

Lecture 6.1 Reaction mechanisms and the rate limiting step.

Note Title

9/9/2011

Mechanism: Steps goal
Baker

- Get up @ 4:00A
- mix up dough
- dough rises
- baking
- packaging & selling.

) Require time - Rate Limiting Steps

- slowest steps

- determine the speed of the mechanism

Reaction Mechanisms:

a series of elementary reactions

(steps) = add up to an overall reaction.

Tests of rxn mechanisms

1) Each elementary reaction must be reasonable. (likely)

☺ unimolecular

• decomposes

reasonable

☺ bimolecular

• ... products

reasonable

☹ trimolecular

•

unlikely

not reasonable

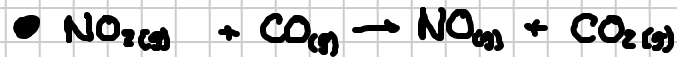
2) Combined elementary reactions reproduce the exp overall reaction.

3) The rate law equation predicted by the mechanism must agree with experiment.

Type I Reaction Mechanisms

- 1) Step #1 slow Rate Limiting Step P.L.S.
- 2) Step #2 fast
- 3) Step #3 fast

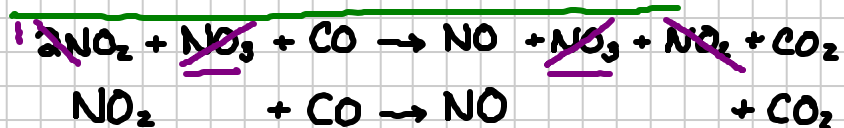
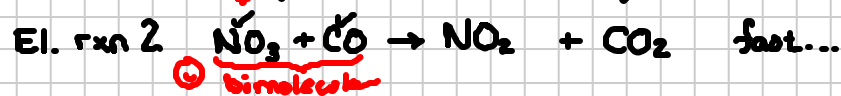
Experimental Result: overall reaction



rate law Equation

$$\text{rate} = k [\text{NO}_2]^2$$

Proposed Mechanism:



Agrees with overall rxn 😊

NO_3 : Reaction Intermediate produced & consumed by mechanism
 ... doesn't appear in overall rxn

3) Derive the mechanism's rate equation.



rate = $k [\text{NO}_2]^2$
reactants ... compare to exp. Same! 😊