Enzymes:

-Usually large, globular proteins.

-Act to speed up a reaction (increase the rate of reaction).

-Two molecules may never react, but an enzyme will bind the first, then the second and make them react. (However, the enzyme cannot make two molecules that wouldn't normally react do anything).

-The enzyme fits three dimensionally over the molecule or molecules it is going to act on. The molecule it is going to act on is called the '**substrate**'.
So the substrate fits three dimensionally into the enzyme like a key into a lock.

-Enzymes are considered 'catalysts' since they speed up the 'rate of the reaction' without being used up by the reaction. They can be used over and over again.

-Enzymes are very sensitive to the pH of the environment they are in. They only function when they are surrounded by their optimal pH. Lysosomal enzymes only work at low pH, whereas extracellular enzymes work at the body's physiological pH of 7.4, and so on.

-They keep <u>all</u> the biochemical reactions in a cell going.

-Some protein enzymes will only work if assembled with another large molecule (an **organic molecule**). This second part of the enzyme needed to make it function is called a '**coenzyme**'. (In other words, if the additional component of the enzyme is a large organic molecule, it is called a 'coenzyme'.) These 'coenzymes' have complicated chemical names according to their chemical structure (ie: cyanocobalamin). For that reason, they also have simplified names and are referred to as 'vitamins' (cyanocobalamin is called Vitamin B-12). That's why we require vitamins, because many of the cell's enzymes require vitamins in order to carry out many of their essential biochemical reactions.

-Now if the additional component for the original enzyme is just an atom, or ion, this additional ion is called a '**cofactor**'. Examples include potassium(K^+), iron (Fe^{++}), calcium (Ca^{++}), etc. As you can probably recognize, these are commonly called **minerals**. That's why we need minerals in our diet, again to help certain enzymes do their biochemical jobs.

-How a cell can turn on one biochemical pathway and turn off another (ie: decide to utilize triglyceride for ATP production instead of glucose, or even protein) is to simply stop making the first set of enzymes and start producing a new set of enzymes that will force the new biochemical pathway to operate.

-Some examples from the biochemical pathways we've already talked about in class include:

Niacin is needed for the enzyme that converts NAD into NADH;
Folic acid is needed for the enzyme that produces the bases: A, G, and T;
Riboflavin is needed for the enzyme that converts FADH into $FADH_2$;

-Be sure and find in your textbook the charts listing the different vitamins and minerals.