ADVANCED BIOLOGY: CELLULAR RESPIRATION AND FERMENTATION

(USE CHAPTER 9 AS A RESOURCE)



CATABOLIC PATHWAYS YIELD ENERGY BY OXIDIZING ORGANIZ FUELS

1. Catabolic Pathways and Production of ATP
2. Fermentation
3. Aerobic respiration
4. Anaerobic respiration
5. Overall Respiration Reaction
6. Redox Reactions: Oxidation and Reduction
7. The Principle of Redox
8. Oxidation
9. Reduction
10. Oxidation of Organic Fuel Molecules During Cellular Respiration

C6H12O6 + 6O2 → 6H2O + 6CO2 + Energy

1. Stepwise Energy Harvest via NAD+ and the Electron Transport Chain
2. The Stages of Cellular Respiration: A Preview



1. Glycolysis
2. Citric Acid Cycle (Kreb’s Cycle)
3. Oxidative Phosphorylation

GLYCOLYSIS HARVESTS CHEMICAL ENERGY BY OXIDIZING GLUCOSE TO PYRUVATE



AFTER PYRUVATE IS OXIDIZED, THE CITRIC ACID CYCLE COMPLETES THE ENERGY-YIELDING OXIDATION OF ORGANIC MOLECULES



DURING OXIDATIVE PHOSPHORYLATION, CHEMIOSMOSIS COUPLES ELECTRON TRANSPORT TO ATP SYNTHESIS

1. The Pathway of Electron Transport



1. Chemiosmosis: The Energy-Coupling Mechanism



ATP Synthase

Chemiosmosis

Proton-motive force

1. An Accounting of ATP Production by Cellular Respiration

FERMENTATION AND ANAEROBIC RESPIRATION ENABLE CELLS TO PRODUCE ATP WITHOUT THE USE OF OXYGEN

Anaerobic respiration

Fermentation

1. Types of Fermentation
2. Alcohol Fermentation



1. Lactic Acid Fermentation



1. Comparing Fermentation with Anaerobic and Aerobic Respiration

|  |  |  |  |
| --- | --- | --- | --- |
|  | Fermentation | Aerobic Respiration | Anaerobic Respiration |
| Begins With |  |  |  |
| Electron Carrier |  |  |  |
| ATP Production |  |  |  |
| Final Electron Acceptor |  |  |  |
| Electron Transport Chain |  |  |  |
| Location |  |  |  |

1. Obligate Anaerobes
2. Facultative Anaerobes
3. The Evolutionary Significance of Glycolysis

GLYCOLYSIS AND THE CITRIC ACID CYCLE CONNECT TO MANY OTHER METABOLIC PATHWAYS

1. The Versatility of Catabolism



1. Biosynthesis (anabolic pathways)