Advanced Chemistry **NAME: _____PER: _____**
Reaction Mechanisms (Part 1)

Fill in the Blank

1. A _____ is neither a reactant nor product of the reaction. It is usually formed in one elementary reaction and consumed in the next.

2. The steps by which a reaction occurs is called the _____.

3. Elementary reaction involving the simultaneous collision of three molecules are _____.

4. The slow step in a multistep mechanism is called the _____ step because it limits the overall reaction rate.

5. Elementary reaction in which a single molecule is involved is _____.

6. _____ reactions typically occur in a single event or step.

7. _____ mechanisms consist of a sequence of elementary reactions.

8. _____ is the number of molecules that participate as reactants in elementary reactions.

9. Elementary reaction involving the simultaneous collision of two molecules are _____.

Concept Questions

10. What is the molecularity of each of the following elementary reactions? Write the rate law for each.

a) $Cl_2(g) \rightarrow 2Cl(g)$

b) $OCl^-(aq) + H_2O(l) \rightarrow HOCl(aq) + OH^-(aq)$

c) $NO(g) + Cl_2(g) \rightarrow NOCl_2(g)$

11. The following mechanism has been proposed for the gas phase reaction H_2 with ICl:

$$H_2(g) + ICl(g) \rightarrow HI(g) + HCl(g)$$
$$HI(g) + ICl(g) \rightarrow I_2(g) + HCl(g)$$

a) Write the balanced equation for the overall reaction.

b) Identify any intermediates in the mechanism.

c) If the first step is slow and the second one is fast, which rate law do you expect to be observed for the overall reaction?

9. The decomposition of hydrogen peroxide is catalyzed by iodide ion. The catalyzed reaction is thought to proceed by a two-step mechanism:

$$H_2O_2(aq) + I^-(aq) \rightarrow H_2O(l) + IO^-(aq)$$
$$IO^-(aq) + H_2O_2(aq) \rightarrow H_2O(l) + O_2(g) + I^-(aq)$$

a) Write the chemical equation for the overall process.

b) Identify the intermediate, if any, in the mechanism.

c) Assuming that the first step of the mechanism is rate determining, predict the rate law for the overall process.