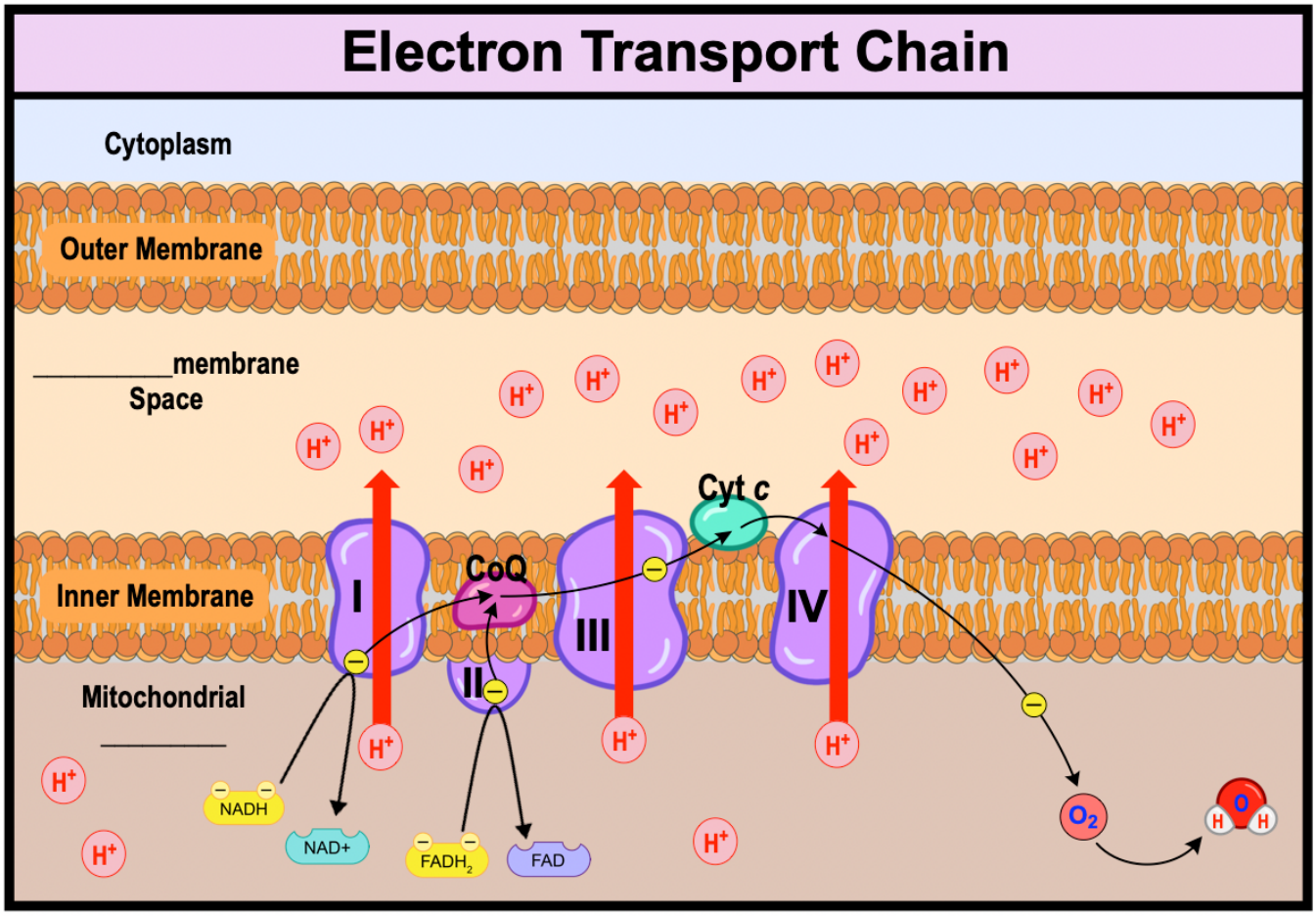
CONCEPT: ELECTRON TRANSPORT CHAIN

Intro to Electron Transport Chain

- **Electron Transport Chain** (_____): one of the last steps of _____ respiration of catabolism.
  - □ Series of _____ reactions that harness energy of _____ from NADH & $FADH_2$ coenzymes.
    - NADH & $FADH_2$ are produced in the citric acid cycle.



EXAMPLE: Which of the following correctly describe(s) the electron transport chain?

a) Harnessing of energy from high-energy electrons from Krebs cycle.

b) The breakdown of NADH and $FADH_2$ to carbon dioxide.

c) Oxidation of NADH and $FADH_2$ coenzymes.

d) Redox reactions facilitated by enzyme complexes and electron carriers located in the inner membrane of the cell.

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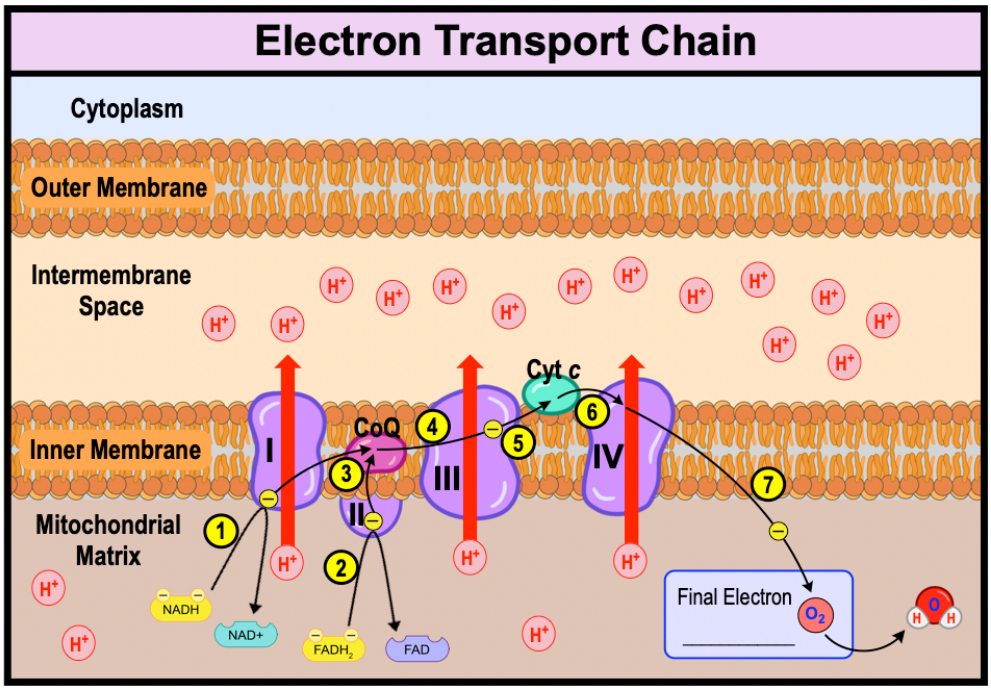
Electron Transport Chain Process

- ETC uses energy from ____ to generate a _____ ion gradient by pumping H^+ into the _____membrane space.
  - □ Increase [H^+] in the intermembrane space (____ pH).

1. NADH transfers e^- to Complex __.
2. $FADH_2$ transfers e^- to Complex __.
3. Complex I & II transfer e^- to _____.
4. CoQ transfers e^- to Complex ____.
5. Complex III transfers e^- to _____.
6. Cyt *c* transfers e^- to Complex ____.
7. e^- are accepted by _____.

NOTE: Only Complexes I, III, IV pump ____ into intermembrane space.



- **Final Electron Acceptor**: the final molecule that accepts the ETC's electrons is _____ gas.
  - □ Oxygen gas (O_2) interacts with H^+ ions to form _____.
- **Summary of ETC Reactions:**

Complex I: $NADH + H^+ + CoQ \longrightarrow$ _____ + _____

Complex II: $FADH_2 + CoQ \longrightarrow$ _____ + _____

Matrix: $4H^+ + 4e^- + O_2 \longrightarrow$ _____

EXAMPLE: What is the primary role of Coenzyme Q and Cytochrome *c* in ETC?

a) To transport H^+ ions into the intermembrane space.

b) To shuttle electrons from one complex to another.

c) To synthesize ATP.

d) To act as final electron acceptors.

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Remembering ETC

HINT 1: NADH ⟶ Complex ___.

HINT 2: $FADH_2$ ⟶ Complex ___ (does not pump protons.)

HINT 3: CoQ ⟶ Complex ___.

HINT 4: Cyt c ⟶ Complex ___.

PRACTICE: $FADH_2$ can be oxidized at both complex I and II in the inner membrane of mitochondria. (T/F)

a) True

b) False

PRACTICE: Write a reaction representing oxidation of NADH coenzyme.

PRACTICE: Protons are pumped into the intermembrane space due to:

a) Energy provided by the electrons as they pass through complexes I, III & IV.

b) Decreasing of the pH in the intermembrane space.

c) CoQ pumping electrons through the complexes.

d) Formation of water from final electron acceptor.

PRACTICE: The mobile electron carriers of the ETC are:

a) Complex I & II b) Complex III & IV c) NADH & $FADH_2$ d) CoQ & Cyt *c*