


Bio 115 Cells & Evolution of Life

Energy Conservation

Overview of Metabolic Pathways



University of Idaho

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How would you define life?

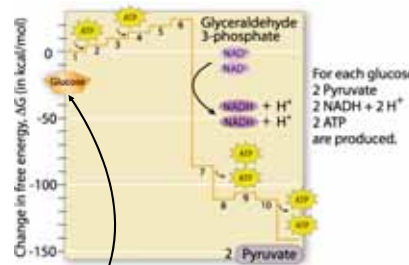


Organisms come in countless shapes, sizes, and colors. All organisms, however, must capture and process energy in order to survive, grow, and reproduce.

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Metabolic pathways occur in steps



Change in free energy, ΔG (in kcal/mol)

Glucose

Glyceraldehyde 3-phosphate

2 Pyruvate

For each glucose:
2 Pyruvate
2 NADH + 2 H⁺
2 ATP are produced.

Glucose starts here and is partially oxidized through ten chemical reactions to produce...

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The link between photosynthesis and respiration

PHOTOSYNTHESIS

$$\text{Energy} + \text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2$$

(glucose)

RESPIRATION

$$\text{C}_6\text{H}_{12}\text{O}_6 + \text{O}_2 \rightarrow \text{H}_2\text{O} + \text{CO}_2 + \text{Energy}$$

(glucose)

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Cyclic metabolic pathways

The Calvin-Benson Cycle

The Citric Acid Cycle

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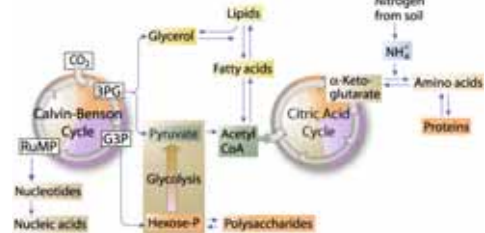
Oxidative Phosphorylation

Respiratory electron transport and oxidative phosphorylation

Photosynthetic electron transport and oxidative phosphorylation



Metabolic pathways involve essential molecules



Many intermediates of photosynthesis and respiration are used to make macromolecules (proteins, polysaccharides, nucleic acids and lipids).
Macromolecules in turn may feed back into photosynthesis and respiration.

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