

Collision Theory & Reaction Rates

Learning Goal:

Students will be able to determine what results in an effective collision and how temperature, concentration and activation energy change the rate of a reaction.

Procedure:

- Open the internet browser and enter the address: <http://phet.colorado.edu>
- Click on “Play with Sims” and select “Chemistry” from the menu on the left.
- Open the “Reaction & Rates” Simulation and select “Run Now”

Single Collision

- Click on the single collision tab
- Pull back on the red launcher (straight shot) at different lengths and record observations. Each time you will need to reset the simulation.

Length of Red Launcher	Record observations

1. Which length resulted in products being formed? (you know products are formed when AB is created)

- Click on energy view +'
- Pull back the launcher again using the same lengths as above
- Draw the energy diagram for each length

Length of Red Launcher	Energy Diagram

2. Which diagram(s) resulted in products being formed?

3. What is the relationship of the total energy line to the potential energy line when products have been formed?

- Change the launcher option to “Angled Shot”
- Pull the launcher all the way back so that the total energy line is above the potential energy line and angle the shot.
- Write observations

Observations	
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4. Were products formed with every collision even when it had enough energy? Why or why not? Explain.

Rate Experiment

- Click on the rate experiments tab
- Make sure energy view is on
- On options click "strip"
- In "initial conditions" start with 5 A's and 5 BC's in container.
- Place the temperature high enough for the reaction to occur (the total energy needs to be above the potential energy line)
- Click begin experiment
- Record Observations & how many seconds it took for products to be formed.
- Repeat experiment changing the conditions as shown in table.

Conditions	Observations	# of seconds
5 A's and 5 BC's Temperature high enough for reaction to occur.		
5 A's and 5 BC's Increase the temperature from the last experiment. (Temperature is increased)		
10 A's and 10 BC's Temperature high enough for reaction to occur. (Concentration is increased)		

5. Which conditions increased the rate of the reaction? Explain why you think these conditions increased the rate of the reaction.