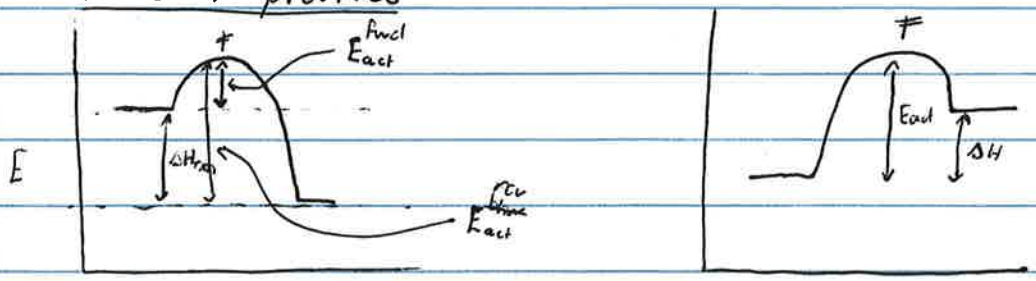
Today Jan 29th Sect 13.9 - 13.13

*today's material WILL be on exam 2

Wednesday: 1/31 CK1, doors open at 9:15

Friday: Start chapter 14

Reaction profiles



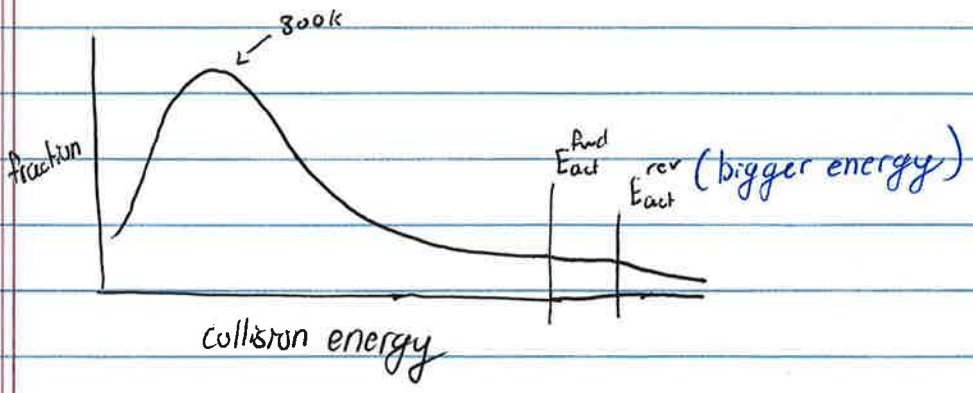
reaction progress

$\Delta H_{rxn} < 0$ (exothermic) $\Delta H_{rxn} > 0$ (endothermic

$E_{act}^{rev} = \Delta H + E_{act}^{fwd}$

initially → transition (‡) → final

Ⓐ Ⓑ → ← Ⓒ → Ⓐ Ⓑ Ⓒ → Ⓐ + Ⓑ Ⓒ



Mechanism: story of how molecules do what they do step-by-step

One-step mechanism: bi-molecular step

step 1. $AB + C \rightarrow A + BC$ (slow step)

overall: $AB + C \rightarrow A + BC$ rate = $k[AB]^1[C]^1$ 2nd order overall

Two-step mechanism:

step 1. $AB \rightarrow A + B$ unimolecular step (slow step)

step 2. $B + C \rightarrow BC$ bimolecular step (fast step)

overall: $AB + C \rightarrow A + BC$ rate = $k[AB]^1$

*the slow step determines the rate

rate ∝ one or two reactants in the slow step

• the only thing that can change the rate constant is a change in temperature

step 1: $AB + AB \rightarrow AB_2 + A$ slow step ∴ rate = $k[AB]^2$

step 2.

step 3.

rate laws can be proposed

overall: $AB + C \rightarrow A + BC$

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powerpoint demo

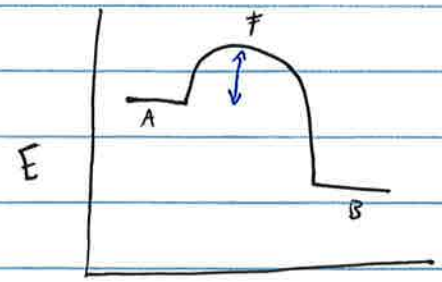
Mechanism A:

rate = $k[NO_2][CO]$

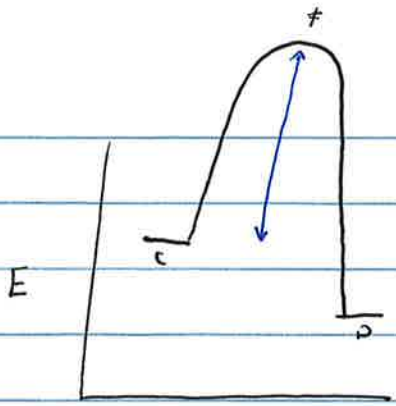
Mechanism B:

if step 1 is slow...

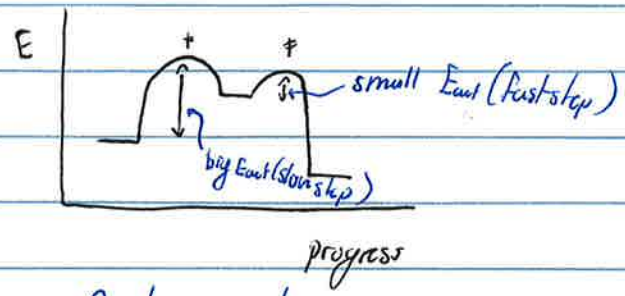
rate = $k[NO_2]^2$



fast (smaller E_{act}) rxn

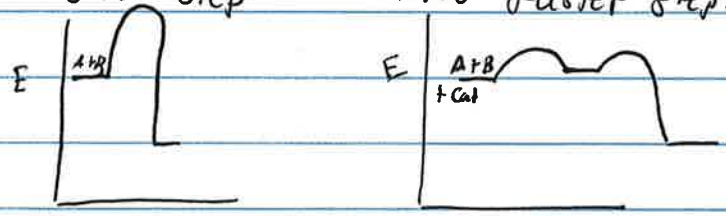


slow (big E_{act}) rxn



2 step mechanism

catalyst: slow step ↪ two faster steps



each step has smaller E_{act}

step 1. A + Cat → intermediate

step 2. intermediate + B → C + Cat

overall: A + B → C