FLINN SCIENTIFIC

Name_____

Post-Laboratory Review Questions

Collision theory offers a simple explanation for how reactions occur—reacting molecules must first collide. In order for colliding molecules to be converted into products, they must collide with enough energy and with a suitable orientation to break existing bonds in the reactants and form new bonds in the products. Any factor that changes either the total number of collisions or the average energy of the colliding molecules should affect the reaction rate.

1. Using collision theory, predict how increasing the temperature should affect the rate of a chemical reaction. State the prediction in the form of a hypothesis and explain your reasoning.

2. Using collision theory, predict how increasing the concentration of a reactant should affect the rate of a chemical reaction. State the prediction in the form of a hypothesis and explain your reasoning.

Two general methods may be used to determine the rate law for a reaction. The graphical method used in this lab is an integrated rate law experiment—it shows how the concentration of a reactant or product depends on time. An alternative method for determining the rate law relies on measuring the initial rate of a reaction for different initial concentrations of reactants. This alternative method may be called a differential rate law experiment. Consider a classic iodine clock reaction between iodide ions and persulfate ions (Equation 6).

$$2I^-(aq) + S_2O_8^{2-}(aq) \rightarrow I_2(aq) + 2SO_4^{2-}(aq) \qquad \textit{Equation 6}$$

The following rate data was collected for different initial concentrations of iodide and persulfate ions.

Trial	$[I^-]$	$[S_2O_8^{2-}]$	Initial rate (mole/L·sec)
1	0.040 M	0.040 M	7.4×10^{-6}
2	0.080 M	0.040 M	1.5×10^{-5}
3	0.040 M	0.080 M	1.4×10^{-5}

3. Compare trials 1 and 2: How did the concentration of iodide ions change in these two trials, and how did the rate change accordingly? What is the reaction order for iodide ions?

4. Which two trials should be compared to determine the order of reaction with respect to persulfate ions? What is the reaction order for persulfate?

5. Write the combined rate law for this version of an iodine clock reaction. Could the rate law have been predicted using the coefficients in the balanced chemical equation? Explain.