2024 Bi H1 Q11

Section: Metabolism and Survival

Topic: Aerobic Respiration – Electron Transport Chain

Question Summary:

A diagram of the electron transport chain (ETC) shows arrows labelled A–D across the inner mitochondrial membrane. The question asks which arrow represents the pumping of hydrogen ions (protons) across the membrane.

Worked Solution:

- In aerobic respiration, electrons from NADH and FADH2 pass along carrier proteins in the inner mitochondrial membrane (ETC).

- The energy released from electron transfer is used to pump hydrogen ions (H+) from the mitochondrial matrix into the intermembrane space.

- This creates an electrochemical gradient (high H+ concentration outside the inner membrane).

- The return flow of H+ through ATP synthase (at another arrow) drives ATP synthesis.

According to the diagram, arrow B shows this pumping of hydrogen ions across the inner mitochondrial membrane.

Final Answer: **B** (Hydrogen ions pumped across the inner mitochondrial membrane).

Revision Tips:

- Electron transport chain uses energy from electrons to pump H+ ions.

- H+ gradient -> ATP synthesis via ATP synthase (chemiosmosis).

- The inner mitochondrial membrane is key to oxidative phosphorylation.