Name_____ Mailbox#_____

CELL RESPIRATION OVERVIEW

Glycolysis

1. What does it take to phosphorylate a molecule of glucose?
2. What is the purpose of phosphorylating glucose (or the intermediate, fructose 6-phosphate) in the "energy-investment phase" of cell respiration?
3. Where does the energy come from for phosphorylating G3P in the first part of the "energy payoff phase" (you will note that ATP is not entering at this step, but a phosphate gets attached anyway).
4. How many total molecules of ATP are produced during glycolysis and where do the phosphate groups come from for each of these ATP molecules?
5. How is water produced as a byproduct of step #8 when it looks like the molecule that enters step 8 remains unchanged at the end of step 8?
6. What does NADH carry, that NAD+ does not?
7. Where do the NADH molecules produced during glycolysis go next?
8. What is the net production of ATP and NADH molecules in this process?

The Citric Acid Cycle

1. Before pyruvate can enter the citric acid cycle, what must happen to it first... and what major byproduct (which is ultimately exhaled) is produced during this process?
2. How does the two-carbon acetyl group at the start of this cycle turn into a six-carbon molecule of citrate? Where do the other four carbons come from?
3. Where do the hydrogen atoms come from that are used to reduce NAD+ to NADH and FAD to $FADH_2$ during the citric acid cycle?
4. How is this cycle a "chicken or the egg" sort of problem?
5. What byproduct (other than ATP, NADH, and $FADH_2$) is produced during this cycle?
6. What is the net production of ATP, NADH, and $FADH_2$ molecules in this cycle?

Oxidative Phosphorylation

1. What is the potential energy in the electrons held in NADH and $FADH_2$ used for in oxidative phosphorylation?
2. How is water made as a byproduct of this process?
3. How is ATP generated during this process?
4. Where do the energy-poor versions of our "electron shuttle molecules" (NAD+ and FAD) go after passing their electrons to the "electron transport chain"?
5. Where does the oxygen that is used in this process come from?
6. What is the net gain of ATP molecules in this process?

Follow-Up Questions:

1. What poisons can interrupt cellular respiration, what specific part does each affect, and what is the effect of each poison on the person, animal, or insect who ingests them?
2. What are the differences between *aerobic* respiration and *anaerobic* respiration?
3. What is the evolutionary significance of the process of glycolysis?
4. What are the differences between using carbohydrates vs. proteins vs. fats (lipids) as a fuel source for cell respiration?
5. Although food is used for generating energy for your body's work (through cell respiration), what other major purpose does food serve?