Biology Name: _____

Energy and Chemical Reactions Reading Assignment

Date: _____ Hour: _____

Adapted from "Energy and Chemical Reactions" Modern Biology by Holt, Rinehart and Winston

Living things undergo many thousands of chemical reactions as part of their life processes. Many reactions are very complex and are interrelated, involving a multistep sequence. Other reactions are rather simple. The one described in Figure 2-7 takes place in your blood.

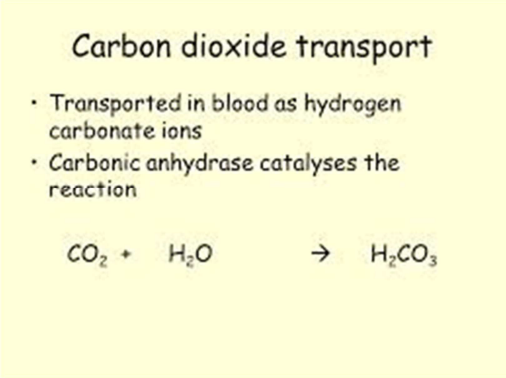

Figure 2.7

The reactants are shown on the left side of the equation. In this reaction, the reactants are CO_2 and H_2O. The products of the reaction are shown on the right side. In this reaction, the product is H_2CO_3. Notice that the number of each kind of atom must be the same on either side of the arrow. In a chemical reaction, bonds present in the reactants are broken, the elements are rearranged, and new compounds are formed as the products. The arrow indicates that the chemical reaction goes to the create a product. Carbon dioxide can water can combined to form carbonic acid, H_2CO_3.

What is the product in the above reaction? _____

What are the reactants in the above reaction? _____

Much of the energy your body needs is provided by sugars from foods. Your body continuously undergoes a series of chemical reactions in which sugar and other substances are broken down to carbon dioxide and water. In this process energy is released for use by your body. Chemical reactions that involve a net release of free energy are called exergonic reactions. Reactions that involve a net absorption of free energy are called endergonic reactions.

The prefix "exer" in exergonic is used to mean the energy is moving which way? _____

For most chemical reactions - both exergonic and endergonic - to begin, energy must be added to the reactants. In many chemical reactions, the amount of energy needed to start the reaction, called activation energy, is high. Figure 2.8 shows the activation energy for a hypothetical chemical reaction.

What does the word hypothetical mean in the above sentence? _____

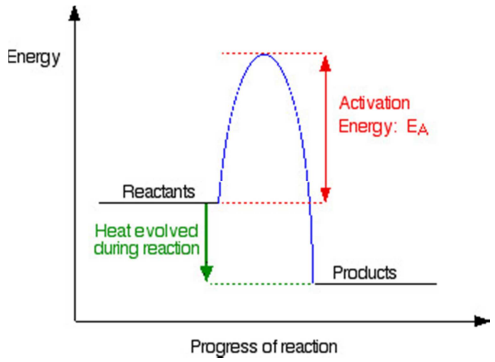

Figure 2.8

What is labeled on the y-axis in Figure 2.8? _____

What is labeled on the x-axis in Figure 2.8? _____

Certain chemical substances, known as catalysts, reduce the amount of activation energy that is needed for a reaction. A reaction in the presence of the correct catalyst will proceed spontaneously or with the addition of a small amount of energy. Enzymes are an important class of catalysts in living things. A single organism may have thousands of different enzymes, each one tailor-made for a different chemical reaction.

What does the word “spontaneously” mean in the above sentence in regards to the reaction? _____

_____

What do the authors mean by the statement “tailor-made for a different chemical reaction”? _____

_____

You know that there is a constant flow of energy into and throughout living things. Many of the chemical reactions that help transfer energy in living things involve the transfer of electrons. These reactions in which electrons are transferred between atoms are known as reduction-oxidation reactions, or redox reactions. In an oxidation reaction, a reactant loses one or more electrons, thus becoming more positive in charge. In a reduction reaction, a reactant gains one or more electrons, thus becoming more negative in charge. Redox reactions always occur together. An oxidation reaction occurs, and the electron given up by one substance is then accepted by another substance in a reduction reaction.

Why does a reduction reaction always accompany an oxidation reaction? _____

_____