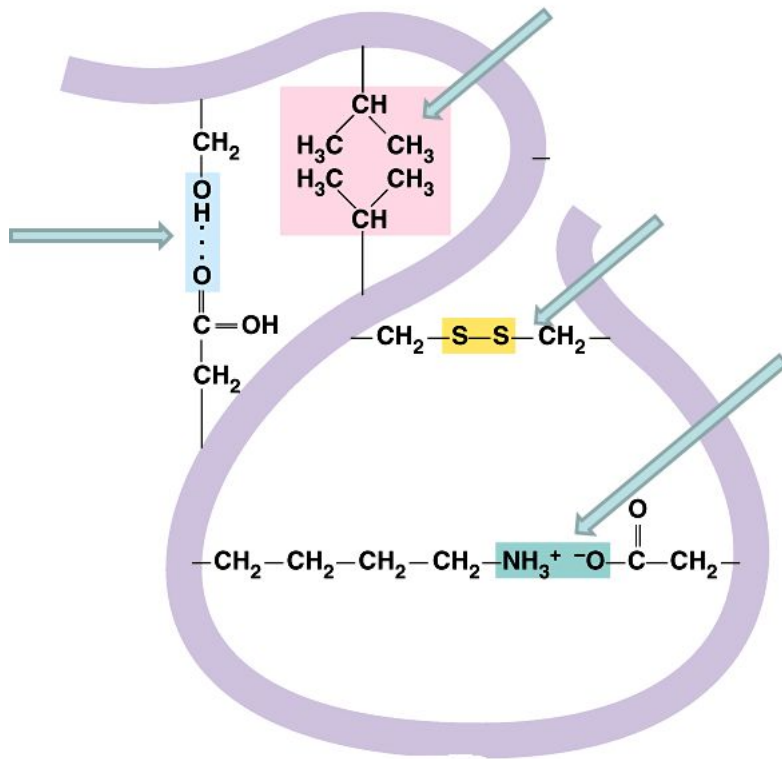


13. Define Primary structure (in its usage for describing proteins).
14. Define the term Secondary Structure, **AND** list the 3 types discussed in class.
15. Draw a picture of an  $\alpha$ -helix. What is responsible for the formation of this structure? Is this an example of primary, secondary, tertiary, or quaternary structure?
16. Define the term Tertiary Structure, **AND** list the 5 types discussed in class. Draw an example of the interaction that would occur between GLU and SER. Which of the 5 interactions does this illustrate?
17. What is the difference between the hydrogen bonding responsible for secondary structure and that responsible for tertiary structure? Draw an example of each illustrating the difference.
18. Proteins have many functions in the body. List the 7 examples given in the book.

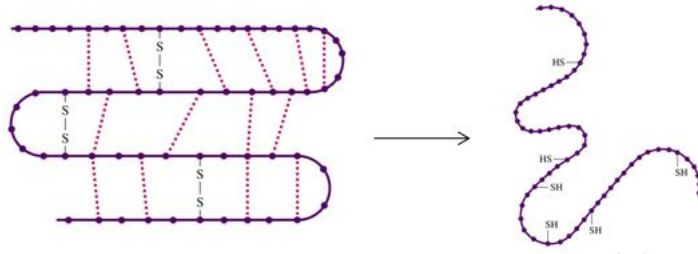
19. What feature of a protein is illustrated by A? What feature of a protein is illustrated by B? Both of these are examples of primary, secondary, tertiary, or quaternary structure?



20. Label each of the interactions. These are examples of what type of structure in proteins: primary, secondary, tertiary, or quaternary structure? Which interaction is missing?

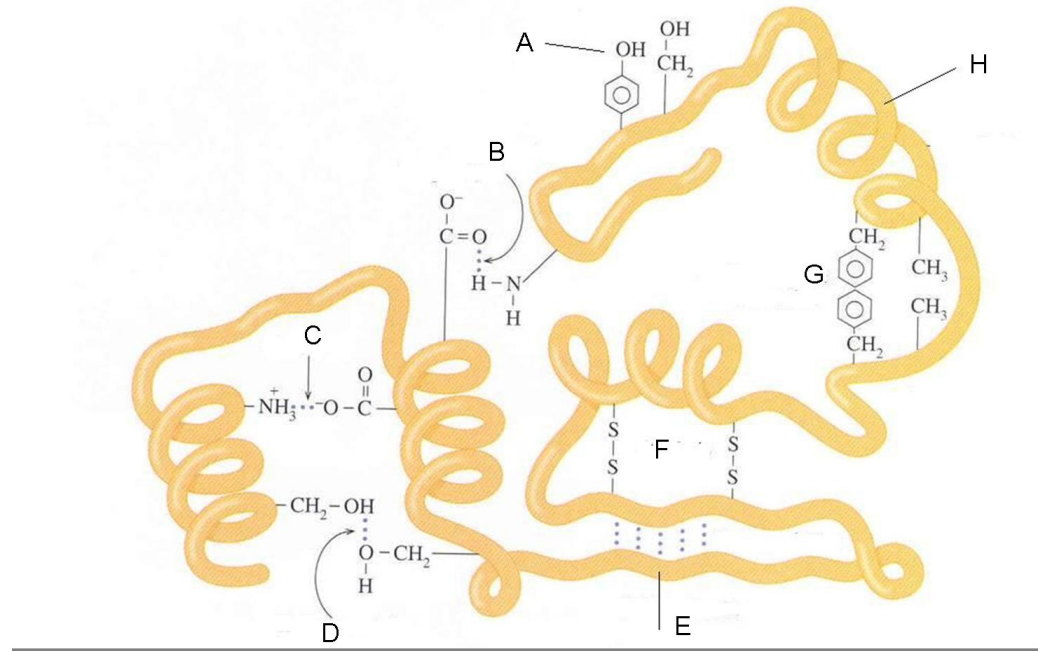


21. What process is being illustrated here. List 3 ways this might have occurred.



22. Label each of the interactions or parts below. Choices are:  $\alpha$ -helix,  $\beta$ -pleated sheet, Disulfide bonds, H-bonds, Hydrophilic, Hydrophobic, Salt Bridges, Triple helix. (Hint: There is one interaction used twice, and one not pictured at all.)

- (a)
- (b)
- (c)
- (d)
- (e)
- (f)
- (g)
- (h)



23. Complete the table below for each test. Include what functional group/feature of the molecule it test positive (+) and negative (-) for and the visual change which indicates each.

Test Name	Positive for:	Visual Change	Negative for:	Visual Change
Biuret Test				
Tyrosine				
Ninhydrin				
Xanthoproteic				
Sulfur Test				