Advanced Chemistry **NAME: _____PER: _____**
Reaction Mechanisms (Part 2)

Concept Questions

1. The following mechanism has been proposed for the reaction of NO with H_2 to form N_2O and H_2O.

Step 1: $NO(g) + NO(g) \rightleftharpoons N_2O_2(g)$ (fast, equilibrium)
Step 2: $N_2O_2(g) + H_2(g) \rightarrow N_2O(g) + H_2O(g)$ (slow)

a) Write the chemical equation for the overall reaction.

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

c) What is the molecularity and rate law of each step?

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

2. Used the following proposed mechanisms to answer the questions below:

Step 1: $A + B \rightleftharpoons X$ (fast, equilibrium)
Step 2: $X + C \rightarrow Y$ (slow)
Step 3: $Y \rightarrow D$ (fast)

a) Write the chemical equation for the overall reaction.

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

c) What is the molecularity and rate law of each step?

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

3. The kinetics of the reaction $2X + Y \rightarrow Z$ was experimentally tested and the rate law was determined to be rate = k[Y]. The following three mechanisms have been proposed for the reaction. Complete the table for each mechanism providing the overall reaction for the mechanism and the rate law of the mechanism. Finally, determine which mechanism fits the chemical equation and rate law given above.

Mechanism 1		Elementary Step	Speed
	Step 1	$X + Y \rightleftharpoons M$	(fast, equilibrium)
	Step 2	$X + M \rightarrow Z$	(slow)
	Overall Reaction		
	Rate Law		

Mechanism 2		Elementary Step	Speed
	Step 1	$Y \rightarrow M$	(slow)
	Step 2	$X + M \rightarrow Z$	(fast)
	Overall Reaction		
	Rate Law		

Mechanism 3		Elementary Step	Speed
	Step 1	$Y \rightarrow M$	(slow)
	Step 2	$X + M \rightarrow N$	(fast)
	Step 3	$N + X \rightarrow Z$	(fast)
	Overall Reaction		
	Rate Law		

The mechanism that was consistent with the overall reaction and rate law from the experiment was mechanism _____.

a) 1
b) 2
c) 3
d) None of the following