

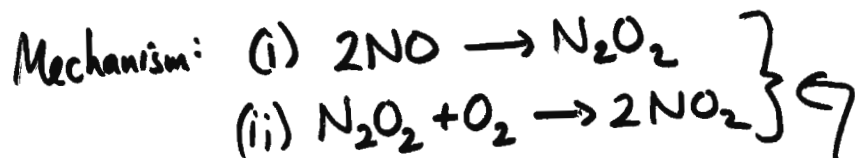
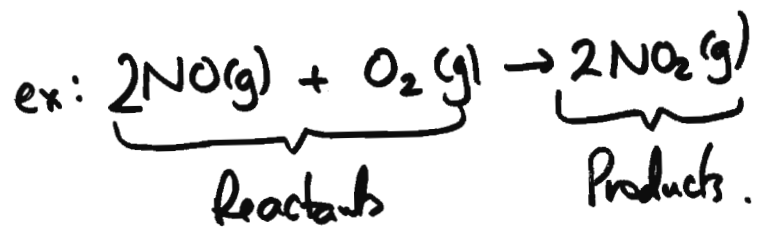
2/25/2015

Reaction Mechanisms

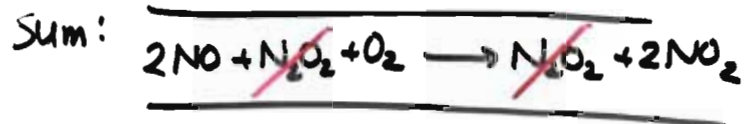
Reactant \longrightarrow Products.

Mechanism: tells us how P are made from R.

- actual series of collisions + reactions to take us $R \rightarrow P$



- elementary rxns
- actual collisions!



$\text{N}_2\text{O}_2 = \text{intermediate.}$

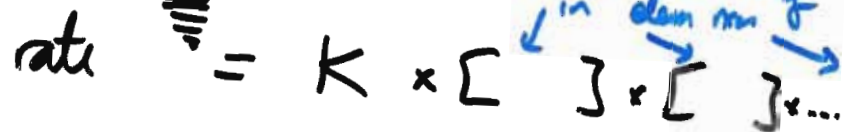
Since elementary rxns describe the actual collisions... it's convenient to use some words to describe # things colliding.

# collisions (# molecules colliding)	name
1	unimolecular
2	bimolecular
3	termolecular

Unlike the overall chem rxn, which we cannot simply write out its rate law

- But when we have elementary rxns,
we can write out their rate laws!

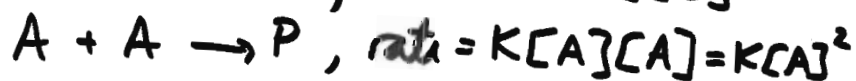
for elem. rxns:



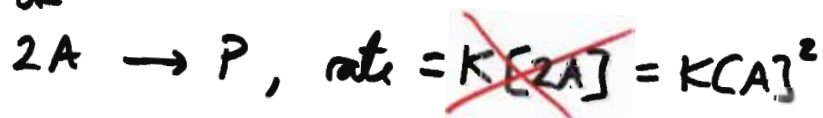
ex: UNIMOLECULAR



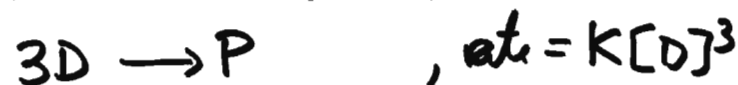
* BIMOLECULAR * common.



or



TERMOLECULAR

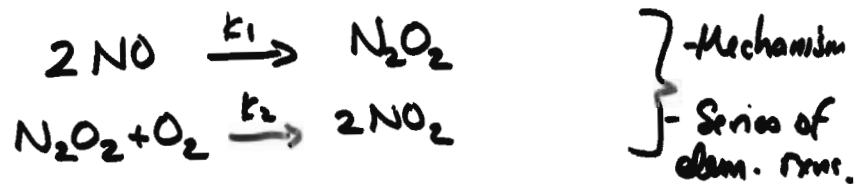
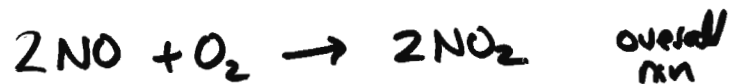


For a multi-step mechanism

- ↑
- actual collisions
- elementary rxns.

- The SLOWEST of these elementary rxns determines the rate of the OVERALL rxn.

↳ Rate Determining Step (RDS)
Rate Limiting Step (RLS)



rate of 1st elem rxn: $\text{rate}_1 = k_1 [\text{NO}]^2$

rate of 2nd elem rxn: $\text{rate}_2 = k_2 [\text{N}_2\text{O}_2][\text{O}_2]$

if $k_1 \ll k_2$, then

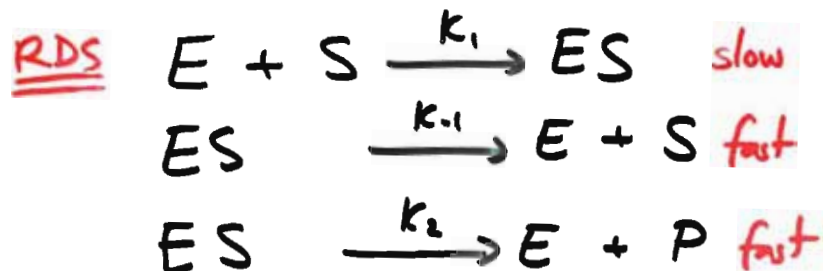
1st elem rxn = SLOW - (RDS)

2nd elem rxn = FAST

$\Rightarrow \boxed{\text{rate} = k [\text{NO}]^2}$ ← predicted overall rate-law!



Mechanism:



$$\text{rate} = k_1 [E][S]$$

Catalyst

- a substance that SPEEDS up the rate of a rxn, without itself being consumed.
- WORK? → Lower EA
- Provide an alternate mechanism.