

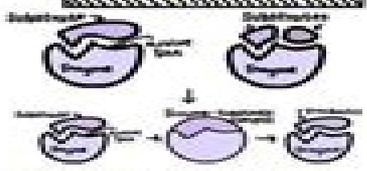
cellular energetics
enzymes
cellular respiration

UNIT 3 REVIEW

CELLULAR ENERGETICS

enzymes
photosynthesis
energy / atp

ENZYMES



- Speeds up chemical reactions
- Changes in shape can stop reaction
 - temperature and pH change
- Can alter enzymes shape
 - pH can disrupt hydrogen bonds
 - higher temp causes more collisions = higher reaction rate

Enzyme concentration

- Increase in concentration of substrate and enzymes can increase reaction rate
- Higher product levels = feedback inhibition

VOCABULARY

- photon = particles of light waves
- shorter wavelength = higher energy
- pigments = substances that absorb light
- wavelength distance between waves
- chloroplasts = found in stroma, stacked into columns known as grana

INHIBITION

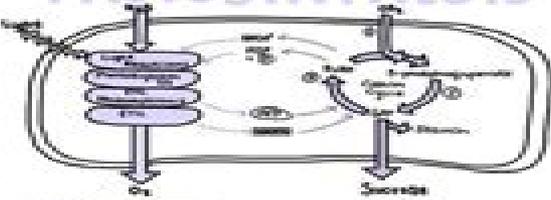
- Competitive inhibition: molecules bind to binding site, competing to bind and change shape and activity
- Noncompetitive inhibition: molecules bind to allosteric site and change enzyme shape



- Chloroplast - captures light, converts light, releases oxygen
- Chlorophyll a = blue-green color
- Chlorophyll b = yellow-green color
- Carotenoids: photosynthesis: photoblast
- Stroma: site of light independent reactions

- Water splits creating O_2 byproduct
 - Light transfers electrons and H^+ ions to NADP⁺
 - NADP⁺ reduced to NADPH by adding electrons and one H^+ ion
 - Chemiosmosis generates ATP through photophosphorylation
- PRODUCTS: ATP and NADPH

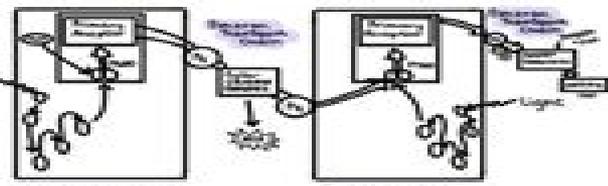
PHOTOSYNTHESIS



Thylakoid space → site of light dependent reactions
Stroma → site of light independent reactions

Light independent reactions

Reductions capture energy from light to create ATP and NADPH to power Calvin cycle



Photosystem II: Pq Synthase produces ATP w/ added H^+ from photo II

calvin cycle

- products: carbohydrates from carbon dioxide
- three phases: carbon fixation, reduction, regeneration of ATP
- Carbon fixation → rubisco catalyzes O_2 attaching to 3-carbon sugar, creates 6-carbon which splits into 2 3's
- Reduction → each molecule gains then loses a phosphate becoming G3P, five G3P are used
- Regeneration → carbon of G3P are arranged to create RuBP = PRODUCT: G3P (sugar)
- For one G3P, cycle must happen three times

CELLULAR RESPIRATION

Glycolysis → releases energy in glucose to form ATP from ADP and inorganic phosphate, and NADPH from NADP⁺ and pyruvate

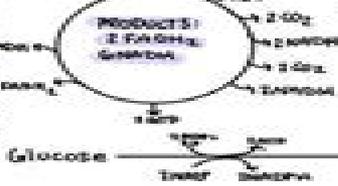
Glucose → $\xrightarrow{\text{small amount of pyruvate}}$ $\xrightarrow{\text{large amount of pyruvate}}$ $\xrightarrow{\text{with or without oxygen}}$

pyruvate is transported from cytosol to mitochondria to further oxidize

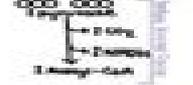
KREBS CYCLE

Carbon dioxide is released from organic intermediates, ATP is synthesized and electrons are transferred to coenzymes NADH and FADH₂

Electrons extracted in glycolysis and Krebs go to ETC in inner mitochondrial membrane



Glucose → $\xrightarrow{\text{small amount of pyruvate}}$ $\xrightarrow{\text{large amount of pyruvate}}$ $\xrightarrow{\text{with or without oxygen}}$



Chemiosmosis: a process through which protons generate ATP. Synthesis, driving ATP from ADP and inorganic phosphate

Maximum rate occurring from phosphorylation in cellular respiration and photosynthesis in photosynthesis

FERMENTATION

Follows glycolysis to proceed in the absence of oxygen, produces lactic acid and alcohol

- 2 lactate, using 2 NADH and sending H^+ back to glycolysis
- 2 ethanol, using 2 NADH and sending H^+ back to glycolysis

both types of fermentation contain NAD⁺ regeneration

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Mike Jess



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