

What is the Electron Transport Chain?

Worksheet

The electron transport chain is a series of protein complexes that pass electrons from NADH and FADH₂ to oxygen, pumping protons to drive ATP synthesis through chemiosmosis.



Questions

1. Where does the electron transport chain occur?

- A) Cytoplasm
- B) Mitochondrial matrix
- C) Inner mitochondrial membrane
- D) Nucleus

2. What is the final electron acceptor in the ETC?

- A) Carbon dioxide
- B) Oxygen
- C) NAD
- D) Water

3. Which enzyme uses the proton gradient to produce ATP?

- A) Hexokinase
- B) ATP synthase
- C) Citrate synthase
- D) Pyruvate kinase

4. Why does FADH yield less ATP than NADH?

- A) It carries fewer electrons
- B) It enters at Complex II, bypassing Complex I's proton pump
- C) It is not oxidized
- D) It reacts with CO instead

5. One glucose molecule's full oxidation delivers 10 NADH and 2 FADH₂ to the ETC. Estimate the total ATP produced.

6. If only 4 NADH enter the ETC (no FADH₂), how many ATP result?

7. A mitochondrion processes 6 FADH₂ molecules only (no NADH). Find the ATP yield.

8. Define: Where is the electron transport chain located?

9. Define: What is the final electron acceptor in the ETC?

10. Define: Which enzyme actually makes the ATP?

Answer Key

1. C) Inner mitochondrial membrane - The ETC protein complexes are embedded in the inner mitochondrial membrane.
2. B) Oxygen - Oxygen accepts electrons and H to form water at Complex IV.
3. B) ATP synthase - ATP synthase converts the proton gradient into ATP via chemiosmosis.
4. B) It enters at Complex II, bypassing Complex I's proton pump - FADH donates electrons at Complex II, so fewer protons are pumped overall.
5. NADH: $10 \times 2.5 = 25$ ATP FADH: $2 \times 1.5 = 3$ ATP Total $25 + 3 = 28$ ATP (from the ETC alone)
6. $4 \times 2.5 = 10$ ATP
7. $6 \times 1.5 = 9$ ATP
8. In the inner mitochondrial membrane.
9. Oxygen - it combines with electrons and H to form water.
10. ATP synthase, using the proton gradient built by the ETC (chemiosmosis).

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