

PHOTOSYNTHESIS – The anabolic reduction of CO₂ to form sugar.

	<i>WHAT GOES IN</i>	<i>WHAT COMES OUT</i>	<i>WHERE DOES IT HAPPEN</i>
LIGHT REACTIONS – ETC with light driving and NADP+ pulling the electrons off.	LIGHT, H ₂ O, ADP, Pi, NADP+	Oxygen, ATP (chemiosmotic/Photophosphorylation), NADPH	THYLAKOID MEMBRANE
CALVIN CYCLE (LIGHT-INDEPENDENT REACTIONS)	ATP, NADPH, CO ₂	NADP+, ADP + Pi, PGAL (G3P) - → GLUCOSE	STROMA of the CHLOROPLAST

Note: The force that is primarily responsible for electron excitation and movement through the ETS comes from light, thus “photophosphorylation.”

CELLULAR RESPIRATION – The catabolic oxidation of glucose to produce ATP.

	<i>WHAT GOES IN</i>	<i>WHAT COMES OUT*</i>	<i>WHERE DOES IT HAPPEN</i>
GLYCOLYSIS ANAEROBIC	GLUCOSE, ADP+Pi, NAD+	2 PYRUVATE, 2ATP (substrate level phosphorylation), 2NADH	CYTOPLASM aka CYTOSOL
PREPARATORY REACTION AEROBIC	2 PYRUVATE, 2 NAD+	2 ACETYL CoA, 2CO ₂ , 2 NADH	ON THE WAY INTO THE MITOCHONDRIA
CITRIC ACID (KREBS) CYCLE AEROBIC	ACETYL CoA,	6 NADH + 2ATP + 4CO ₂ (substrate level phosphorylation)	MITOCHONDRIA
ELECTRON TRANSPORT CHAIN – NADH and FADH ₂ provide the electrons, and O ₂ pulls them off. AEROBIC	10 NADH, 2 FADH ₂ , O ₂	H ₂ O, (32 or 34)ATP (chemiosmotic/oxidative phosphorylation)	INNER MICHONDRIAL MEMBRANE

Note: the force that is driving the ETC is the pull on electrons exerted by the very highly electronegative O₂. thus, “oxidative phosphorylation.”

* NUMBERS ARE PER GLUCOSE MOLECULE

Chemiosmosis, or chemiosmotic phosphorylation operates in both photosynthesis and cellular respiration, and is referred to as photophosphorylation and oxidative phosphorylation, respectively (see notes above). In each case, the production of ATP from ADP + P_i is powered by the rapid flow of protons through ATP synthase. The power for proton pumping comes from the high energy electrons moving down the ETC in both cases.