Cellular Respiration – Getting energy out of food

<http://www.mhhe.com/biosci/bio_animations/MH01_CellularRespiration_Web/>

**The Big Idea of Cellular Respiration is**

Chemical formula:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ -> -> -> \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Words:

**How does it start?**

Digestion breaks down …

**The first part is called glycolysis**

In the cytoplasm of a cell, the process of glycolysis breaks up \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into two molecules of pyruvate. You also get two\_\_\_\_\_\_\_\_\_\_\_\_ and free up two \_\_\_\_\_\_\_\_\_\_\_\_\_\_ that are picked up by a carrier.

**The second part oxidates pyruvate inside the mitochondria.**

Each pyruvate loses a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which forms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Electrons are also lost and picked up by a carrier. Oxidation means that a molecule lost electrons.

**The third part is called the Citric Acid Cycle**

This part also happens in the matrix of the mitochondria. Through several reactions, all \_\_\_\_\_\_\_\_\_\_\_, hydrogens and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in pyruvate will end up as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Electrons are also let go and are picked up by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Electrons are the only thing left from the glucose and they have the \_\_\_\_\_\_\_\_\_\_\_\_.

**ETC – The Electron Transport Chain**

This chain passes electrons among a bunch of proteins that are stuck in the mitochondria’s inner membrane. As the electrons are passed through the different proteins, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are pumped through the inner membrane to the intra-membrane space. This is the space between the two membranes of the mitochondria. This is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ transport because the H+ are moving from an area of \_\_\_\_\_\_\_\_\_\_ concentration to \_\_\_\_\_\_\_\_\_\_\_\_\_ concentration. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is also formed from Hydrogen ions and oxygen.

The hydrogen ions (H+) move back through the inner membrane through a molecule called ATP synthase. This molecule is like a little motor, turning and attaching a phosphate to an ADP making ATP. It rotates fast, making 32 to 36 ATPs.

Questions

1. Why do you think a mitochondrion has two membranes? Most organelles only have one.

2. Think about a piece of chicken breast meat and a chicken thigh meat. Both of these tissues that some of us eat are made of cells that have mitochondria in them. More mitochondria can make a tissue look darker. Which one, the breast meat or the thigh meat, is lighter in color? Which one is darker? Why do you think there is that difference?

3. Pyruvate dehydrogenase complex deficiency (PDCD) (formerly known as PDH deficiency) is an inherited inborn error of metabolism. This means that children born with this disorder can’t convert some of the food they eat into energy. In a normal metabolic cycle, carbohydrates are broken down into energy by certain enzymes called the pyruvate dehydrogenase complex. These are the molecules that help pyruvate attach to acetyl CoA. Children with PDCD have fewer enzymes than those without the disorder, so they are less able to break down carbohydrates and sugars into energy. Where in the process of cellular respiration do these children have a problem? Do you think this is a big problem or something minor? Give an explanation for your answer.