



# Kinetics & Organic Reactions

UCI Chem 51A  
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# Goals

- After this lesson you should be able to
  - Determine the general form of the rate law for a reaction based on given information
  - Predict the affect of changing concentration on the rate of reaction
  - Compare relative rates based on activation energies
  - Identify the rate-determining step in a reaction from a reaction coordinate diagram
  - Explain how a catalyst affects the rate of a reaction

# Reaction Rates & Kinetic Molecular Theory

- Molecules must collide in the correct orientation and with the correct energy to react!
- Rates depend on:
  - \_\_\_\_\_
  - \_\_\_\_\_

# Rate Laws: Effect of Concentration

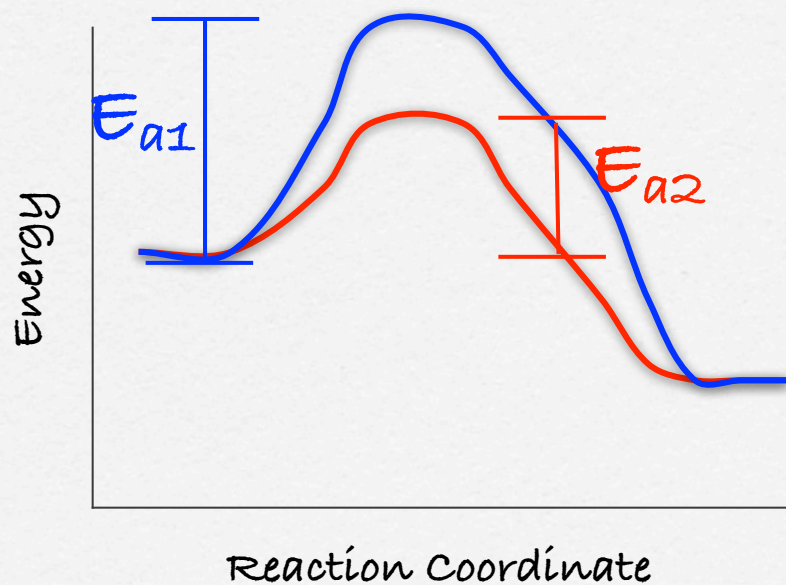
- Rates depend on concentration, but of what?

1st Order

2nd Order

Generally determined experimentally.

# Transition States & Activation Energy

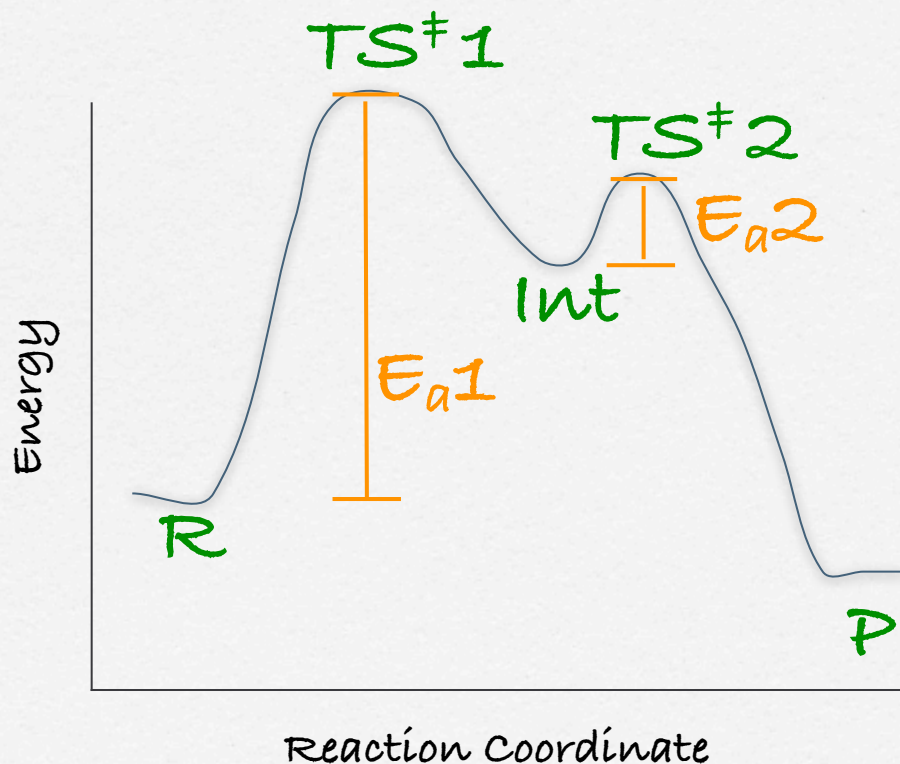


Note: Rates DO NOT depend on  $\Delta G$ ,  $\Delta H$ , or  $K_{eq}$ !

# Reactions with Multiple Steps

What determines the rate?

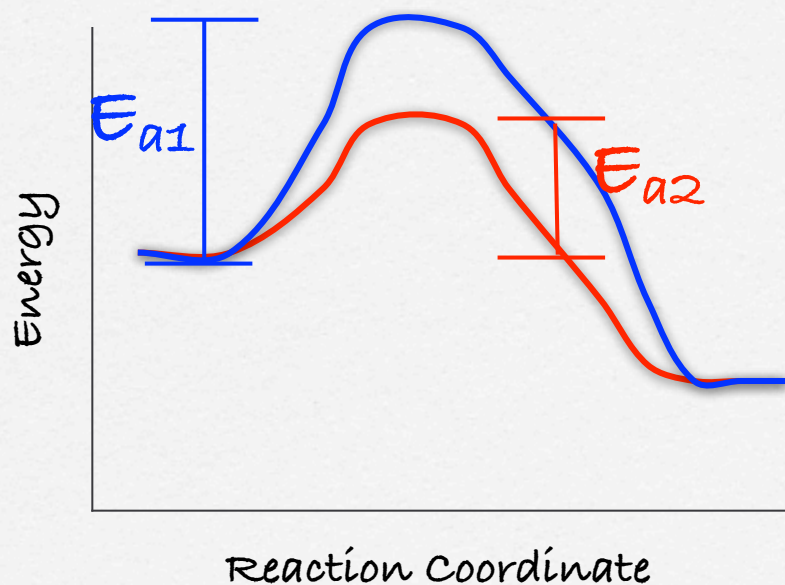
Minimum energy needed to get reaction going depends on highest energy  $TS^\ddagger$ .



# Rate Law & Rate-Determining Steps

- What does the rate law tell us about the rate-determining step?

# How Do Catalysts Work?



rate 1 < rate 2

$TS^\ddagger 1 > TS^\ddagger 2$

Rxn 2 catalyzed!  
Different TS!

Catalysts provide alternative path with lower activation energy!



# Wrapping Up

- Practice predicting the effect of concentration changes on rate of reaction
- Practice determining rate laws from changes in concentrations
- Practice comparing rates of reactions based on reaction coordinate diagrams
- Practice identifying the rate-determining step from a reaction coordinate diagram
- Practice identifying a catalyst or catalyzed reaction