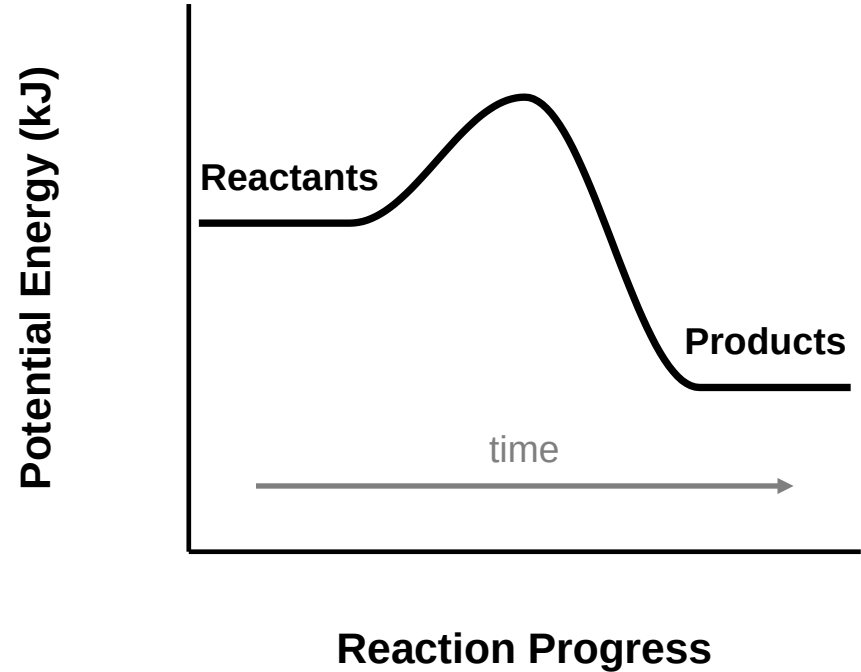


Essential Question

How does energy change during a reaction?

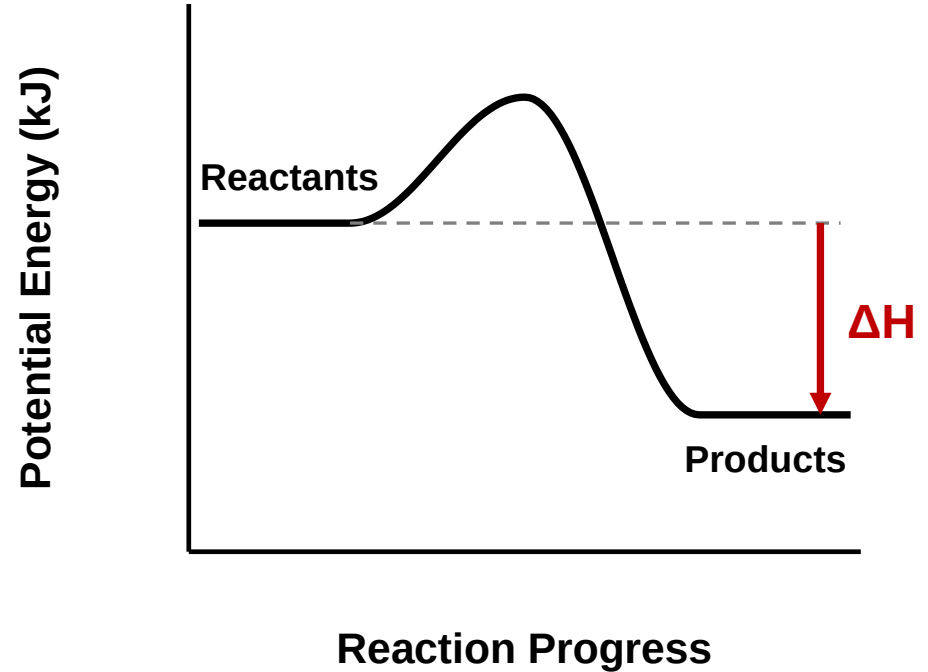
What a PE Diagram Shows

- Tracks **stored energy**
- Read it left to right



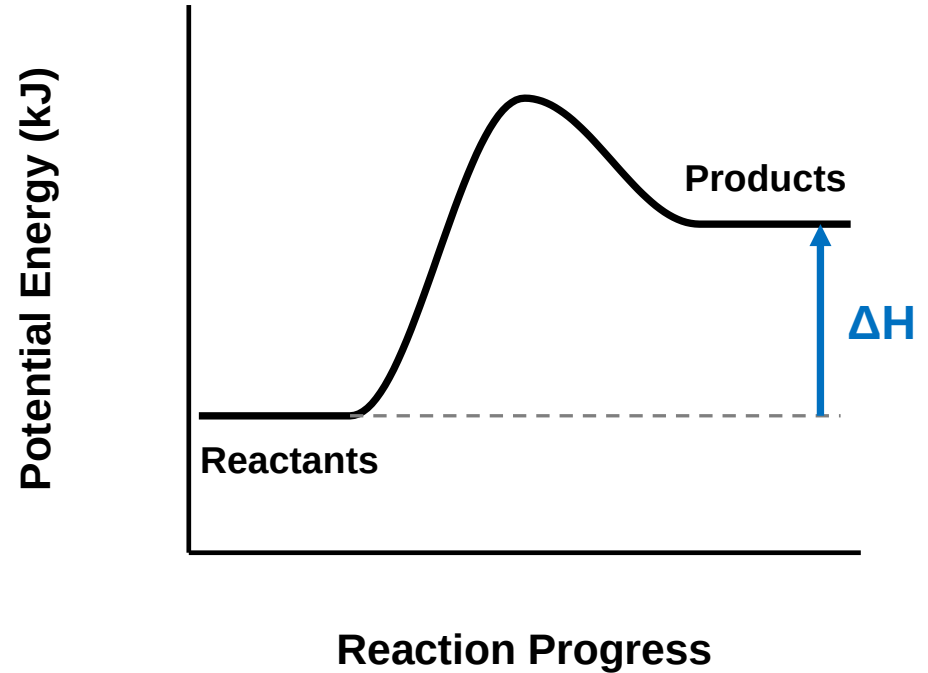
Exothermic Reactions

- Products end up **lower**
- ΔH is **negative** (-)
- Heat is **released**



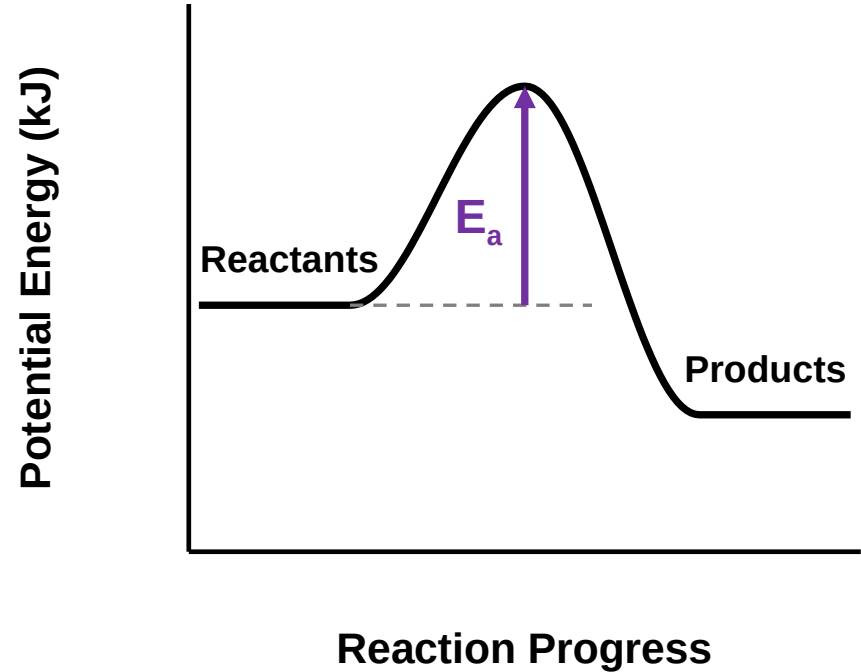
Endothermic Reactions

- Products end up **higher**
- ΔH is positive (+)
- Heat is **absorbed**



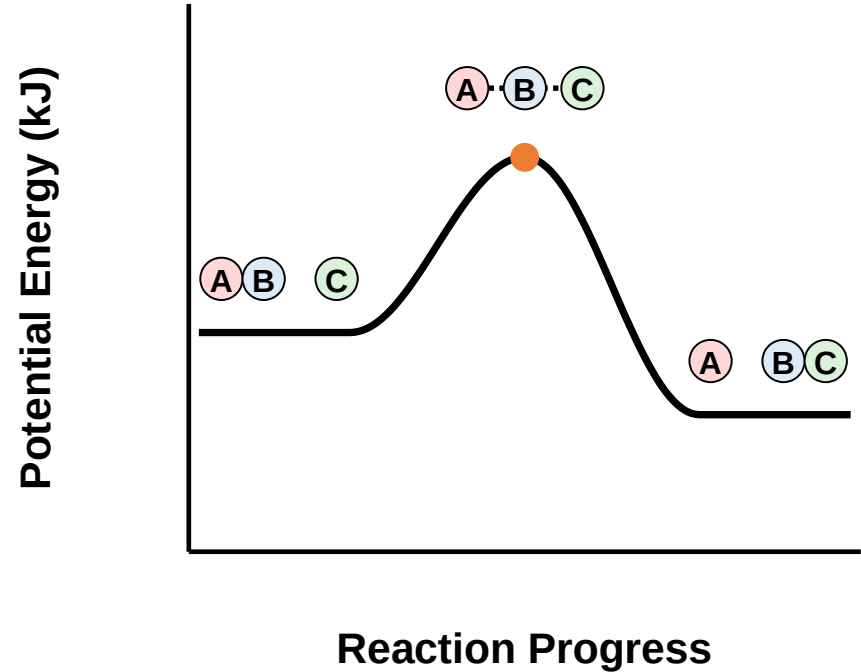
Activation Energy

- E_a : energy needed to start
- From **reactants** to **peak**



Activated Complex

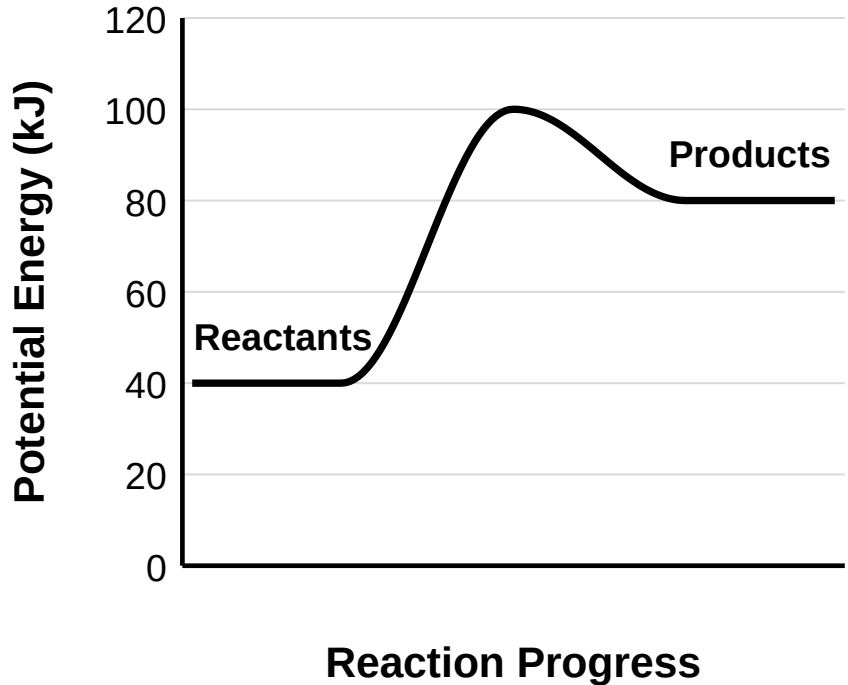
- The unstable **peak** of the hill
- Also: **transition state**
- Bonds break and form



Finding ΔH on a Diagram

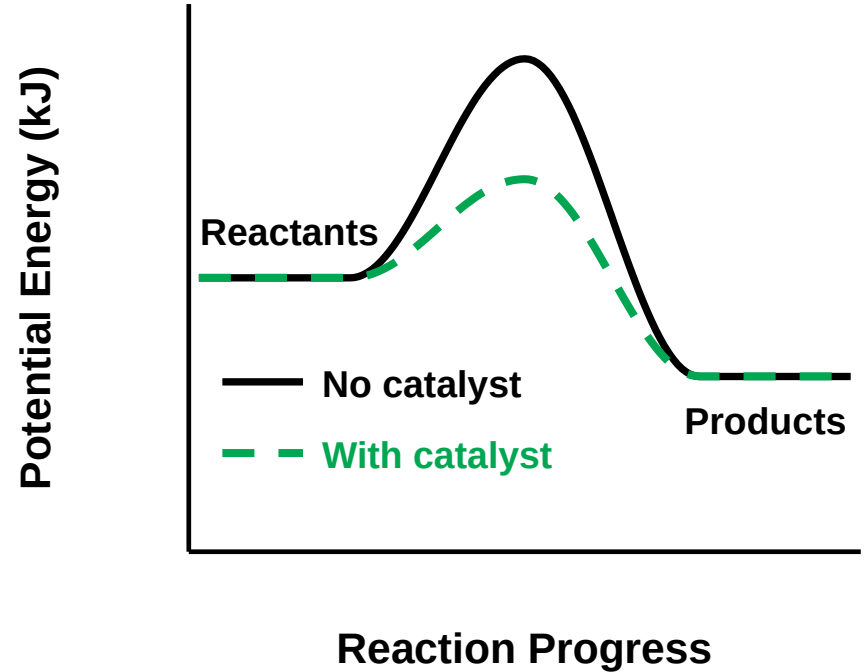
$$\Delta H = PE_{\text{products}} - PE_{\text{reactants}}$$

- Read each **flat line**
- Sign: exo or endo



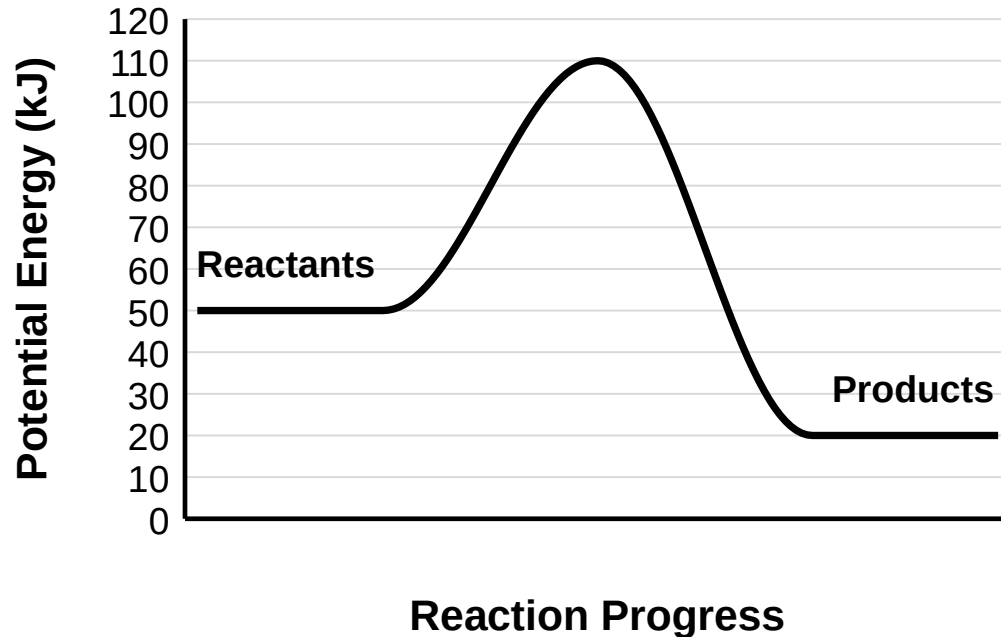
Effect of a Catalyst

- **Catalyst:** lowers E_a
- Reaction goes **faster**
- Same ΔH , same flat lines



Example 1: Reading a PE Diagram

Use the PE diagram to answer (a), (b), and (c).



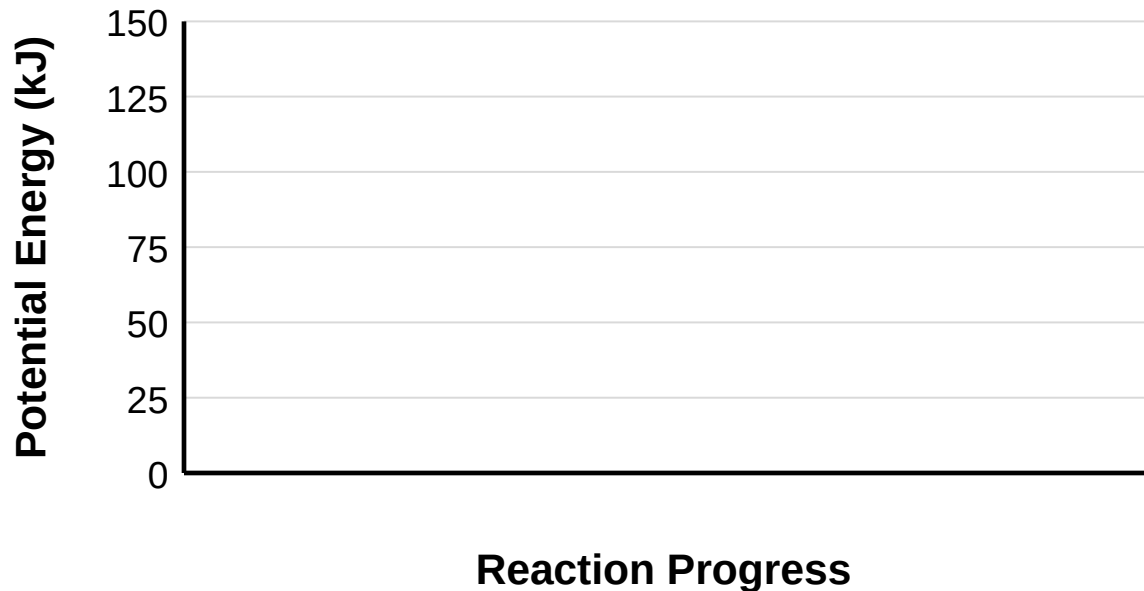
(a) Find ΔH .

(b) Find E_a .

(c) Exothermic or endothermic?

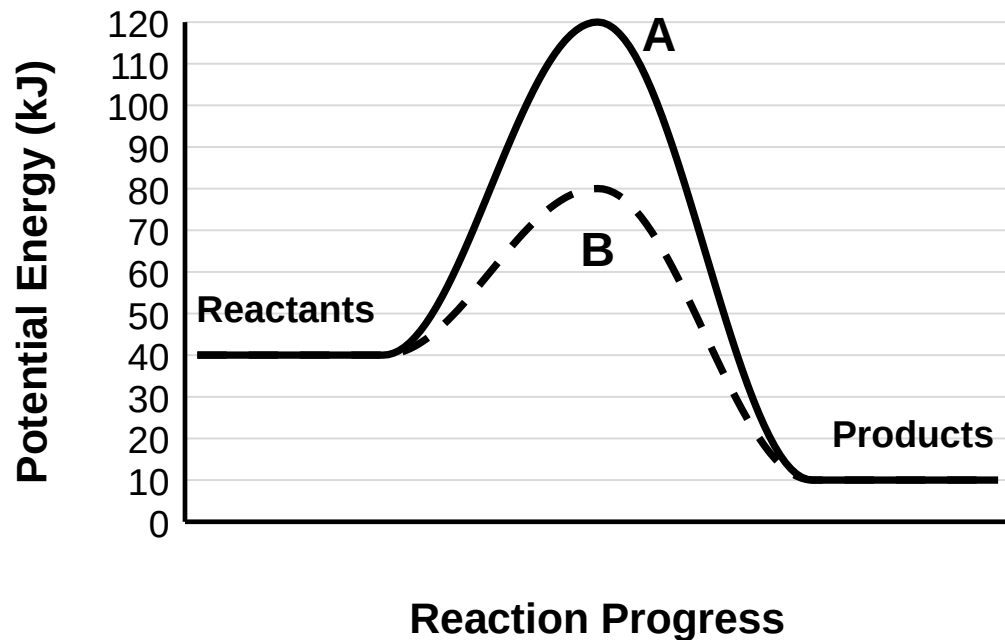
Example 2: Sketch a PE Diagram

Sketch a PE diagram for a reaction with reactants at 25 kJ, $\Delta H = +50$ kJ, and $E_a = 100$ kJ.



Example 3: Catalyst or Not?

Curves A and B show the same reaction.



(a) Which curve is catalyzed?

(b) Find E_a for each curve.

(c) Find ΔH for each curve.

Big Ideas

- PE diagrams track energy from reactants to products
- Exothermic: $\Delta H < 0$; endothermic: $\Delta H > 0$
- $\Delta H = \text{products} - \text{reactants}$
- $E_a = \text{peak} - \text{reactants}$; a catalyst lowers E_a