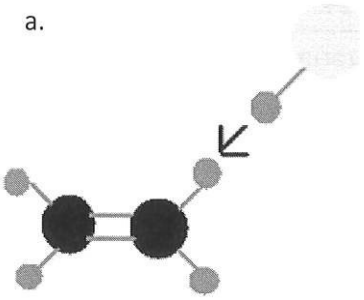
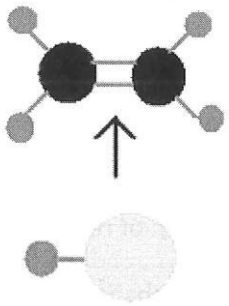
Let's Practice! Mmm, delicious multiple choice.

1. In the synthesis reaction between ethene, CH_2CH_2 and HCl, the molecule CH_3CH_2Cl is formed. Which of the following options indicates a viable orientation of both reactant molecules prior to the collision? (Note: the arrow indicates the direction the HCl molecule is moving prior to the collision.)

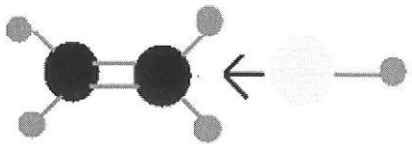
a.



b.



c.



2. Which of the following reasons correctly explains one reason that increasing the temperature of a reaction increases its speed?

   a. All the reactant molecules will have more kinetic energy.
   b. A larger percentage of reactant molecules will exceed the activation energy barrier.
   c. A higher percentage of molecular collisions will have the correct orientation to cause a reaction.
   d. The order of each reactant will increase.

$$NH_4^+(aq) + NO_2^-(aq) \rightarrow N_2(g) + 2H_2O(l)$$

3. Increasing the temperature of the above reaction will increase the rate of reaction. Which of the following is NOT a reason that increased temperature increases reaction rate?

   a. The reactants will be more likely to overcome the activation energy.
   b. The number of collisions between reactant molecules will increase.
   c. A greater distribution of reactant molecules will have high velocities.
   d. The decreased activation energy is easier for reactant molecules to overcome.

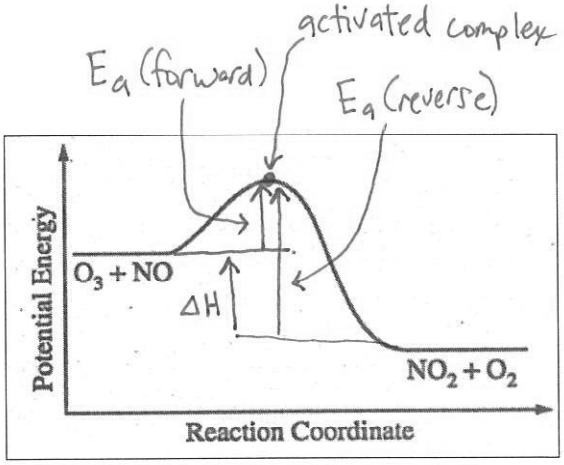
$$H_2(g) + I_2(g) \rightarrow 2HI(g)$$

4. When the reaction given above takes place in a sealed isothermal container, the rate law is: $\text{rate} = k[H_2][I_2]$. If a mole of H_2 gas is added to the reaction chamber and the temperature remains constant, which of the following will be true?

   a. The rate of reaction and the rate constant will increase.
   b. The rate of reaction and the rate constant will not change.
   c. The rate of reaction will increase, and the rate constant will decrease.
   d. The rate of reaction will increase, and the rate constant will not change.

More Practice!

1. The diagram to the right shows the energy pathway for the reaction $O_3 + NO \rightarrow NO_2 + O_2$. Clearly label the following directly on the diagram.
   i. The activation energy for the forward reaction. E_a (fwd)
   ii. The activation energy for the reverse reaction. E_a (rvs)
   iii. The enthalpy change (ΔH) for the reaction.
   iv. The point where the activated complex is present.

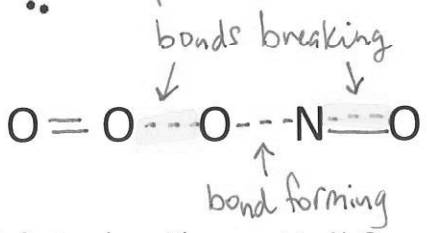


b. The Lewis dot structures for O_3 and NO are shown below. Use these and your knowledge of chemistry to draw a structure for a possible activated complex of this reaction given the incomplete structure below. Use solid lines to represent unchanged bonds and dotted lines to represent any bonds that are broken or formed in the reaction.

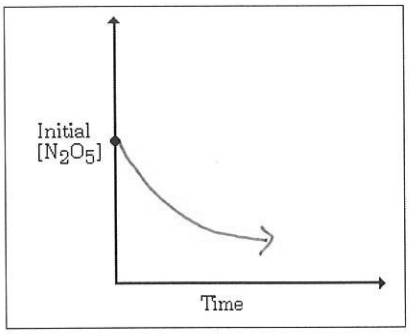
$O_3 + NO \rightarrow NO_2 + O_2$

Reactants:

Activated Complex:



2. The reaction $2\ N_2O_5 \rightarrow 4\ NO_2 + O_2$ is first order with respect to N_2O_5.
   a. Using the axes to the right, complete the graph that represents the change in $[N_2O_5]$ over time as the reaction proceeds.
   b. Considering the rate law and the graph in (a), describe how the value of the rate constant, k, could be determined. (Hint: there are two ways!)



Option 1: Use data provided to graph $\ln[N_2O_5]$ vs. time, then calculate the absolute value of the slope of the line graphed.

Option 2: Determine $t_{1/2}$ from graph, solve for K using the equation $t_{1/2} = \frac{0.693}{K}$ (since rxn is 1st order)

c. If more N_2O_5 were added to the reaction mixture at constant temperature, what would be the effect on the rate constant, k? Explain.

No effect on k, blc only a change in temp. or activation energy can change K (only rxn rate overall would be affected)