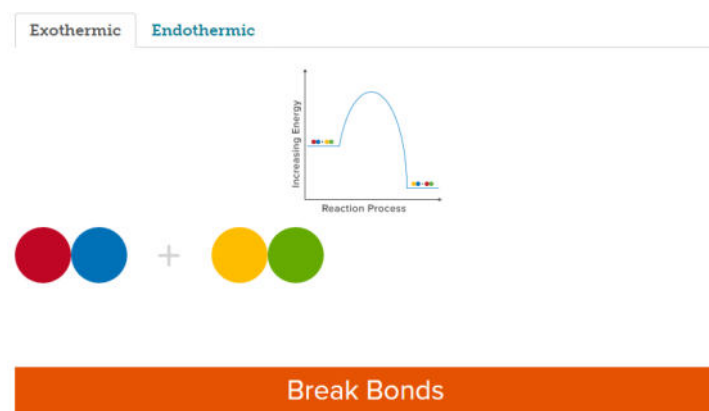


Simulation: Energy Changes in Chemical Reactions **Answer Key**

Background

In this investigation you will examine two chemical reactions. You will be asked to answer questions as you navigate through the steps of the simulation. You can find the simulation here: <https://teachchemistry.org/periodical/issues/november-2016/energy-changes-in-chemical-reactions>



Exothermic Chemical Reactions: Make sure the Exothermic tab is chosen to begin.

1. Click the orange button to "Break Bonds." What is needed in order to break a chemical bond?

Energy

2. When the particles rearrange during the chemical reaction, to create new bonds, why do they pair up like this? What is being represented in this step?

Possibly anions and cations, or metals and non-metals based on the rearrangement of the colors.

3. In the overall reaction, what do you notice about the energy associated with the reactants and the energy associated with the products?

The amount of energy indicated by the arrows on the product side is larger than on the reactant side, indicating that more energy is released when bonds of the products are formed than the energy needed to break the bonds of the reactants.

4. What observation best represents this exothermic chemical reaction?
 - a. A reaction takes place and the temperature of the mixture increases.
 - b. A reaction takes place and the temperature of the mixture decreases.

Answer is A.

5. How does the energy diagram image shown relate to the chemical reaction?

The energy of the reactants is larger than the energy of the products, indicating a release in energy during the reaction.

6. The prefix "exo" means *external* or *outside*, how does this relate to the exothermic chemical reaction that you just observed?

Energy in this type of reaction is released, implying that it is exiting the reaction, similar to the meaning of *external* or *outside*.

Endothermic Chemical Reactions: Click on the endothermic tab to begin.

1. Before clicking the orange button to "Break Bonds." How has the energy diagram changed? What is noticeable about the reactants in particular?

The reactants are much lower on the Y-axis, indicating that they are lower in energy than the reactants in the exothermic reaction.

2. Play the reaction. What do you notice about the energy changes between the reactants and the products in this reaction?

More energy is needed to break the bonds of the reactants, than is released by the products. More energy is absorbed in this reaction than is released. You can see this by comparing the size of the arrows in the overall reaction.

3. If you observed a chemical reaction take place and the product was very cold, would this be an endothermic or an exothermic reaction?

Endothermic reaction

Comparing Endothermic and Exothermic Chemical Reactions:

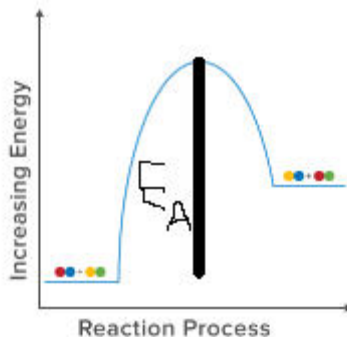
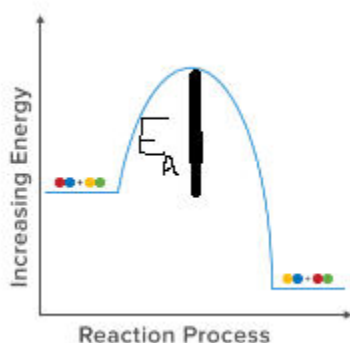
1. The activated complex is the point on the graph that indicates that the reactants transition into products. Identify the point on the graph that you think might represent the activated complex.

This would be the highest point/top of the curve on the graph.

2. Which type of reaction needs more energy (activation energy) added to the reactants to begin?

Endothermic reactions

3. Draw a sketch of both types of energy diagrams and indicate the activation energy for each.



The exothermic graph is on the left, and the endothermic graph is on the right.