# 2025 Bi H2 Q7

**Section:** Metabolism and Survival
**Topic:** Cellular Respiration

**Question Summary:**
Students must identify key components of the electron transport chain, describe the role of NAD, and explain how altered carrier proteins reduce ATP production.

**Worked Solution**

**(a)(i)** The electron transport chain is located on the **inner mitochondrial membrane**.

**(a)(ii)** Enzyme X is **ATP synthase**.

**(a)(iii) Y:** Oxygen (O2)
**Z:** Water (H2O)

**(b)** NAD carries **hydrogen ions and electrons** from glycolysis and the citric acid cycle to the electron transport chain, enabling ATP production.

**(c)** If the carrier proteins are altered, fewer electrons are transported along the chain. This reduces the energy released for pumping hydrogen ions across the membrane. With fewer hydrogen ions available to drive ATP synthase, **less ATP is produced**.

**Final Answer:**
Inner mitochondrial membrane. ATP synthase. Oxygen and water. NAD carries hydrogen ions and electrons. Altered carrier proteins reduce hydrogen ion pumping and therefore ATP output.

**Revision Tips**

- The electron transport chain is the final stage of respiration.
- NAD is essential for delivering electrons to the chain.
- ATP synthase produces ATP as hydrogen ions flow through it.
- Any disruption to carrier proteins disrupts the proton gradient and ATP yield.