Name: _____ **Date:** _____

Section: _____

Electron Transport Chain Activity

Exploring the Mitochondrial Power Plant

Phase 1: ENGAGE (3 minutes)

Getting Started: Open peebedu.com and navigate to Electron Transport Chain

Read the introduction popup to understand the inputs, process, and outputs.

Essential Question: How does the ETC convert energy from food molecules into ATP? _____

Initial Observations:

- What molecules bring electrons to the ETC? _____ and _____

- What energy molecule is produced? _____

Phase 2: EXPLORE (10 minutes)

Observe the Simulation

Set all sliders to middle values and watch the process.

Part A: Following the Electrons Which complexes do electrons from NADH pass through? _____ Which complexes do electrons from $FADH_2$ pass through? _____ What happens when electrons reach oxygen? _____

Part B: Proton Movement Which complexes pump protons? Circle them: _____

Complex I Complex II Complex III Complex IV

Where do protons get pumped TO? _____ How do protons return through ATP synthase? _____

Part C: Changing Conditions Try adjusting the sliders:

Temperature:

- Cold makes the process: FASTER / SLOWER
- Hot makes the process: FASTER / SLOWER

Oxygen Level:

- Low oxygen causes electrons to: _____

Phase 3: EXPLAIN (8 minutes)

Making Connections

Energy Flow Pattern: Complete the sequence:

Food → _____ → Electrons → _____ gradient → _____

Why Multiple Complexes?

Each complex releases energy. What does this energy do? _____

The Role of Oxygen: Why is oxygen called the '`final electron acceptor`'? _____

ATP Synthase Function: How is ATP synthase like a water wheel? _____

Phase 4: ELABORATE (3 minutes)

Real-World Applications

Cyanide Poisoning: Cyanide blocks Complex IV. What would happen to:

- Electron flow? _____

Exercise: During intense exercise, your cells need more ATP. What increases? _____

Brown Fat: Some proteins let protons flow back without making ATP, producing heat instead. When would this be useful? _____

Phase 5: EVALUATE (1 minute)

Quick Check

Order these from first to last: ___ ATP production: increases / decreases / stays same Protons pumped out _____ ___ NADH delivers electrons ___ Water formed ___ Protons flow through ATP synthase

Key Concept: The ETC uses energy from _____ to pump _____, creating a gradient that drives _____ production.

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Reflection: Why is the ETC called the '`powerhouse`' of cellular respiration? _____