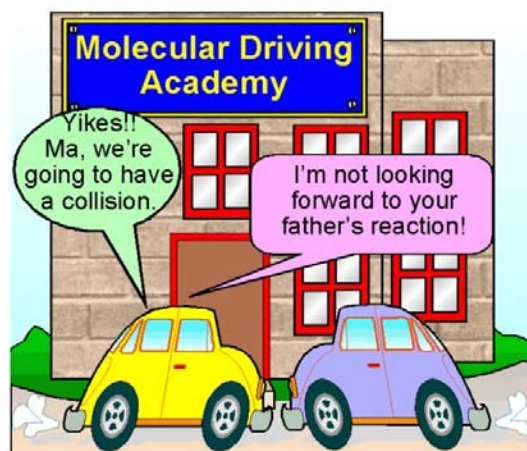


## Collisions Drive Reactions

In order for a reaction to occur, particles of the reactant must collide. Not every collision will do. The colliding particles must approach each other at the proper angle and with the proper amount of energy in order for a reaction to occur. Such a collision is called an **effective collision**. The greater the rate of effective collisions is, the greater the reaction rate is. If all the particles shown on the reactant side of a balanced equation had to collide in order for a reaction to occur, the reaction would not take place. As a result, chemical reactions occur by a series of intermediate steps between the initial reactants and final products, each of which probably involves a collision of only two particles. This series of steps is called a reaction **mechanism**. The slowest step of the reaction mechanism is called the **rate determining step**. Increasing the concentration of the reactant(s) that enter the rate determining step increases the reaction rate, but increasing the concentration of only reactants not involved in the rate determining step has little effect on the reaction rate.



**Collisions Drive Reactions**

Answer the questions below based on the reading above and on your knowledge of chemistry.

- You are playing pool. You line up your cue, pull back, and shoot.
  - Complete the following statement. "Nothing will happen at all if the cue ball \_\_\_\_\_."
  - How is this similar to the requirements for the molecules of reactants to react with each other? \_\_\_\_\_
- Examine the picture at the right. Why isn't the procedure pictured a good way to chop down a tree? How is this similar to the requirements for a chemical reaction to occur? \_\_\_\_\_



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3. You are in a race. You need to pick up a basketball, go through a door, climb up a rope, and drop the basketball in a waste basket on a shelf at the top of the rope. Which step would you change to make things go a lot faster?

How is this similar to speeding up a chemical reaction? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

4. You are collecting expensive wild mushrooms and selling them. You bring baskets with you, hunt for the mushrooms, put them in a basket, and take a new basket whenever a basket becomes full.

a. Which would have the greatest effect on the speed with which the collecting proceeds, the availability of more baskets, or the availability of more mushrooms? Why? \_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

b. How is this similar to changing the concentration of reactants in order to speed up a chemical reaction? \_\_\_\_\_

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5. According to collision theory, what are the requirements for a reaction to occur? \_\_\_\_\_

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6. What are reaction mechanisms? Why are reaction mechanisms a necessary part of the collision theory model?

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