- The electron transfer reaction between NADH and oxygen is a spontaneous reaction at 37 °C

  $$NADH + \tfrac{1}{2}O_2 + H^+ \rightarrow NAD^+ + H_2O \qquad \Delta G = -220 \text{ kJ mol}^{-1}$$

  When this reaction is carried out in solution in a test tube via direct mixing of NADH with dissolved oxygen, the reaction releases a significant amount of heat. However, when the reaction occurs in mitochondria during respiration, it produces very little heat. Explain why the heat evolved is much less in mitochondria.

**3**