

# Collision theory

Science



**Collision Theory** The theory proposes that molecules must collide in a particular way with a certain amount of energy to ultimately form a new product. This is because only a select portion of molecules during a reaction have enough energy and the correct orientation to break any existing bonds to form new ones at the moment of impact with other reactants. The very minimum amount of energy needed for this process to occur is referred to as activation energy.

Collision theory explains why reaction rates differ for alternate reactions and also how chemical reactions occur in the first place. During a reaction, collision theory states that the higher the concentration of the reactants, the faster the rate of the reaction. More reactants leads to more effective collisions between the particles to create a new product whereas a higher concentration of products is associated with a slower reaction rate. An increase in temperature can also speed up the reaction rate.

Temperature is a measure of the average amount of kinetic energy in a system so a higher temperature leads to a higher average kinetic energy of the molecules in the reaction, therefore, more collisions occur; a faster rate of reaction. However, there is a limit in some reactions as some reactants/products can be destroyed or denatured by a temperature that exceeds its optimum conditions. In reactions involving a gas, pressure becomes a factor. Increasing the pressure will increase the chance of molecules colliding as there will be less space for them to move thus speeding up the rate of reaction.

Pressure has the same effect on reactions as concentration because both factors alter the density of the particles in the reaction - the higher the more

dense. In reactions involving solid reactants, to increase the rate of reaction, they should be ground up into smaller pieces (powder) as it will increase its surface area; exposing more particles to the other reactant. As more particles are exposed, the reaction rate will escalate as more collisions can occur.