Enzymes, Energy, Cellular Respiration, Photosynthesis

Enzymes

- type of protein
- biological catalyst = increase the rate of chemical reactions
- lower the E_A = energy of activation = amount of energy required to start a reaction
- are not used up in the reaction
- do not add energy

Enzyme specificity

- active site = allows specificity through a lock and key type mechanism

- a change in the shape of the active site can cause the enzyme to no longer function

Enzyme inhibitor = a chemical that interferes with an enzyme's activity

Energy

- heat from the environment
- chemical energy = energy that is stored in molecules
- ATP = energy-rich molecule that functions as the cell's fuel; the molecule used by the cell to power all of its cellular activities

2 sources of energy:

1. food
2. sun

Cellular Respiration

- process that uses oxygen to harvest energy stored in molecules of food to make ATP

$$\textbf{glucose} + O_2 \rightarrow \textbf{ATP} + CO_2 + H_2O$$

3 Stages:

1. glycolysis

- occurs in cytoplasm

glucose → pyruvate + 2 ATP + NADH

2. Kreb's cycle = Citric Acid cycle

- occurs in matrix of the mitochondria

pyruvate → acetyl CoA

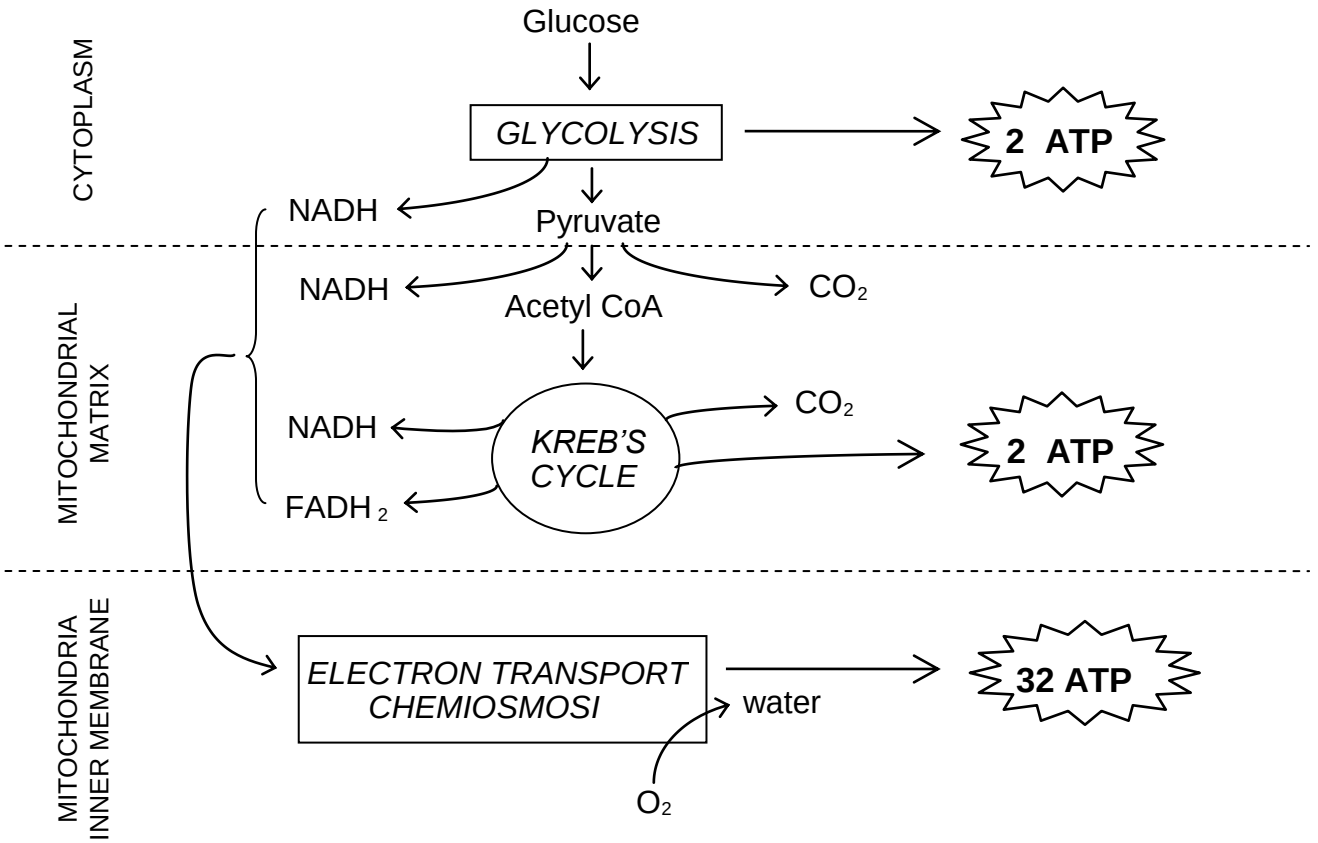
acetyl CoA → 2 ATP + NADH + $FADH_2$ + CO_2

3. electron transport chain and chemiosmosis (ATP synthesis)

- occurs in the cristae of inner mitochondria membranes
- molecules embedded in the cristae make up an electron transport chain

NADH & $FADH_2$ + O_2 → 32 ATP's + H_2O

Summary:



Fermentation

- Anaerobic Alternative to Cellular Respiration

Glucose → Ethanol + CO_2 + 2 ATP

Photosynthesis

- the process that traps and converts light energy from the sun to make high energy food molecules

H_2O + CO_2 + light energy → glucose + O_2

2 stages:

1. **light reactions** = convert light energy to chemical energy
   - occur in the thylakoid membranes

2. **Calvin cycle (Dark reactions)** = chemical energy is stored
   - occur in the stroma

Cellular Respiration and Photosynthesis are complementary processes:

cellular respiration: glucose + O_2 → CO_2 + H_2O + ATP (chemical energy)

photosynthesis: CO_2 + H_2O + light (solar energy) → glucose + O_2