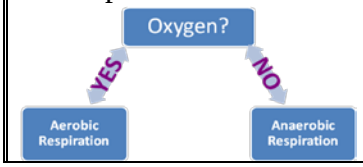
Class Notes *Cellular Respiration* **Questions/Main Idea:**	Name: _____ Period:_____ Date: _____ **Notes:**
Cellular Respiration	⊡ …Using glucose to make energy (ATP).
Where Do Plants Get Energy?	⊡ Plants get energy from the sun and store it in the bonds of glucose
Glucose Turns into Energy	• How do we get energy? – by eating food. • What types of food provide the most energy? – Carbs (sugars or glucose) have the most energy • What does your body do to the food you eat? – digests our food (breaks apart bonds), releasing energy
Breaking Bonds	⊡ Breaking bonds releases energy! ▪ Energy is "stored" in the glucose bonds; breaking them releases the energy ⊡ What form of energy do our cell (and our body) use? ▪ the molecule ATP ⊡ *So.. our body breaks down glucose and uses it to make ATP (ENERGY!)* ⊡ Which **organelle** is responsible for producing energy for our cells? ▪ The MITOCHONDRIA
What is ATP?	⊡ ATP (adenosine triphosphate) is a nucleic acid that can transfer energy within the cell. ⊡ Ex: a small amount of energy from a glucose molecule can be used directly… ⊡ The extra energy is transferred to ATP. ⊡ The energy in ATP is stored in the bonds between the phosphates (ATP has 3 phosphates).
Steps of Cellular Respiration Step 1: Gylcolysis	⊡ glyco = refers to glucose ⊡ lysis = break apart ⊡ Glycolysis = break down 1 **glucose** into 2 **pyruvic acid** molecules, which have three carbons each (splits glucose in half) ⊡ Also makes **2 ATP**! ☺ ⊡ Takes place in the **cytoplasm**
Why Glycolysis?	⊡ Glucose molecules are too large to move into the mitochondria, so glycolysis makes them smaller to get through the mitochondria's membranes
Possible paths in respiration… 	⊡ After glycolysis, there are two possible paths: ⊡ Aerobic respiration – requires oxygen ⊡ **An**aerobic respiration – does not require oxygen; happens if oxygen is **lacking**

Aerobic Respiration	⊡ An **aerobic** process (requires oxygen). ⊡ Takes place in the mitochondria. ⊡ Equation: $6O_2$ + $C_6H_{12}O_6$ $6H_20$ + $6CO_2$ + 36ATP Oxygen + Glucose Water + Carbon Dioxide + Energy
HOLD IT! Notice Anything Similar?	Equation for photosynthesis: Energy + $6H_2O$ + $6CO_2$ $C_6H_{12}O_6$ + $6O_2$ Equation for aerobic cellular respiration: $6O_2$ + $C_6H_{12}O_6$ $6H_20$ + $6CO_2$ + 36ATP
Organisms that Do Aerobic Cellular Respiration	⊡ Plants ⊡ Animals ⊡ Fungi ⊡ Protists ⊡ Some bacteria ⊡ …almost everything alive!
Aerobic Cellular Respiration	⊡ Recap: Step 1 = glycolysis -- 2 ATPs produced in cytoplasm and enter mitochondria. ⊡ For aerobic respiration, in mitochondria: ▪ Step 2 = Krebs Cycle (Citric Acid Cycle) – in matrix ▪ Step 3 = Electron Transport Chain – in inner membrane ⊡ ATP is generated in each step, but most of the ATP is made in the Electron Transport Chain
Krebs Cycle and ETC	See separate handouts
Anaerobic Cellular Respiration	⊡ AKA: **fermentation** ⊡ Two types: ▪ Alcohol fermentation ▪ Lactic acid fermentation ⊡ Both take place in the cytoplasm. ⊡ Each creates 2 ATP from each pyruvic acid molecule.
Alcohol Fermentation	⊡ Yeast can do aerobic or anaerobic respiration. ⊡ Grapes turn to alcohol by adding yeast in containers with out oxygen. ⊡ Bread rises because yeast gives off CO_2 bubbles while fermenting in dough.
Lactic Acid Fermentation	⊡ When humans (and other animals) exercise intensely, their muscles often use more O_2 than is available ⊡ When O_2 runs out, muscles switch to anaerobic respiration to try to keep up with energy demand. ⊡ This is lactic acid fermentation. ⊡ The build up of lactic acid is what makes your muscles sore.
Aerobic v. Anaerobic Respiration	⊡ You get **<u>way</u>** more ATP from aerobic cellular respiration than from fermentation. ⊡ Fermentation is mostly used to provide organisms with short-term bursts of energy when oxygen is not available.

Summary: