Honors Biology Name:

*Step by Step guide to Glycolysis*

1. The point of cellular respiration is to make ATP molecules which store energy for the cell to use. This energy comes from glucose, which is made during photosynthesis or is stored in organisms that have eaten plants which made glucose.
2. There are two ways the energy in glucose can be converted to the energy in ATP: Cellular respiration which requires oxygen or Fermentation which does not require oxygen. Cellular respiration is much more efficient making 38 ATP molecules for every glucose molecule. By comparison, Fermentation makes 2 ATP for every glucose molecule.
3. The actual chemical pathway for glycolysis involves 10 chemical reactions each requiring a separate enzyme. We will simplify it here. Glycolysis happens in the cytoplasm outside of the mitochondria. Here enzymes which are floating in the cytoplasm of the cell change the glucose into fructose. This requires energy so an ATP molecule is used resulting in ADP and P plus energy that is used to change glucose.
4. The fructose is broken in half. Fructose had 6 carbons and the resulting two molecules called G3P have 3 carbons each. Again energy is needed so another ATP is used.
5. The G3P molecules are transformed via 5 reactions into a molecule called Pyruvate which still has 3 carbons. This process creates an NADH molecule which is the combination of NAD- and H+ and two electrons from the G3P molecule. It also creates 2 ATP molecules from 2 ADP and 2 P molecules.
6. **If** oxygen is present the pyruvate molecules are immediately converted to a 2-carbon molecule called an acetyl group. The other carbon combines with oxygen and makes CO2 that is released (ultimately to the air).
7. The acetyl group combines with a molecule called Co-enzyme A, which is not an enzyme, but does help the acetyl group move to the matrix of the mitochondria. The combination of the two molecules is called acetyl CoA. This molecule is the molecule needed for the next step of Cellular respiration called the Krebs Cylcle.
8. **If**oxygen is not present **and** is happening in yeast cells, the pyruvate molecules are transformed into Ethyl alcohol or Ethanol, which has 2 carbons and releases the third carbon as Carbon dioxide.
9. **If** oxygen is not present **and** is happening in animal cells, the pyruvate molecules are transformed into lactic acid (this is what makes your muscles hurt). Lactic acid has 3 carbons so no CO2 is given off.
10. **Remember** there are two pyruvate molecules made for each glucose so the numbers of ATP and NADH are doubled.