# Electron Transport Chain Activity: ATP Production in Mitochondria

## AP Biology/College Level Teacher Guide

### Overview

This guide supports implementation of the Electron Transport Chain Activity: ATP Production in Mitochondria using the 5E instructional model.

### Learning Objectives

- Students will trace electron flow through the mitochondrial ETC
- Students will explain the relationship between proton gradient and ATP synthesis
- Students will identify factors affecting oxidative phosphorylation

### Standards Alignment

- **ESSENTIAL KNOWLEDGE 3.3.B.1:** Cellular respiration includes the metabolic pathways of glycolysis, the Krebs cycle, and the electron transport chain.
- **ESSENTIAL KNOWLEDGE 3.3.B.2:** Cellular respiration captures the chemical energy in glucose to produce ATP.
- **ESSENTIAL KNOWLEDGE 2.5.B.1:** Electrochemical gradients represent potential energy.

#### Topic 3.6: Cellular Energy

- **LO 3.6.A:** Describe cellular processes that require ATP
- **EK 3.6.A.2:** The electron transport chain captures energy from electrons

### Prerequisites

- Understanding of redox reactions

- Mitochondrial structure
- ATP synthesis basics

## Time Estimate

25 minutes

## Materials Needed

- Computer with internet access
- Student Activity Sheet

## Teaching Tips by Phase

### Phase 1: ENGAGE (5-10 minutes)

- Start with the phenomenon or problem presented
- Elicit student predictions and prior knowledge
- Create cognitive dissonance if possible
- Build excitement for investigation

### Phase 2: EXPLORE (15-20 minutes)

- Allow students to investigate with minimal guidance
- Circulate and ask probing questions
- Encourage systematic data collection
- Note common discoveries and difficulties

### Phase 3: EXPLAIN (10-15 minutes)

- Have students share their findings first
- Build on their observations to introduce concepts
- Address misconceptions directly
- Connect to broader biological principles

### Phase 4: ELABORATE (10 minutes)

- Apply knowledge to new scenarios

- Make real-world connections
- Encourage deeper investigation
- Support transfer of learning

### Phase 5: EVALUATE (5-10 minutes)

- Use varied assessment strategies
- Focus on conceptual understanding
- Provide immediate feedback
- Plan follow-up based on results

> **Remember:**
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> The goal is student discovery through guided inquiry. Resist the urge to explain concepts before students have explored them!

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