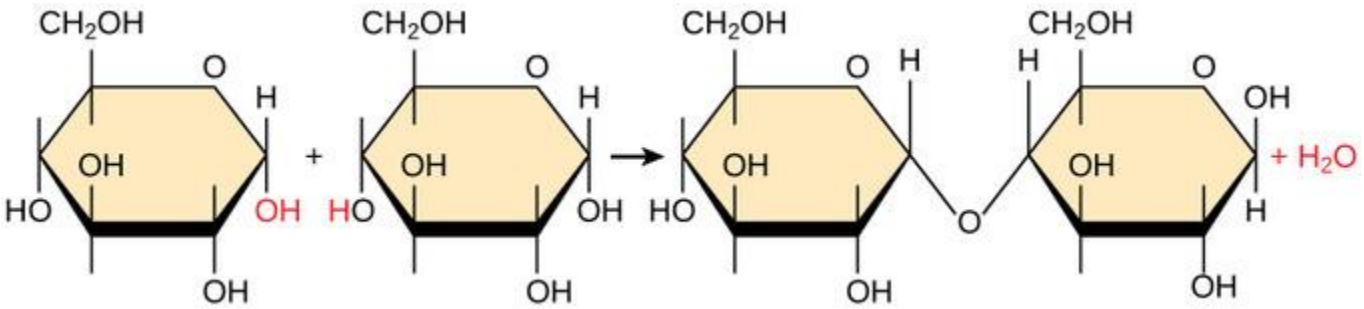
Name _____ Date _____ Period _____

LAB: Organic Compounds

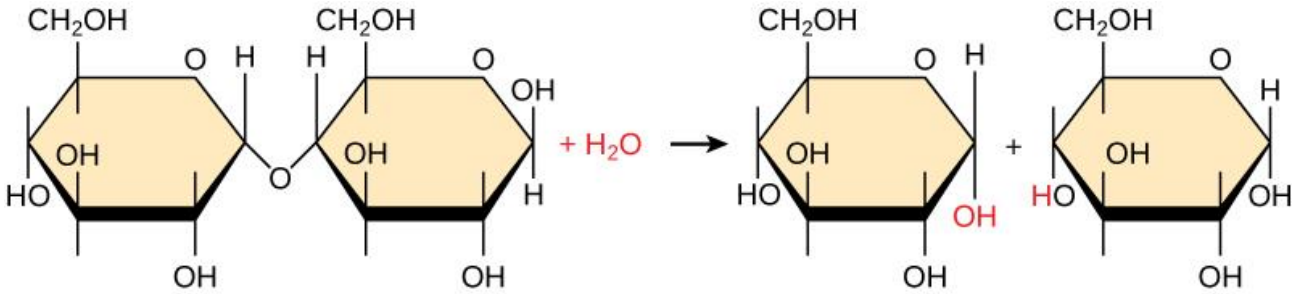
H O N O R S B I O L O G Y : U N I T 1

Metabolism is a set of chemical reaction that occurs in all living organisms that facilitate growth, reproduction, and homeostasis. Metabolism is divided into two reactions:

1. **Anabolism**. This is a set of reactions that combine monomers to form polymers. The forming of polymers builds bonds that hold energy. Anabolic processes tend toward "building up" organs and tissues. These processes produce new molecules for repair, growth, and cell differentiation. Anabolic reactions involve **dehydration synthesis**; a water molecule is removed from each monomer as part of the bond formation.



2. **Catabolism.** This is a set of reactions that break down polymers into monomers. As these large biomolecules are broken down then release energy. The monomers are recycled to make new polymers (biomolecules. Catabolic reactions involve **hydrolysis** as water molecules are required to break apart the existing bonds in the polymers. Water is required to metabolize large organic molecules such as lipids, carbohydrates, and proteins into their monomers.



Chemistry of Lipids

In lecture we discussed triglycerides, phospholipids, cholesterol, saturated fats and unsaturated fats. The monomers of fats are composed of glycerol and fatty acids.

☞ Examine the structural formulas and models on **page 39**

You will notice I have placed a square around the **carboxyl group**.

- Are Carboxyl groups present in all fatty acids on this sheet? (yes or no) _____

☞ *On the right side of the paper are models of glycerol and three different fatty acids. You are going to create a triglyceride by cutting these models out.*

- The glycerol will have the three fatty acid tails attach to it.
- What molecule must be removed to connect the fatty acids to the glycerol model?

_____

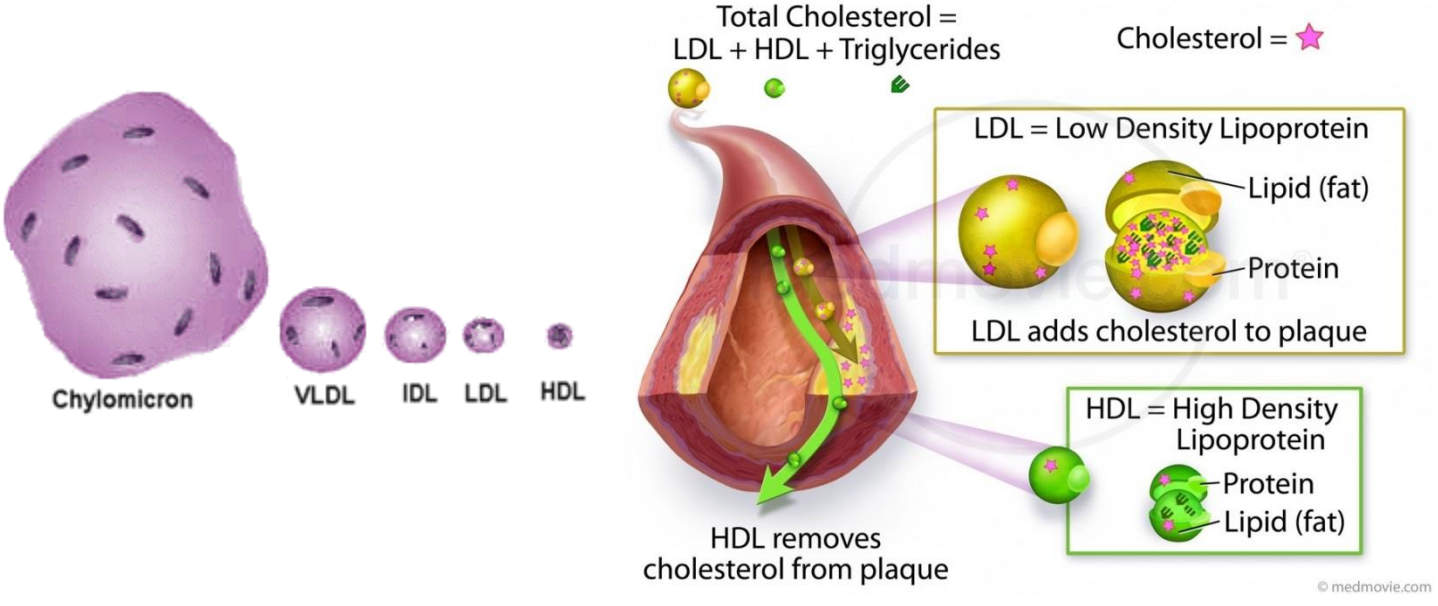
- What is the name of this process? _____

Summarize what you did in the equation below

_____ + _____ → _____ + _____

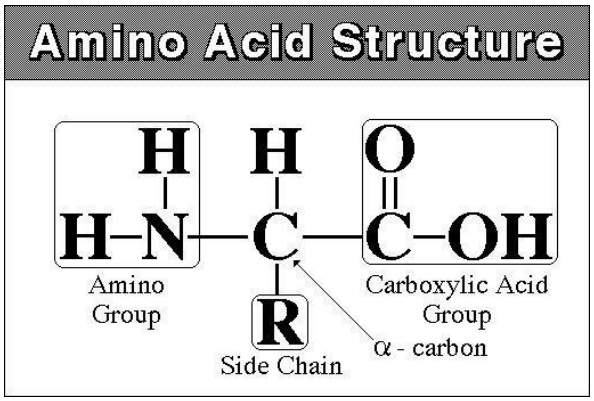
- Is this process anabolism or catabolism? Explain your answer.

Cardiologists today are concerned about **cholesterol** in a different way. Cholesterol cannot dissolve in the blood; it must be transported by carrier molecules called lipoproteins, a combination of a lipid and protein. These lipoproteins carry cholesterol to and from our cells; they are categorized into **<u>LDL</u> (low density lipids) and <u>HDL</u> (high density lipids**). The LDL's are considered bad for you and lead to atherosclerosis, HDL are considered good because they carry LDL cholesterol from the arteries to the liver where it is broken down.



Chemistry of Proteins

Proteins are composed of monomers called amino acids.
Amino acids are determined by their R-group.
Amino acids are combined by peptide bonds.
Page 41 shows the structural formulas and models for proteins.

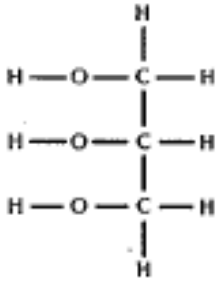


☞ *Looking at the models, combine the four amino acids into a polypeptide chain.*

- What molecule was removed? _____
- What do you call this process? _____
- What molecule must be added to break the polypeptide chain into amino acids? _____
- What is this process called? _____

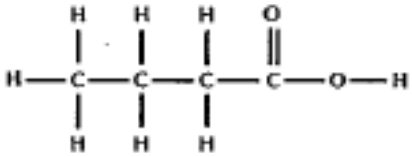
The precise folding of a protein into its tertiary structure creates a three dimensional arrangement that gives the protein its unique chemical properties. Explain what the term **denature** means, how it applies to proteins as well as enzymes, and what substances or conditions denature proteins.

structural formula of glycerol

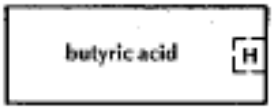


model of glycerol

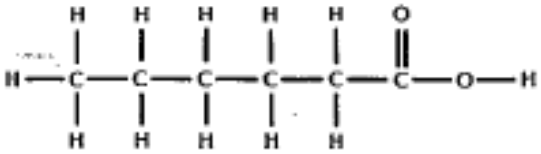
structural formula of butyric acid



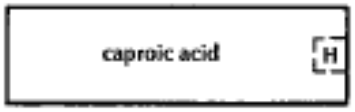
model of butyric acid



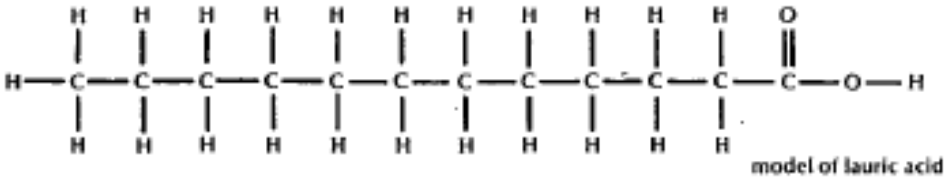
structural formula of caproic acid



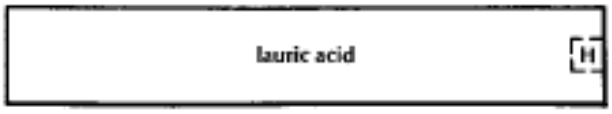
model of caproic acid



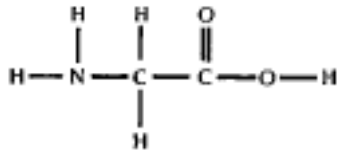
structural formula of lauric acid



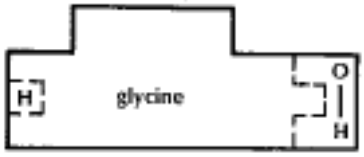
model of lauric acid



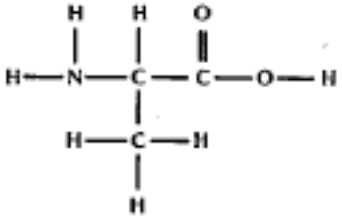
structural formula of glycine



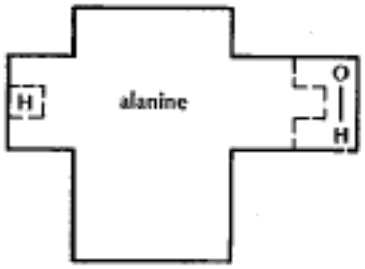
model of glycine



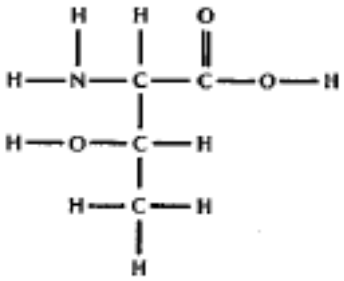
structural formula of alanine



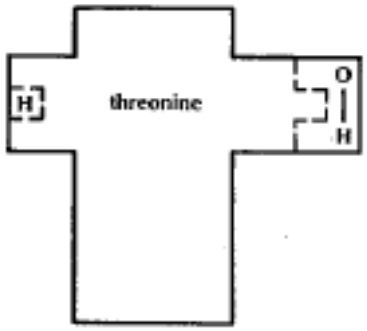
model of alanine



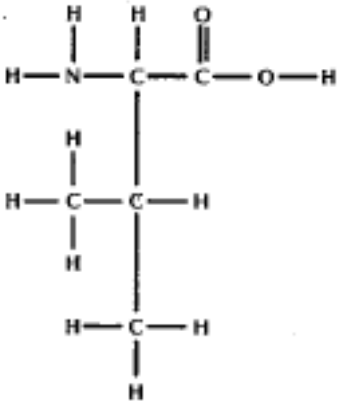
structural formula of threonine



model of threonine



structural formula of valine



model of valine