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| **Science 10 – Chemistry**  **Factors Affecting Rates of Reactions** | **Name: Date: Block:** |

## **Objectives***:*

## To review Kinetic Molecular Theory (Grade 9)

## To understand that a chemical reaction involves collisions between particles (Collision Theory)

## To be able to describe the four factors which will affect the rate of a chemical reaction.

# What is a rate of reaction? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Rates of Reaction

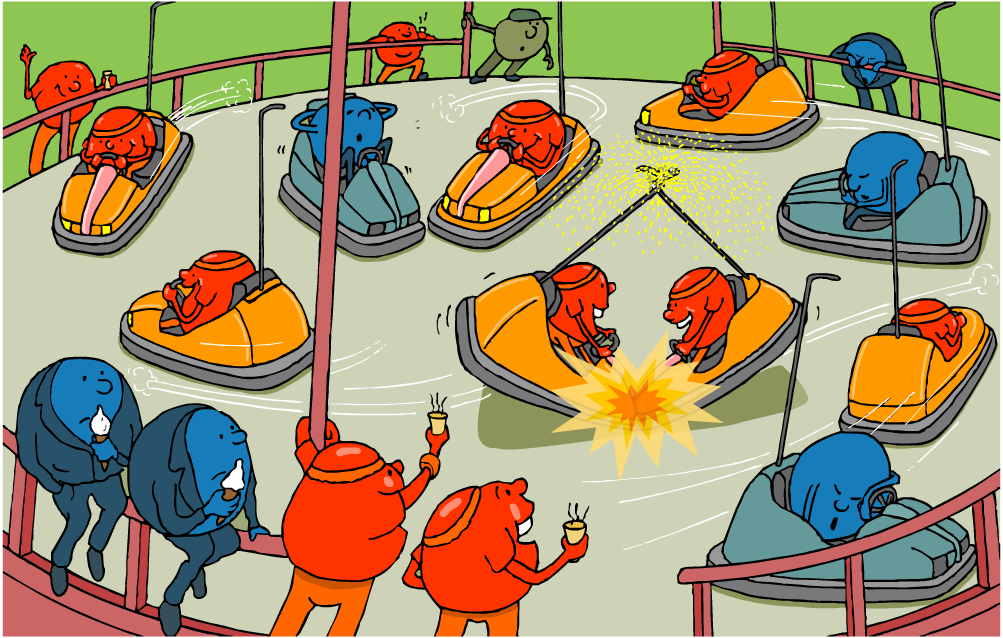
## A chemical reaction involves a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between particles.

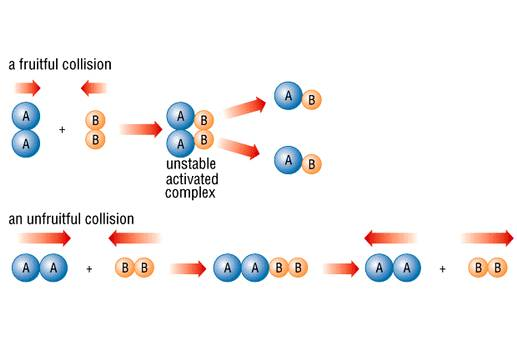
## The particles collide and make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## The particles which react are called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## The substances which are made are called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Kinetic Molecular Theory: (***whiteboard activity***)



When particles collide….

## Collision theory states that for a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to take place the particles must have a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and the correct \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (*alignment*)

# Reactions take place when particles collide with a certain amount of energy

The rate of reaction depends on **two things:**

* the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of collisions between the particles
* the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with which the particles collide

If particles collide with less energy than the activation energy, they ***will not react***

## ***4 Factors that lead to an increased rate of reaction***:

1. increased \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. increased \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of dissolved reactants, and increased \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of gaseous reactants
3. increased \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ surface area of solid reactants
4. use of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **1. Temperature- for all phases!** |

* + When the temperature is increased, the particles have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy.
  + Will result in more frequent and more forceful collisions.
  + More frequent and more forceful collisions result in more successful collisions.
  + If the temperature increases the reaction rate will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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| **CA9 pat cartoon** |  |

Cold Hot

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| **2. Concentration – Only for a liquid or gas!** |



Concentration is the ***amount of “stuff”*** in a given space or volume

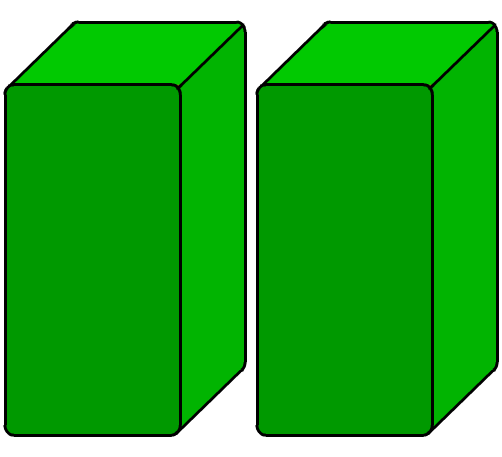
* + As the reactant concentration increases, there are more particles to collide with each other.
  + Creates ***more opportunity*** for successful collisions
  + If the concentrations increase the reaction rate will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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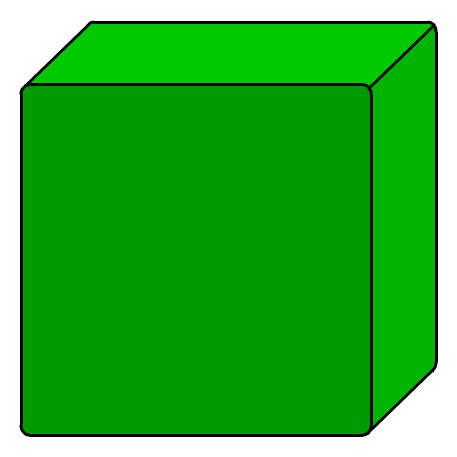
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| **3. Surface Area – Only for a solid!** |

Surface is the ***amount of “stuff”*** ***exposed***. Solids with low surface area have stuff hidden beneath the surface.

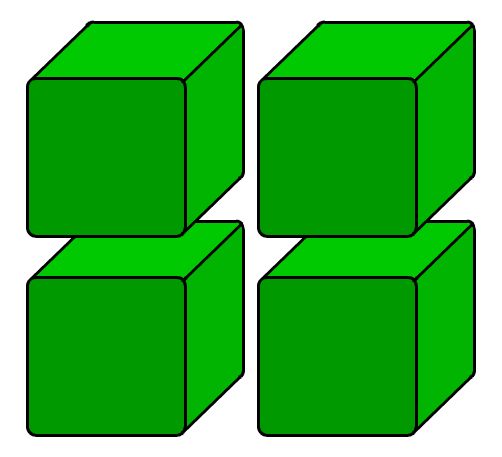
* + The greater the surface area exposed, the greater the locations where the reaction can take place
  + Allows for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in reaction rate. <http://www.youtube.com/watch?v=TAdElO1FCSM>



**low surface area**

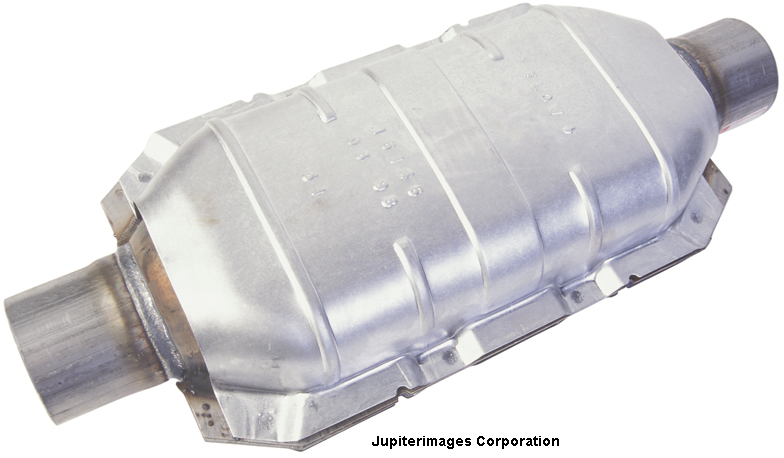


**high surface area**



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| **4. Catalyst – For all reactions** |

A catalyst is a substance that increases the rates of chemical reactions ***without being used us***.

* + *(An inhibitor is a species that reduces the rate of a chemical reaction by combining with a reactant to stop it from reacting in its usual way.)*
  + A biological catalyst is known as an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Catalytic Convertor used in a car!*

**Homework: Collect the Reaction Rate Worksheet from the front of the room + Complete Online Survey**