



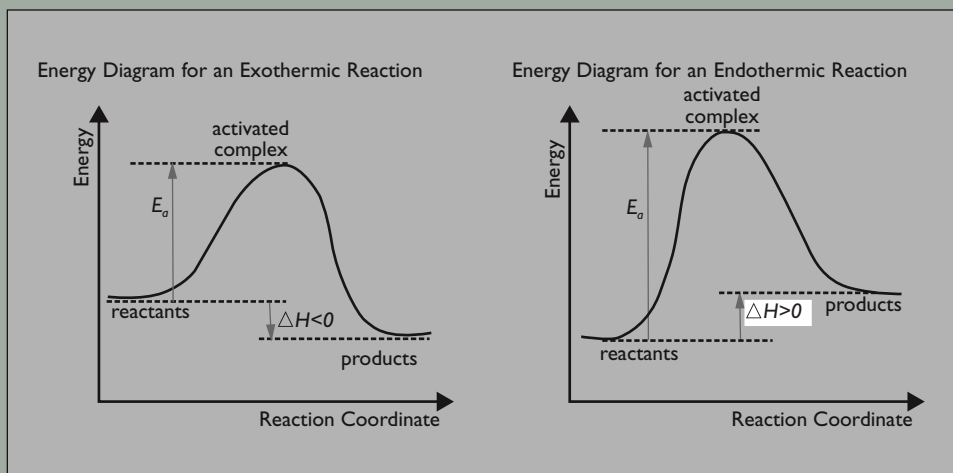
Chem Words

activation energy (E_a): the energy that must be gained by molecules so they can break existing bonds and undergo a reaction.

activated complex: the intermediate state that is a combination of reactant and product atoms.

catalyst: a substance that provides a lower-energy pathway for a reaction which increases the speed of a reaction; it is not consumed (used up) during the reaction.

Activation energy: Regardless of whether the change is endothermic or exothermic, bonds must always be broken in the reactants (requiring energy input) before new bonds can form in the products (releasing energy). Therefore, some initial amount of energy (always a positive value, since it is added to the system) must be supplied to the system in order for the reaction to begin. This is represented as an activation barrier, or an initial “bump” in the curve, to get from reactants to products. The height of this bump, measured from the reactant energy, is called the **activation energy (E_a)** and it is always positive ($E_a > 0$). The intermediate (in-between) state, between reactants and products, at the top of the barrier is called the **activated complex**.



More about the Bump

When you compared the reaction of three types of magnesium with water, you observed that the reaction of magnesium pieces with water was very slow (if you could even detect a reaction at all). Magnesium metal reacts easily with oxygen from the air to form a magnesium oxide coating on the metal. This coating makes it difficult for water to get to the magnesium metal. As a result, the reaction is very slow. Although there was more heat produced by the reaction of granular magnesium with water, that reaction was also pretty slow. You know from your observations of the MRE heater that the reaction between magnesium metal and water produces a huge amount of heat energy. But in the first two test tubes, the amount of heat that was produced was not very great. Clearly, providing soldiers with magnesium pieces or granules would not help them heat their food very well.