

**CHE 112 - Homework - Ch 13d**  
**Reaction Mechanisms**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

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) \_\_\_\_\_

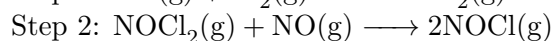
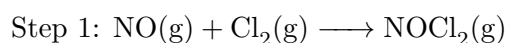
1(b) The sum of all the elementary steps in a reaction must sum to give the overall reaction. 1(b) \_\_\_\_\_

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) \_\_\_\_\_

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

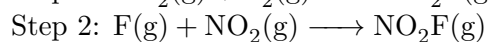
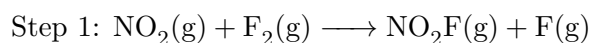


2(a) Write the overall reaction.

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

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

3. The reaction between nitrogen dioxide and fluorine has a second order rate law:  $\text{rate} = k[\text{NO}_2][\text{F}_2]$  and is believed to react via the following reaction mechanism:



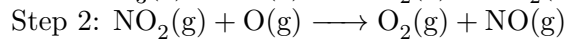
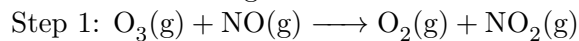
3(a) Write the overall reaction.

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

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

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4. Given the following reaction mechanism:

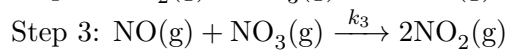
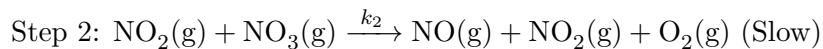
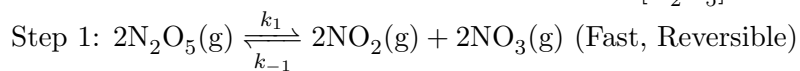


4(a) Write the overall reaction.

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

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

5. The following mechanism has been proposed for the decomposition of dinitrogen pentaoxide. Experimentally the rate law has been determined to be:  $\text{rate} = k[\text{N}_2\text{O}_5]$ .



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

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

5(c) Show that the proposed mechanism is consistent with the experimental rate law.

5(d) Relate the rate constant  $k$  to the rate constants for the elementary reactions.