**CELLULAR RESPIRATION SUMMARY- In a Nutshell**

Cellular respiration is the enzymatic breakdown of glucose (C6H12O6) in the presence of oxygen (O2) to produce cellular energy (ATP):

**OVERALL:**

C6H12O6 + 6O2 🡪6 CO2 + 6H2O + 36 to 38 ATP *(\*FYI- new data suggests it may be less)*

**THREE STAGES OF CELLULAR RESPIRATION**

**1. Glycolysis:**

a ten-step process that occurs in the cytoplasm

converts each molecule of glucose to two molecules of pyruvic acid/pyruvate (a 3-carbon molecule)

an anaerobic process - proceeds whether or not O2 is present; O2 is not required

net yield of 2 ATP per glucose molecule

net yield of 2 NADH per glucose (NADH is nicotine adenine dinucleotide, a co-enzyme that serves as a carrier for H+ ions and electrons from breaking down glucose)

The pyruvic acid diffuses into the mitochondrion where a **transition reaction** (‘grooming’/ pre-Krebs) occurs that serves to prepare pyruvic acid for entry into the next stage of respiration. The two 3-Carbon pyruvates each lose CO2 and become acetylCoA. 2 total CO2 are produced (\*as well as 2 NADH)

**2. Krebs (Citric Acid) Cycle:**

occurs in the mitochondrial matrix

an aerobic process; will proceed only in the presence of O2

net yield of 2 ATP per glucose molecule (per 2 acetyl CoA)

net yield of 6 NADH and 2 FADH2 (FAD basically serves the same purpose as NAD by transporting e-)

in this stage of cellular respiration, the oxidation of glucose to CO2 is completed. 4 (total) CO2 are released (all 6 CO2 have now all been produced)

**3. Electron Transport System:**

consists of a series of enzymes on the inner mitochondrial membrane

electrons are released from NADH and from FADH2 and as they are passed along the series of proteins, they give up energy which is used to fuel a process called chemiosmosis by which H+ ions are actively transported across the inner mitochondrial membrane into the intermembrane space. The accumulation of H+ ions (protons) cause ATP Synthase in the membrane to change shape, and they flow back through the membrane and cause ~ 32-34 ATP’s to be produced.

6 H2O are formed when the electrons and H+ unite with O2 at the end of electron transport chain. [\* Note: **This is the function of oxygen in living organisms!]**