

5 Chemical energetics

5.1 Exothermic and endothermic reactions

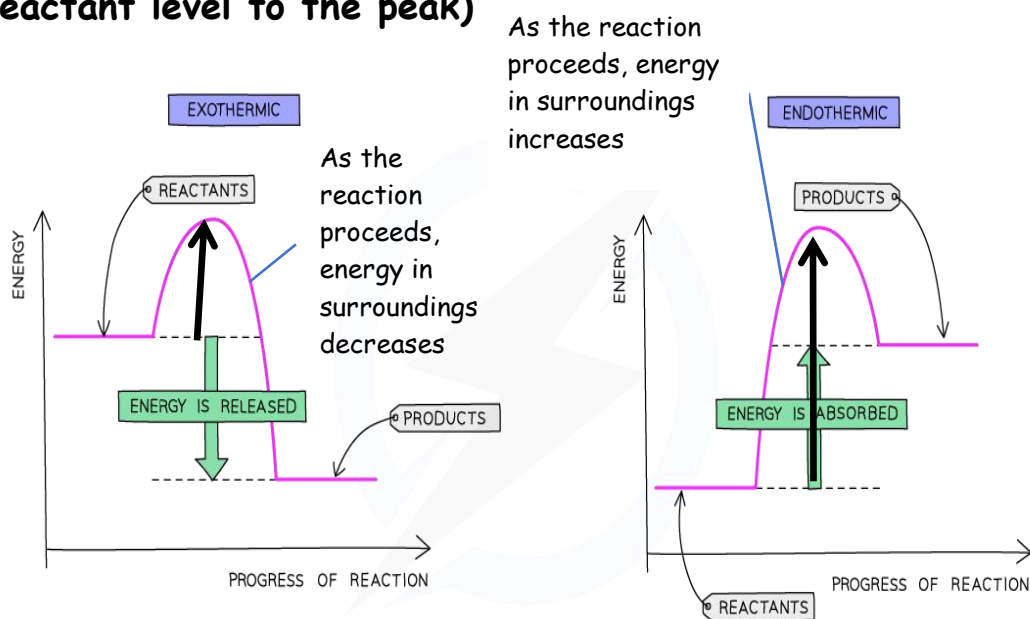
- 1 State that an exothermic reaction transfers thermal energy to the surroundings leading to an increase in the temperature of the surroundings
- 2 State that an endothermic reaction takes in thermal energy from the surroundings leading to a decrease in the temperature of the surroundings
- 3 Interpret reaction pathway diagrams showing exothermic and endothermic reactions AND 6 Draw and label reaction pathway diagrams for exothermic and endothermic reactions using information provided, to include:

(a) reactants

(b) products

(c) enthalpy change of the reaction, ΔH (The green arrow) from the reactant level to the product)

(d) activation energy, E_a (The black arrow which starts from reactant level to the peak)



4 State that the transfer of thermal energy during a reaction is called the enthalpy change, ΔH , of the reaction. ΔH is negative for exothermic reactions and positive for endothermic reactions

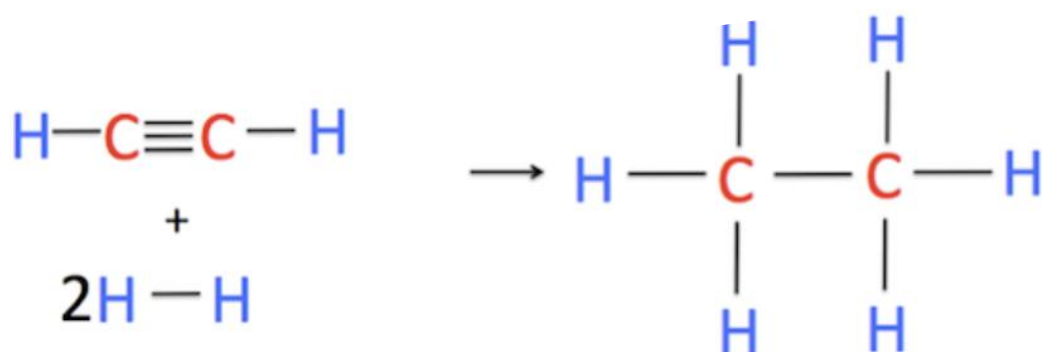
5 Define activation energy, E_a , as the minimum energy that colliding particles must have to react

7 State that bond breaking is an endothermic process and bond making is an exothermic process and explain the enthalpy change of a reaction in terms of bond breaking and bond making

- In exothermic reactions, the rate of bond making is greater than rate of bond breaking. In endothermic reactions, the rate of bond breaking is greater than rate of bond making.
- Hence, the energy taken in for bond breaking is more than energy given out during bond making in an endothermic reaction. The energy given out during bond making is greater than energy taken in for bond break.
- The products in endothermic reactions have more energy than the reactants. The products in the exothermic reactions have less energy than the reactants.

8 Calculate the enthalpy change of a reaction using bond energies

$$\Delta H = \Sigma(\text{bond energies of bonds broken}) - \Sigma(\text{bond energies of bonds formed})$$



From the table of the values of bond enthalpy, the values we need are:

Bond	Enthalpy (kJ/mol)
H—H	432
C≡C	839
C—H	413
C—C	347

Reactant
Products

$$\begin{aligned}
 & 2(\text{H}-\text{C}) + (\text{C}\equiv\text{C}) + 2(\text{H}-\text{H}) - (\text{C}-\text{C}) + 6(\text{H}-\text{C}) \\
 & 2(413) + 839 + 2(432) - 347 + 6(413) \\
 & 2529 - 2825 \\
 & \Delta H = -296 \text{ kJ/mol, Reaction is exothermic}
 \end{aligned}$$

END OF CHAPTER