

Endothermic and Exothermic QUESTION

Question: Pentane, C_5H_{12} , is a liquid at room temperature. It evaporates at $36.1^\circ C$ in an endothermic process.

(i) Explain why the evaporation of pentane is an endothermic process.

(ii) Draw, including labels, the energy diagram for the combustion of pentane, $C_5H_{12}(l)$.

Pentane combustion: $C_5H_{12}(l) + 8O_{2(g)} \rightarrow 5CO_{2(g)} + 6H_2O(l)$ $\Delta_r H^\ominus = -3509 \text{ kJ mol}^{-1}$

Include in your diagram the reactants, products, and change in enthalpy.

ANSWER

1. define an **endothermic** process

An Endothermic process is one where heat / energy has been absorbed and the enthalpy of the products is higher than the reactants

2. For the substance (name) state the type of "solid" that it is

Pentane is a molecular "solid" made up of molecules held together by weak intermolecular bonds.

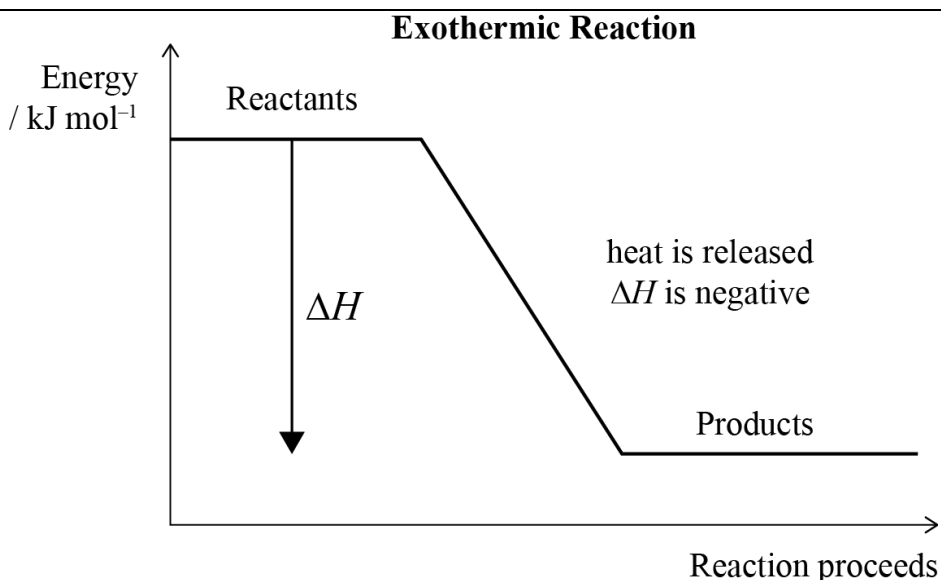
3. link state change (liquid to gas) to breaking bonds requiring energy

Energy is required to change pentane from a liquid to a gas. The energy / heat is used to break weak intermolecular forces / bonds / attraction between pentane molecules. (not the strong covalent bonds between atoms in the molecule)

3. link state change to endothermic process

Because energy is needed to be absorbed by the pentane to break the bonds then this process of evaporation is endothermic.

4. draw **labelled diagram** including labelled axis's, reactants H_R , products H_P and change in enthalpy ΔH



NOTE: The white column is how your answer would appear on your test paper so make sure you **write out complete sentences**. The grey area is just to help you structure your answer and would not appear in the question.