Name _____Beth"Key"_____

Chemistry 2: Reaction – Chemical Kinetics Reaction Mechanisms

1. Complete the table for each elementary reaction shown.

Elementary Reaction	Molecularity	Rate Law
$2NO \rightarrow N_2O_2$	Bimolecular	Rate=k$[NO]^2$
$SO_3 \rightarrow SO_2 + O$	Unimolecular	Rate=k$[SO_3]$
$O + O_3 \rightarrow 2O_2$	Bimolecular	Rate=k$[O][O_3]$

2. The decomposition of hydrogen peroxide is catalyzed as shown below. The catalyzed reaction is thought to proceed by a two-step mechanism:

$H_2O_2 + I^- \rightarrow H_2O + IO^-$ (slow)
$IO^- + H_2O_2 \rightarrow H_2O + O_2 + I^-$ (fast)

a. Predict the rate law for the overall process

Rate=k$[H_2O_2][I^-]$ according to slow elementary step. However, I^- is not consumed in the reaction and therefore changing its concentration does not impact rate. Its behavior as a catalyst will impact the value for k. This is often designated with k' so we can write the rate law as:

Rate=k'$[H_2O_2]$

b. Write the chemical equation for the overall process.

$$2H_2O_2 \xrightarrow{I^-} 2H_2O + O_2$$

c. Identify the intermediate, if any, in the mechanism.

IO^-

d. Identify the catalyst in this reaction.

I^-

3. The balanced equation for the reaction of the gases nitrogen dioxide and fluorine is:
$2NO_2 + F_2 \rightarrow 2NO_2F$
The experimentally determined rate law is: Rate = K$[NO_2][F_2]$

One possible mechanism for this reaction is shown below.

$NO_2 + F_2 \rightarrow NO_2F + F$ (slow)
$F + NO_2 \rightarrow NO_2F$ (fast)

a. What is the rate law for this mechanism?

Rate = k$[NO_2][F_2]$

b. What is the overall reaction for this mechanism?

$2NO_2 + F_2 \rightarrow 2NO_2F$

c. Is this an acceptable mechanism?

Yes