MACROMOLECULES KEY
AP BIOLOGY

1. In the dehydration synthesis reaction, two molecules of glucose are linked together to form the dissacharide maltose. In the process, a water molecule is formed.

2. In the hydrolysis reaction, the disaccharides maltose is broken down to form two glucose monomers. Note that this reaction is the reverse of the synthesis reaction

3. Monosaccharides are classified based on the position of their carbonyl group and the number of carbons in the backbone.

4. Trioses, pentoses, and hexoses have three, five, and six carbon backbones, respectively.

5. Glucose, galactose, and fructose are all hexoses. They are structural isomers, meaning they have the same chemical formula ($C_6H_{12}O_6$) but a different arrangement of atoms

6. . Fructose and ribose also form rings, although they form five-membered rings as opposed to the six-membered ring of glucose.

7. Because of the way the subunits are joined, the glucose chains have a helical structure

8. In cellulose, glucose monomers are linked in unbranched chains by *β* 1-4 glycosidic linkages. Because of the way the glucose subunits are joined, every glucose monomer is flipped relative to the next one resulting in a linear, fibrous structure.

9. Insects have a hard outer exoskeleton made of chitin, a type of polysaccharide

10. Hydrophobic lipids in the fur of aquatic mammals, such as this river otter, protect them from the elements

11. Triacylglycerol is formed by the joining of three fatty acids to a glycerol backbone in a dehydration reaction. Three molecules of water are released in the process.

12. Saturated fatty acids have hydrocarbon chains connected by single bonds only. Unsaturated fatty acids have one or more double bonds

13. Waxy coverings on some leaves are made of lipids

14. A phospholipid is a molecule with two fatty acids and a modified phosphate group attached to a glycerol backbone.
15. The phospholipid bilayer is the major component of all cellular membranes. The hydrophilic head groups of the phospholipids face the aqueous solution. The hydrophobic tails are sequestered in the middle of the bilayer.

16. Amino acids have a central asymmetric carbon to which an amino group, a carboxyl group, a hydrogen atom, and a side chain (R group) are attached.

17. There are 20 common amino acids commonly found in proteins, each with a different R group (variant group) that determines its chemical nature.

18. Peptide bond formation is a dehydration synthesis reaction. The carboxyl group of one amino acid is linked to the amino group of the incoming amino acid. In the process, a molecule of water is released.

19. The amino acid cysteine (cys) has a sulfhydryl (SH) group as a side chain. Two sulfhydryl groups can react in the presence of oxygen to form a disulfide (S-S) bond. Two disulfide bonds connect the A and B chains together, and a third helps the A chain fold into the correct shape. Note that all disulfide bonds are the same length,

20. The α-helix and β-pleated sheet are secondary structures of proteins that form because of hydrogen bonding between carbonyl and amino groups in the peptide backbone.

21. The tertiary structure of proteins is determined by a variety of chemical interactions. These include hydrophobic interactions, ionic bonding, hydrogen bonding and disulfide linkages.

22. A nucleotide is made up of three components: a nitrogenous base, a pentose sugar, and one or more phosphate groups.

23. Two types of pentose are found in nucleotides, deoxyribose (found in DNA) and ribose (found in RNA). Deoxyribose is similar in structure to ribose, but it has an H instead of an OH at the 2' position.

24. Bases can be divided into two categories: purines and pyrimidines. Purines have a double ring structure, and pyrimidines have a single ring.

25. Native DNA is an antiparallel double helix.

26. Adenine forms hydrogen bonds (or base pairs) with thymine, and guanine base pairs with cytosine.

27. A ribosome has two parts: a large subunit and a small subunit. The mRNA sits in between the two subunits. A tRNA molecule recognizes a codon on the mRNA, binds to it by complementary base pairing, and adds the correct amino acid to the growing peptide chain.