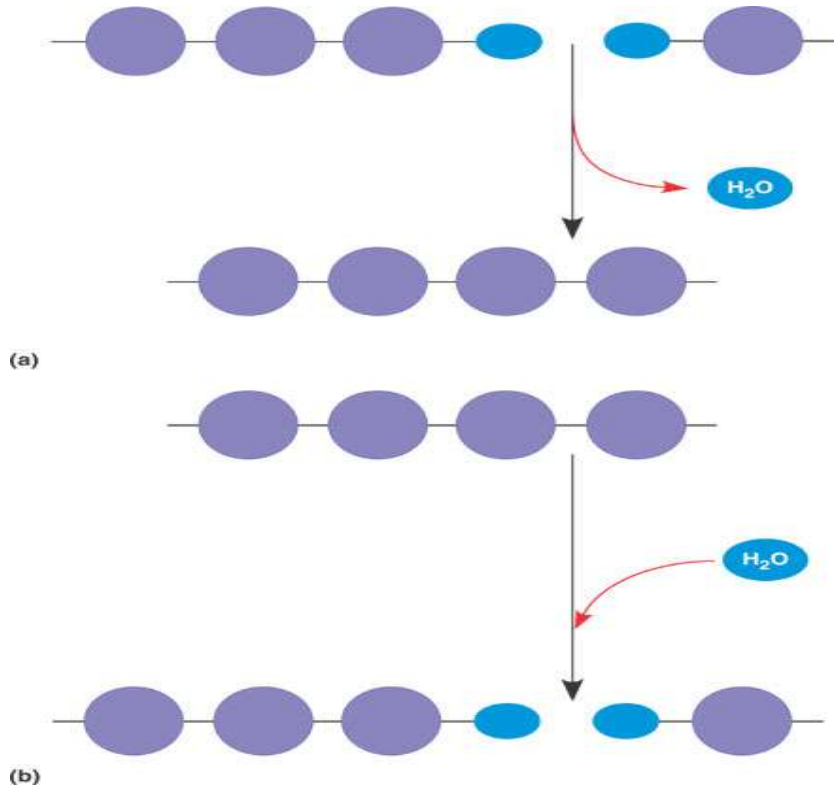
AP Chapter 5 Study Guide: Macromolecules

Teachers Note: *Chapter 5 is an introduction to biochemistry and the most important chapter we have read so far! Many new concepts, molecular structures and many terms……YIKES! This may seem overwhelming but hang in there. Our authors do a great job on this chapter. So read pgs 68-77 and answer the questions below.*

1. The four main classes of large biological molecules are _____, _____, _____, and _____
2. What is a macromolecule? _____
3. What do we call the small molecules that are joined to make macromolecules? _____
4. What is the name of the reaction that joins monomers and forms polymers? _____ _____. What molecule is formed as a byproduct of this reaction? _____
5. What is the name of the reaction that breaks down polymers? _____
6. What is the name of reaction (a) in the illustration below? _____
7. What is the name of reaction (b) in the illustration below? _____



8. All living things are composed of only 40 to 50 monomers. How is it possible to have such a huge variety of polymers with so few monomers? _____

_____

9. What are two functions of carbohydrates in living things? _____

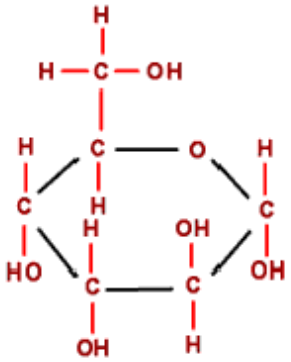
_____

10. What 3 elements make up carbohydrates? _____

_____

11. What is the generic term used to describe a single sugar? _____

12. What is the name of the sugar below? _____ What is it's molecular formula? _____



13. What do we call two single sugars joined in a condensation reaction? _____

14. What do we call many single sugars joined in a condensation reaction? _____

15. What polysaccharide is used by plants to store energy? _____

16. What polysaccharide is used by animals to store energy? _____

17. What polysaccharide is used by plants as a structural material? _____

18. What is the difference between α glucose and β glucose? _____

_____

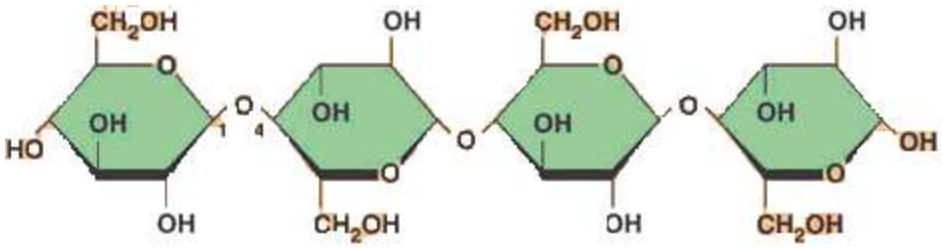
19. What kind of glycosidic bonds join monosaccharides in starch and glycogen? _____

20. What kind of glycosidic bonds join monosaccharides in cellulose? _____

21. Why can't humans use cellulose as a fuel molecule? _____

_____

22. What is the name of the molecule pictured on the next page? _____



23. What is chitin? _____

24. What are the two kinds of smaller molecules that make up a fat? _____, &

    _____

25. What molecule results from three dehydration reactions (also called condensation reactions)

    with one glycerol molecule and three fatty acids? _____

Indicate whether the following statements refer to a saturated fat or an unsaturated fat by marking them "S" or "U"

26.

An animal fat _____	A plant oil _____
No double bonds between carbons _____	Double bonds between carbons _____
Maximum number of hydrogens _____	Fewer hydrogens _____
Butter, lard, bacon grease _____	Peanut, olive & corn oil _____
Thought to contribute to cardiovascular disease _____	

27. List five functions of lipids in living things: _____

    _____

28. What molecule is a major component of biological membranes? _____

29. Explain why phospholipids form a bilayer in water. _____

    _____

30. Lipids consisting of four fused rings are called _____

Well now we arrive at the meat of the chapter. Proteins are the workhorses of the cell. If a cell can carry out a function, it is because a protein does it. Because proteins have so many jobs, you can deduce that protein must be able to assemble into many shapes. In pages 77-85 you will read about the functions of proteins and how their component molecules allow them to assume such varied shape. This is a must read! Your understanding of proteins is crucial to your development as an AP candidate.

31. List eight functions (types) of proteins:

1. _____ 5. _____

2. _____ 6. _____

3. _____ 7. _____

4. _____ 8. _____

32. What is the monomer of protein? _____ _____

33. The asymmetric alpha carbon of an amino acid connects the four parts all amino acids share.

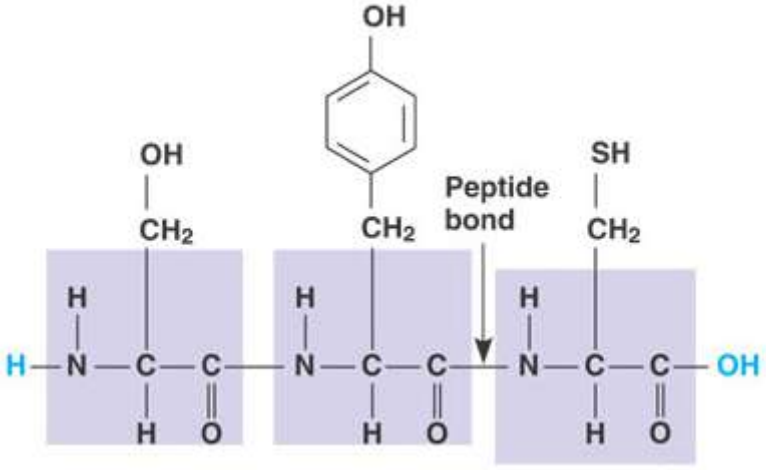
    List the four parts: _____ _____

_____ _____

34. How many different amino acids are used by cells to build their proteins? _____

35. When two amino acids are position so that the carboxyl group of one is next to the amino group of the other, an enzyme can catalyze a condensation reaction, removing a molecule of water and forming a dipeptide. The covalent bond that holds dipeptide together is called a _____ _____.

36. Repeated bonding of amino acids will form a polymer called a _____

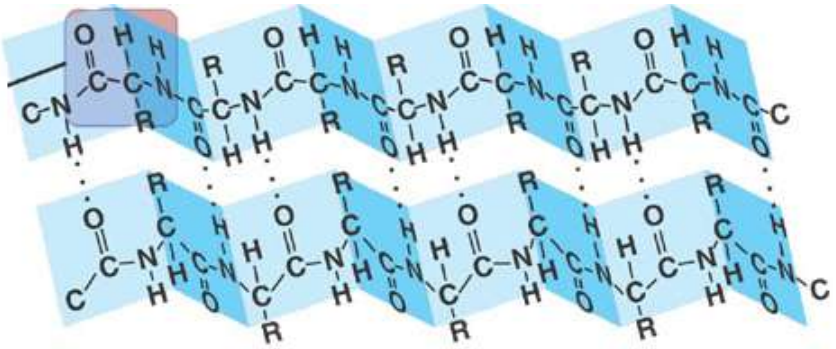


Amino Acid #1 Amino Acid #2 Amino Acid #3…….

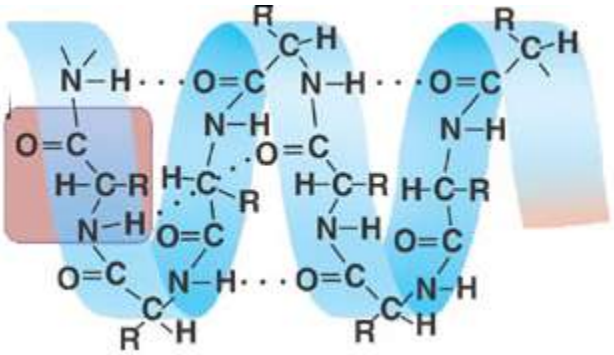
The specific linear sequence of amino acids within a polypeptide will cause it to take various shapes due to the differing properties of its side chains. (ie. Some amino acid side chains are polar and hydrophilic, while some are non-polar and hydrophobic) However, the linear sequence of amino acids stabilized by strong, covalent, peptide bonds is just the first level of protein structure. The complex shapes of proteins are due to multiple levels of structure, stabilized in many different ways. Now let's examine the other levels of protein structure.

37. Due to polar and non polar side chains, polypeptides immediately fold into one of the following structures

Structure A



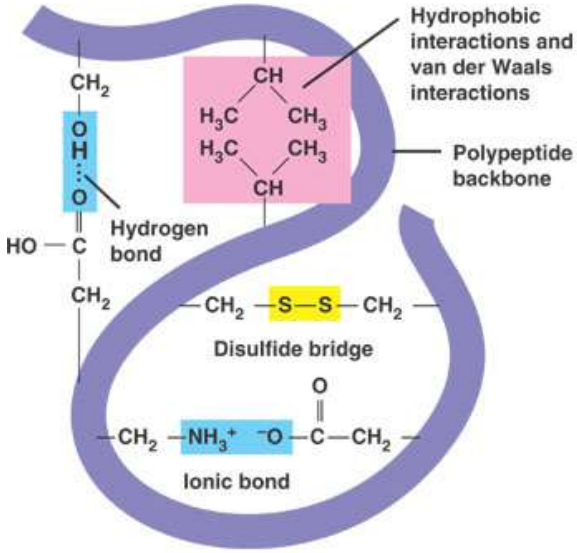
Structure B



What is structure A? _____ What is structure B? _____

What do the dots within the structures represent? _____ _____

The α helixes and β pleats are then bent and folded into another three dimensional structure which is stabilized by the four different interactions between side chains shown below



38. List the four interactions that stabilize the tertiary level of protein structure:

    1. _____ 2._____

    3. _____ 4._____

39. Describe the result of a hydrophobic interaction? _____

    _____

40. More often than not, proteins require multiple polypeptide chains and sometimes non- polypeptide components. This level of protein structure is called the _____ _____

41. Because much of a protein's structure is stabilized by weak hydrogen bonds, any force that disrupts hydrogen bonds will cause the protein to unravel and lose its ability to function. The loss of proper shape (conformation) is called _____.

42. List three factors that can cause a protein to denature: _____,

    _____, _____.

43. Sometimes other proteins are required to fold a particular protein into its final conformation. What do we call the protein folding proteins? _____

We are going to spend the better part of the months of December and January discussing the details of nucleic acids and genetic inheritance, but chapter 5 introduces the structure and function of DNA & RNA because they are organic macromolecules. So read 86-89 and answer the questions below.

45. What is the function of DNA? _____

_____

46. What is the function of RNA? _____

_____

47. What is the name of the monomer that forms DNA & RNA? _____

48. What are the three parts of a nucleotide? _____

49. How do nucleotide bases pair? _____ &_____, _____ &_____

50. What is the three dimensional shape of DNA? _____ _____

51. The sugar-phosephate backbones of DNA are antiparallel. What does this mean? _____

_____