

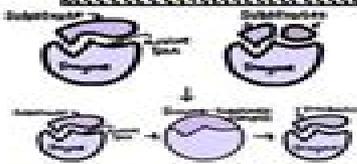
cellular energetics  
enzymes  
cellular respiration

# UNIT 3 REVIEW

## CELLULAR ENERGETICS

enzymes  
photosynthesis  
energy / atp

### ENZYMES



- Speeds up chemical reactions
- Changes in shape can stop reaction
  - temperature and pH changes
- 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: Inhibitors bind to active site competing for substrate

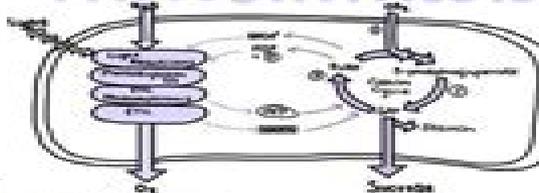


- Chloroplast - captures light, converts light, releases oxygen
- Chlorophyll a = blue-green color
- Chlorophyll b = yellow-green color
- Carotenoids: photosynthesis: photoblast
- Stroma: site of light independent reactions

### Steps of Light dependent reactions

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

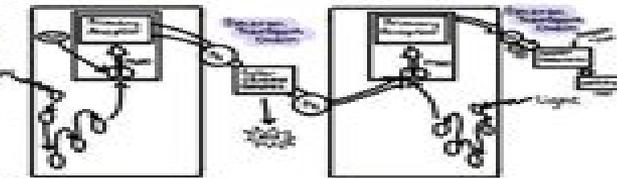
### PHOTOSYNTHESIS



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

### Light independent reactions

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



Photosystem II: NADP Synthase produces NADPH w/ added  $H^+$  from photo II  
Photosystem I: ATP 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 5-carbon sugar, creates 6-carbon which splits into 2 3C
- 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<sup>+</sup> and pyruvate



pyruvate is transported from cytosol to mitochondrion to further oxidize

### KREBS CYCLE

Carbon dioxide is released from organic intermediates, ATP is synthesized and electrons are transferred to coenzymes NADH and FADH<sub>2</sub>

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



PRODUCTS: 2 FADH<sub>2</sub>, 2 CO<sub>2</sub>, 2 ATP, 2 H<sub>2</sub>O

Chemiosmosis: a process through which protons generate ATP. Synthesis of ATP from ADP and inorganic phosphate. Occurs in mitochondria and chloroplasts.

### FERMENTATION

Follows glycolysis to process 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<sup>+</sup> regeneration

# Ap Biology Chapter 18 Notes

**R Barnett**



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