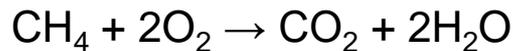


Intro to Chemical Kinetics

Chem 400
Spring 2017

What is kinetics?

- ❖ Kinetics is the study of **rates** of chemical **reactions**.



Experiment 4:

Reaction of zinc with iodine

- $\text{Zn} + \text{I}_2 \rightarrow \text{ZnI}_2$
- Boiled for 20 minutes (color change)
- ❖ Why does the reaction take so long?

Physical Processes

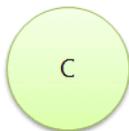
- ❖ Changes that occur at the **physical level**, atoms interacting with other atoms
 - Can imagine them as atomic **collisions**
 - examples:



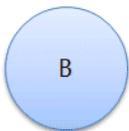
Chemical Reaction

❖ We still have **collisions**, just like with physical changes

➤ Collisions result in chemical rearrangement, or **reaction**

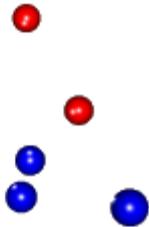


◆ For a reaction to occur, there must be enough energy, this is called **activation energy**



Rate of Reaction

- ❖ Now that we have an understanding of collisions causing reactions, we can consider how fast these reactions occur, or the **rate of reaction**.



What things might affect this rate of reaction?

Frequency of collision

Probability of reaction occurring with collision

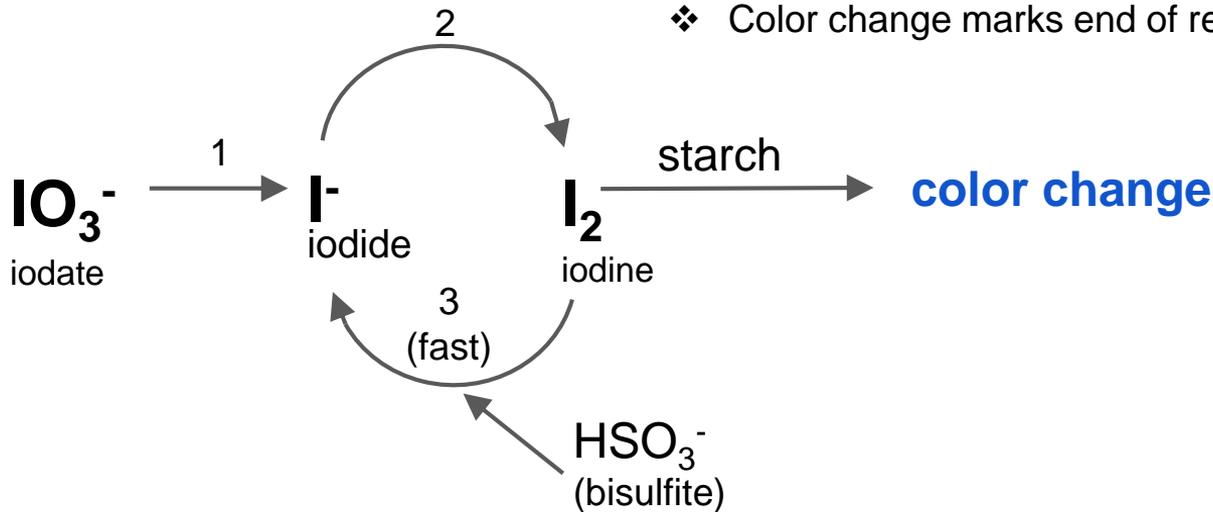
Iodine clock reaction

Solution A: KIO_3

Solution B: NaHSO_3 , H_2SO_4 , starch

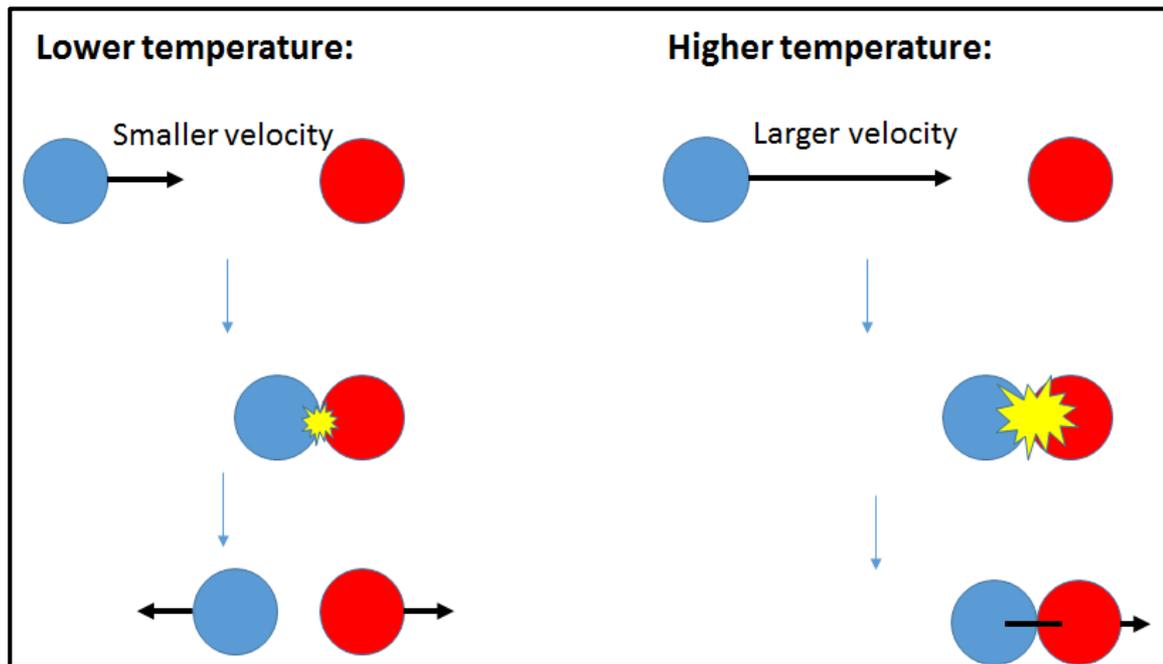
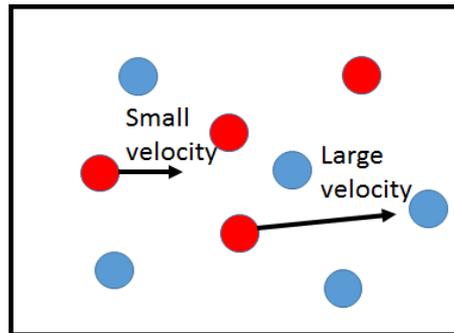
1. $\text{IO}_3^- + 3\text{HSO}_3^- \rightarrow \text{I}^- + 3\text{HSO}_4^-$
2. $5\text{I}^- + 6\text{H}^+ + \text{IO}_3^- \rightarrow 3\text{I}_2 + 3\text{H}_2\text{O}$
3. $\text{I}_2 + \text{HSO}_3^- + \text{H}_2\text{O} \rightarrow 2\text{I}^- + \text{HSO}_4^- + 2\text{H}^+$

- ❖ We see the color change when bisulfite is completely converted.
- ❖ Color change marks end of reaction.



Temperature Effects

- Concept of temperature
 - Kinetic energy
 - vibrational energy of molecules
- Some kind of analogy, “ping pong balls”
- Higher temperature
 - More frequent collisions
 - More likely that collision will result in reaction

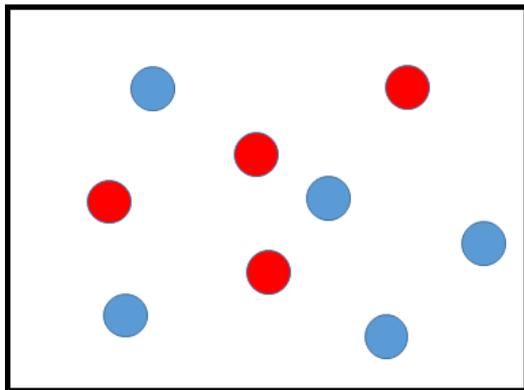


Concentration Effects

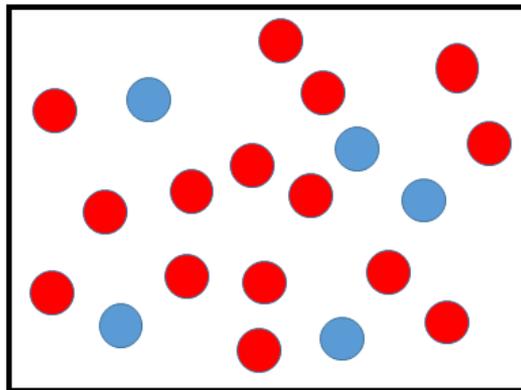
- Higher concentration \rightarrow More crowded \rightarrow More collision



Low Conc. of A and B:



Low Conc. of A and high Conc. of B:



High Conc. of A and B:

