**Cellular Respiration Notes**

Name:

**Overview of Cellular Respiration**

* Definition: **Reactants**: Sugar and Oxygen.

**Products**: Carbon Dioxide and Water and 36 ATP

* **Purpose**: Releases energy from sugar
* **Occurs in all organisms**
* Begins in the cytoplasm and ends in the mitochondria
* **Has 3 main stages**: Glycolysis, Kreb Cycle, Electron Transport Chain
* **ATP is made by cellular respiration and is used by the cells for energy**

**Cellular Respiration**: Glucose + 6 Oxygen 6 Carbon Dioxide + 6 Water + Energy (36 ATP)

**ATP Review:**

* ATP provides energy for cellular work
	+ Energy is released when ATP is converted to ADP
	+ Energy from the organic molecules in food are used to add a phosphate group to ADP so that it can be converted into ATP again.
	+ ATP is used for energy for movement, heat, biosynthesis and digestion



* The mitochondria are the major sites of cellular respiration

Cellular Respiration:

* The controlled breakdown of glucose into CO2 and H2O.
* Requires oxygen
* Energy is captured in the form of ATP
* The balanced chemical equation for the reaction of cellular respiration is:
* **C6H12O6 + 6O2** → **6CO2 + 6H2O + 36–38 molecules of ATP**

**Cellular respiration takes place in three different stages**

* + **Stage 1** is Glycolysis
	+ **Stage 2** Krebs Cycle
	+ **Stage 3** is the electron transport chain **and ATP synthase**



**Glycolysis**

* Takes place in the cytoplasm outside the mitochondria
* Two ATP’s are used to split one glucose molecule (a 6 carbon sugar) into 2 molecules of pyruvic acid/pyruvate (with 3 carbons)
* Does not require oxygen

**END PRODUCTS OF GLYCOLYSIS:**

* + **4** molecules of ATP (a net gain of 2 ATP molecules – 2 are used to start the reaction)
	+ 2 NADH molecules (each NAD+ carries 2 electrons and 1 H ion from each 3 carbon sugar 🡪 NADH)
	+ 2 molecules of pyruvate (used in the Krebs cycle)

**The Krebs Cycle**

* Occurs in the matrix of the mitochondria
* Requires pyruvic acid from glycolysis
* Requires Oxygen

END PRODUCTS OF the Krebs Cycle:

* + 2 ATP molecules
	+ 4 CO2 molecules
	+ 6 NADH molecules and 2 FADH2 molecules

**The Electron Transport Chain and ATP Synthase**

* Occurs in the inner membrane of the mitochondria
* NADH and FADH2 carry high-energy electrons to the electron transport chain
* As electrons “fall” down the chain toward oxygen a small amount of energy is released
* This energy is used to generate ATP production (from ADP + P) using a special protein structure called an ATP synthase.
* **This process generates up to 36 ATP’s!**

