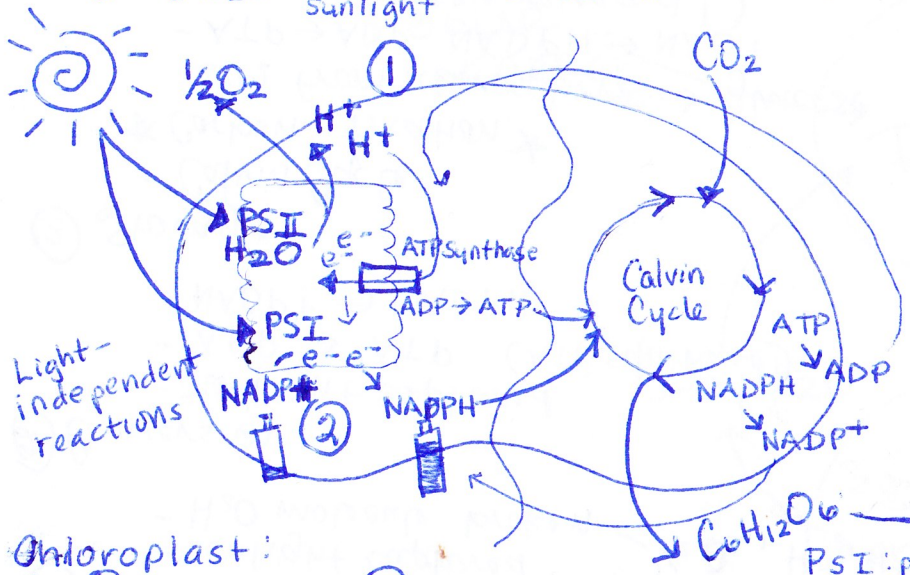
Photosynthesis

$6CO_2 + 6H_2O \xrightarrow{\text{sunlight}} C_6H_{12}O_6 + 6O_2$



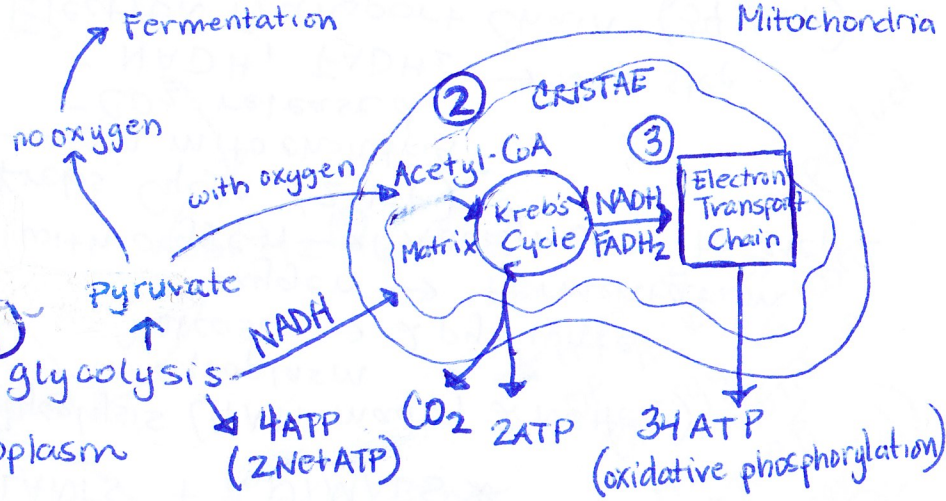
Chloroplast:
1 + 2 : thylakoid 3 : stroma

PsI : photosystem I
PsII : photosystem II

Aerobic Cellular Respiration

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + \text{Energy (ATP)}$

TOTAL MAX NET: 38 ATP / 1 GLUCOSE



Cytoplasm

BIOENERGETICS

KCY

① Absorption
- Sunlight captured
- H_2O molecule broken — $\frac{1}{2}O_2$, H^+, H^+

② Conversion
- Sunlight captured
- ADP → ATP (ATP synthase)
- $NADP^+$ → NADPH

③ Storage
- Calvin Cycle
- ★ Carbon Fixation ★
  - CO_2 from atmosphere → glucose
  - ATP → ADP, NADPH → NAD^+ (energy released!)
  - $C_6H_{12}O_6$ (glucose) product stored — links together to make starch or cellulose

★ PLANTS + ANIMALS ★

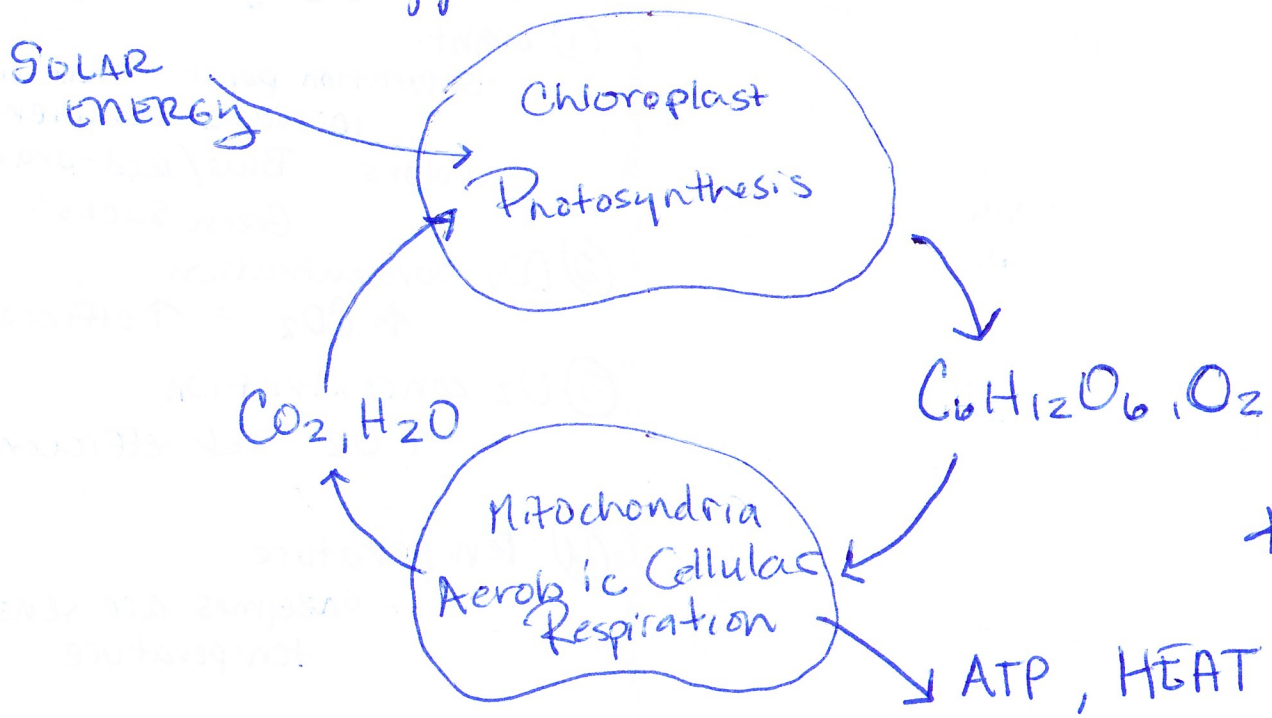
① Glycolysis (4 ATP made, 2 Netted)
- in cytoplasm
- Glucose → 2 pyruvate

without oxygen → Fermentation
with oxygen → Acetyl CoA to step 2

② Krebs Cycle (2 ATP)
- in mitochondria
- CO_2 released
- NADH, $FADH_2$ → Next step

③ Electron Transport Chain (34 ATP)
- oxidative phosphorylation
- Breakdown of NADH & $FADH_2$ cause H^+ gradient
- H^+ produces ATP (ATP synthase)

★ All Energy on EARTH ORIGINATES FROM SUN (SOLAR/RADIENT ENERGY)



★ Heat is a byproduct of ACR → Energy is lost as HEAT in NATURE (thermal)

Key

BIOENERGETICS

Factors Affecting Photosynthesis

1. Light
   - saturation point - max light that increases efficiency
   - Colors: Blue/Red-orange Best
     Green Sucks!
2. CO_2 concentration
   ↑ CO_2 = ↑ efficiency
3. O_2 concentration
   ↑ O_2 = ↓ efficiency
4. Temperature
   - enzymes are sensitive to temperature