CHE 112 - Homework - Ch 17d

OER 17.6 **Reaction Mechanisms** Score: _____/40

Name: _____ Date: _____

[10 pt] 1. Are the following statements (T)rue or (F)alse? For the false statements, correct them so that they are true.

1(a) The fastest step in a reaction is called the rate-determining step. 1(a) _____

1(b) The sum of all the elementary steps in a reaction must sum to give the overall reaction. 1(b) _____

1(c) Reaction intermediates are destroyed in one step and created in another. 1(c) _____

1(d) The coefficients of the overall reaction are the same as the exponents in the rate law. 1(d) _____

1(e) A catalyst speeds up a reaction by providing an alternative, higher energy pathway. 1(e) _____

[5 pt] 2. The following mechanism has been proposed for the reaction of nitrogen monoxide and chlorine:

Step 1: ___$NO(g)$ + ___$Cl_2(g)$ $\longrightarrow$ ___$NOCl_2(g)$
Step 2: ___$NOCl_2(g)$ + ___$NO(g)$ $\longrightarrow$ _2_$NOCl(g)$

2(a) Write the overall reaction.

2(b) Identify any reaction intermediates and/or catalysts.

2(c) What is the molecularity of each elementary step?

[5 pt] 3. The reaction between nitrogen dioxide and fluorine has a second order rate law: rate = $k[NO_2][F_2]$ and is believed to react via the following reaction mechanism:

Step 1: ___$NO_2(g)$ + ___$F_2(g)$ $\longrightarrow$ ___$NO_2F(g)$ + ___$F(g)$
Step 2: ___$F(g)$ + ___$NO_2(g)$ $\longrightarrow$ ___$NO_2F(g)$

3(a) Write the overall reaction.

3(b) Identify any reaction intermediates and/or catalysts.

3(c) Which step is the rate limiting step. Explain.

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[5 pt] 4. Given the following reaction mechanism:

Step 1: $\_\_\_O_3(g) + \_\_\_NO(g) \longrightarrow \_\_\_O_2(g) + \_\_\_NO_2(g)$

Step 2: $\_\_\_NO_2(g) + \_\_\_O(g) \longrightarrow \_\_\_O_2(g) + \_\_\_NO(g)$

4(a) Write the overall reaction.

4(b) Identify any reaction intermediates and/or catalysts.

4(c) Assuming the first step is slow, write the rate law.

[5 pt] 5. Given the following reaction mechanism:

Proposed Mechanism:

(1)	$HBr(g)$	+ $O_2(g)$	$\xrightarrow{k_1}$	$HOOBr(g)$	*(Slow)*
(2)	$HOOBr(g)$	+ $HBr(g)$	$\xrightarrow{k_2}$	$2\,HOBr(g)$	*(Fast)*
(3)	$HOBr(g)$	+ $HBr(g)$	$\xrightarrow{k_3}$	$H_2O(g) + Br_2(g)$	*(Fast)*
(4)	$HOBr(g)$	+ $HBr(g)$	$\xrightarrow{k_4}$	$H_2O(g) + Br_2(g)$	*(Fast)*

5(a) Write the overall reaction.

5(b) Identify any reaction intermediates and/or catalysts.

5(c) Assuming the first step is slow, write the rate law.

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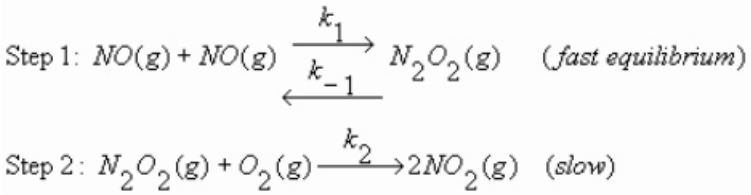
[5 pt] 6. The following mechanism has been proposed for a reaction.



6(a) Write the balance equation for overall reaction.

6(b) Identify any reaction intermediates and/or catalysts.

6(c) What is the rate law?

6(d) What is the rate constant?

[5 pt] 7. The following mechanism has been proposed for the formation of Hydrogen Iodide gas HI.

Step 1: ___I_2(g) $\underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}}$ _2_I(g) (Fast, Equilibrium)

Step 2: ___H_2(g) + ___I(g) $\underset{k_{-2}}{\overset{k_2}{\rightleftharpoons}}$ ___H_2I(g) (Fast, Equilibrium)

Step 3: ___H_2I(g) + ___I(g) $\xrightarrow{k_3}$ _2_HI(g) (slooooooooooow)

7(a) Write the balance equation for overall reaction.

7(b) Identify any reaction intermediates and/or catalysts.

7(c) What is the rate law?

7(d) What is the rate constant?

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