

# FACTORS THAT AFFECT THE RATE OF A CHEMICAL REACTION

The Collision Model:

- Molecules are always moving and are always colliding with each other
- The rate of reaction is somewhat controlled by the number of collisions that occur between the reactant molecules
- A collision can be effective when molecules move fast and collide harder. This increases the chance of bonds breaking and new bonds forming. (Effective Collision)

HOW DO YOU INCREASE THE RATE OF A REACTION?

1. Increase the number of collisions
2. Increase the number of effective collisions

**THERE ARE 4 FACTORS THAT CAN INCREASE THE RATE OF A REACTION:**

## 1) CATALYST

- Catalysts increase the rate of a reaction, without being used up by the reaction
- A catalyst is not a reactant (it does not react to become something new)
- It provides an easier way for a chemical reaction to occur
- Although the particles are moving at the same speed, enzymes increase the number of effective collisions
- Example: biological enzymes in the body break down food at a faster rate so they can be used for energy

## 2) TEMPERATURE

- As the temperature increase, the average speed of the molecules will increase
- This gives a higher chance of more collisions and more effective collisions
- Thus,  $\uparrow$  TEMPERATURE =  $\uparrow$  RATE OF A REACTION
- If you decrease the temperature, the rate of a reaction will decrease
- Example: Applying heat to food makes it easier to cook

## 3) CONCENTRATION OF REACTANTS

- Since there are more molecules in a given area to move around, more molecules will have a greater number of collisions and a higher chance of effective collisions
- Thus,  $\uparrow$  CONCENTRATION =  $\uparrow$  RATE OF A REACTION
- If you decrease the concentration, less molecules can have collisions and the rate will decrease
- Example: Taking two tums for heartburn may be more relief than just one

## 4) *SURFACE AREA*

- Surface area is the area of matter that can make contact with another reactant
- Surface area can be increased, by making the size of the reactants smaller (cutting, breaking)
- Increasing the surface area, means you are increasing the number of molecules (in a solid) able to react
- This allows for more room for more collisions to take place
- $\uparrow$  SURFACE AREA =  $\uparrow$  RATE OF A REACTION
- If you decrease the surface area, less molecules are able to react, and the rate will decrease
- Example: using twigs, instead of logs to get a campfire going

