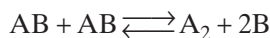


FIGURE 3 Three possible collision patterns for AB molecules are shown. Not every collision produces a chemical reaction.

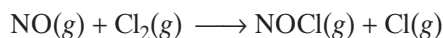
Consider what might happen on a molecular scale in one step of a homogeneous reaction system. We will analyze a proposed first step in a hypothetical decomposition reaction.



According to the collision theory, the two AB molecules must collide in order to react. Furthermore, they must collide with a favorable orientation and with enough energy to merge the valence electrons and disrupt the bonds of the AB molecules. If they do so, a reshuffling of bonds leads to the formation of the products, one A₂ molecule and two B atoms. An effective collision is modeled in **Figure 3a**.

If a collision is too gentle, the two molecules simply rebound from each other unchanged. This effect is illustrated in **Figure 3b**. Similarly, a collision in which the reactant molecules have an unfavorable orientation has little effect. The colliding molecules rebound without reacting. A collision that has poor orientation is shown in **Figure 3c**.

A chemical reaction produces new bonds which are formed between specific atoms in the colliding molecules. Unless the collision brings the correct atoms close together and in the proper orientation, the molecules will not react. For example, if a chlorine molecule collides with the oxygen end of a nitrogen monoxide molecule, the following reaction may occur.



This reaction will not occur if the chlorine molecule strikes the nitrogen end of the molecule.

Thus, collision theory provides two reasons why a collision between reactant molecules may fail to produce a new chemical species: the collision is not energetic enough to supply the required energy, or the colliding molecules are not oriented in a way that enables them to react with each other.