

Bond Energy

What makes a reaction endothermic or exothermic?

Why?

Chemical reactions can be a lot like playing with Legos®—you must take apart part of your last creation before you can replace it with something new. For many chemical reactions, we have to first break bonds in the reactants before we can put the atoms back into a new arrangement to form the products. Both of these processes involve changes in energy. The net energy change for a reaction is called the **heat of reaction** or the **change in enthalpy** (ΔH). In this activity we will look at one way energy changes can be approximated for chemical reactions.

Model 1 – Breaking and Forming Bonds

| | Reaction | Change in Energy (kJ/mol _{rxn}) | | Reaction | Change in Energy (kJ/mol _{rxn}) |
|----|--|---|----|--|---|
| A) | $\text{PCl}_3(\text{g}) \rightarrow \text{P}(\text{g}) + 3\text{Cl}(\text{g})$ | + 966.7 <i>broken</i> | E) | $\text{P}(\text{g}) + 3\text{Cl}(\text{g}) \rightarrow \text{PCl}_3(\text{g})$ | - 966.7 <i>formed</i> |
| B) | $\text{PCl}_5(\text{g}) \rightarrow \text{P}(\text{g}) + 5\text{Cl}(\text{g})$ | + 1,297.9 <i>broken</i> | F) | $\text{P}(\text{g}) + 5\text{Cl}(\text{g}) \rightarrow \text{PCl}_5(\text{g})$ | - 1,297.9 <i>formed</i> |
| C) | $\text{PF}_3(\text{g}) \rightarrow \text{P}(\text{g}) + 3\text{F}(\text{g})$ | + 1,470.4 <i>broken</i> | G) | $\text{P}(\text{g}) + 3\text{F}(\text{g}) \rightarrow \text{PF}_3(\text{g})$ | - 1,470.4 <i>formed</i> |
| D) | $\text{PF}_5(\text{g}) \rightarrow \text{P}(\text{g}) + 5\text{F}(\text{g})$ | + 2,305.4 <i>broken</i> | H) | $\text{P}(\text{g}) + 5\text{F}(\text{g}) \rightarrow \text{PF}_5(\text{g})$ | - 2,305.4 <i>formed</i> |

- Identify four reactions in Model 1 where bonds are being broken. Write "broken" in the Change in Energy box in the table for each reaction you identify.
- Identify four reactions in Model 1 where bonds are being formed. Write "formed" in the Change in Energy box in the table for each reaction you identify.
- Circle the correct word to complete each sentence below.
 - When bonds are (broken/formed) there is a positive energy change.
 - Breaking bonds is (endothermic/exothermic).
 - When bonds are (broken/formed) there is a negative energy change.
 - Forming bonds is (endothermic/exothermic).
- Find two reactions in Model 1 that are exact opposites of each other, that is, one reaction is the reverse of the other reaction.
 - How do the changes in energy for the reverse reactions compare?
The changes in energy for these reactions are the same, but opposite in sign.
 - Explain your answer to part a considering what you learned from Questions 1–3 about bond breaking and bond formation.
If a given amount of energy is required to break a bond, then the same amount of energy will be released when the bond is formed.

Bond Energy Pogil Answers

Arturo Cuomo



Bond Energy Pogil Answers:

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In a digital era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is really remarkable. This extraordinary book, aptly titled "**Bond Energy Pogil Answers**," written by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound impact on our existence. Throughout this critique, we will delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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