REACTION MECHANISMS

NAME _____ SECTION _____

1. Given the chemical equation

$$R + BG \rightarrow RG + B$$

Describe the interaction between reactant particles that must occur to convert them to products. You may draw one or more pictures as part of your description.

2. Write the general differential form of the rate law for the reaction above.

3. The following table summarizes several experiments where the concentrations of R and BG were varied to determine the effect on the initial rate of the reaction.

Experiment Number	R (M)	BG (M)	Initial Rate ($\frac{M}{s}$)
1	0.240	0.125	1.85×10^{1}
2	0.480	0.124	3.68×10^{1}
3	0.479	0.249	7.37×10^{1}

Determine the rate law for the reaction.

4. How do the exponents in the rate law that was obtained in Question 3 compare to the coefficients in the balanced chemical equation in Question 1?

5. Define the term *reaction mechanism*.

6. a. Optional: Look at the simulation (http://introchem.chem.okstate.edu/DCICLA/K2GBM.htm) for the reaction:

$$2G + B \rightarrow G_2B$$

The rate law is known to be rate = $k[G]^2$. Suggest a possible mechanism for this reaction.

b. Why is B not part of the rate law? (Hint: do all of the steps in a mechanism contribute to the overall rate? Why or why not?)

7. The rate law for the following reaction

$$2NO_2(g) + F_2(g) \rightarrow 2NO_2F(g)$$

was experimentally determined to be

$$\text{rate} = k[NO_2]^1[F_2]^1$$

Which of the following mechanisms is the most reasonable? Explain your reasoning for making the choice you did.

a. $2NO_2(g) + F_2(g) \rightarrow 2NO_2F(g)$

b. $NO_2(g) + F_2(g) \rightarrow NO_2F(g) + F(g)$ (fast)

$NO_2(g) + F(g) \rightarrow NO_2F(g)$ (slow)

c. $NO_2(g) + F_2(g) \rightarrow NO_2F(g) + F(g)$ (slow)

$NO_2(g) + F(g) \rightarrow NO_2F(g)$ (fast)

8. Suggest a mechanism for the reaction

$$CH_3NC(g) \rightarrow CH_3CN(g)$$

if the experimental rate law is rate = $k[CH_3NC]^1$.

9. Suggest a possible mechanism for the reaction

$$OH^- + CH_3Br \rightarrow CH_3OH + Br^-$$

if the experimental rate law is rate = $k[CH_3Br]^1[OH^-]^1$.

10. Suggest a possible mechanism for the reaction

$$NO_2(g) + CO(g) \rightarrow NO(g) + CO_2(g)$$

if the experimental rate law is rate = $k[NO_2]^2$.

11. Consider the following set of equations

Step I: $Cl(g) + O_3(g) \rightarrow ClO(g) + O_2(g)$

Step II: $ClO(g) \rightarrow Cl(g) + O(g)$

$$O_3(g) \rightarrow O(g) + O_2(g)$$

Describe the process illustrated by the above set of equations and the role each of the species plays in the process. Use words like mechanism, elementary steps, overall reaction, reactants, products, intermediate, and catalyst in your description.