Major Formulas

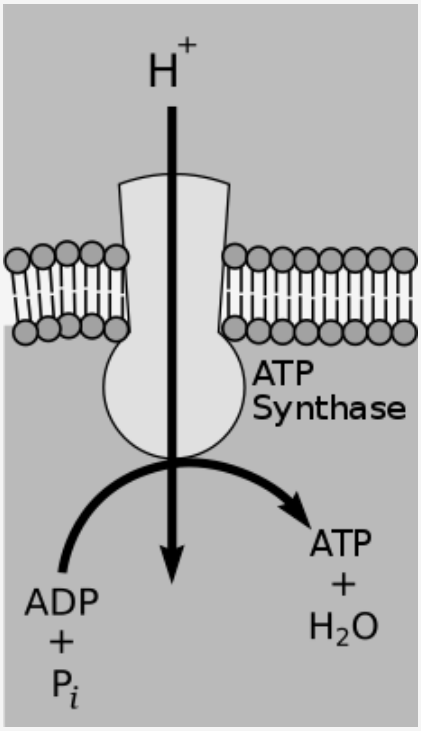
Cellular Respiration	$C6H12O6 + O2 \rightarrow H2O + CO2$
Photosynthesis	$H2O + CO2 \rightarrow C6H12O6 + O2$

Other

(NADH, FADH2, NADPH):
Carry e- in the form of H+ ions. They drop e- either at the ETC to make ATP or the Calvin Cycle to help bond formation.

ATP Synthase:
Enzyme that synthesizes ATP - Uses chemiosmosis in order to in order to phosphorylate ADP into ATP

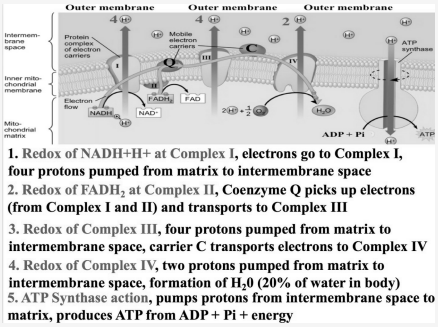
ATP Synthase



ATP Synthase transports a proton down the gradient and uses the energy to complete the phosphorylation of ADP to ATP.

Phosphorylation

ETC



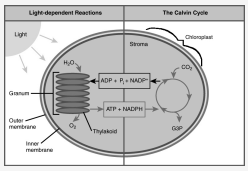
1. Redox of NADH+H+ at Complex I, electrons go to Complex I, four protons pumped from matrix to intermembrane space
2. Redox of $FADH_2$ at Complex II, Coenzyme Q picks up electrons (from Complex I and II) and transports to Complex III
3. Redox of Complex III, four protons pumped from matrix to intermembrane space, carrier C transports electrons to Complex IV
4. Redox of Complex IV, two protons pumped from matrix to intermembrane space, formation of H_20 (20% of water in body)
5. ATP Synthase action, pumps protons from intermembrane space to matrix, produces ATP from ADP + Pi + energy

Oxygen = Final e- Acceptor.
Step 1: Generating a Proton Motive Force.
Step 2: ATP Synthesis via Chemiosmosis.
Step 3: Reduction of Oxygen.
Summary: Oxidative Phosphorylation.

Fermentation

Facultative Anaerobes	Tolerate, but do not use, O_2
Obligate Anaerobes	Cannot live in an environment w/O_2
Alcoholic Fermentation	Converts pyruvate into ethyl alcohol + CO_2 & oxidizes NADH to NAD+
Lactic Acid Fermentation	Reduces pyruvate into lactic acid (lactate) & oxidizes NADH to NAD+

Photosynthesis



Light Dependent Stage

Key Points

- In light-dependent reactions, the energy from sunlight is absorbed by chlorophyll and converted into chemical energy in the form of electron carrier molecules like ATP and NADPH.
- Light energy is harnessed in Photosystems I and II, both of which are present in the thylakoid membranes of chloroplasts.

Calvin Cycle / Light Independent Stage

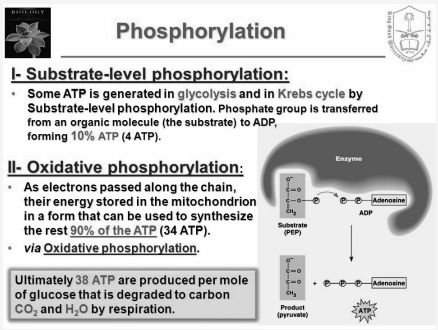
Chemiosmosis

Chemiosmosis

- The movement of ions across a semipermeable membrane, down their electrochemical gradient. An example of this would be the generation of adenosine triphosphate (ATP) by the movement of hydrogen ions (H+) across a membrane during cellular respiration or photosynthesis.

Photorespiration, C-4, & CAM

Photoresp.	rubisco binds with O_2 instead of CO_2; produces no ATP or sugar
C-4 Plants	Use alternate C-fixation (PEP carboxylase) that ends in a 4C compound (occurs in mesophyll & bundle sheath cells)
CAM Plants	Carbon fixation to organic acids at night → light reactions release CO_2 in the day

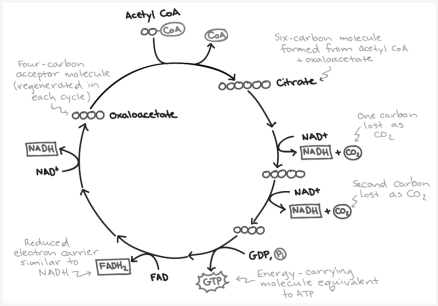


Glycolysis

2 ATP + 1 Glucose → 2 pyretic acid + 4 ATP

PFK = allosteric enzyme inhibited by ATP

Krebbs/Citric Acid Cycle



Substrate Level Phosphorylation: ATP + pyruvate

Pyruvate + coenzyme A: acetyl CoA

Products: 3 NADH, 1 ATP, 1 FADH, CO_2

Equation: 2acetyl groups + 6NAD+ + 2FAD + 2ADP + 2Pi → 4CO2 + 6NADH + $6H^+$ + 2 FADH2 + 2ATP

Key Points

- Carbohydrate molecules are assembled from carbon dioxide using the chemical energy harvested during the light-dependent reactions.

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