

Reactions

3. Chemical Energy

CONCEPT 1

LESSON GUIDE

EXOTHERMIC REACTIONS

PRECISE LEARNING POINTS

KNOW

I know what an exothermic reaction is.

APPLY

I can apply my knowledge to explain what happens to chemical bonds during an exothermic reaction.

EXTEND

I can extend my knowledge to use data for bonding energy to calculate energy change in an exothermic reaction.

NOTES

There are many ways that we can identify if a chemical reaction has taken place. A change in temperature can be a good indication that a chemical reaction has occurred, these types of reactions are known as exothermic reactions. An exothermic reaction occurs when thermal energy is released during a reaction, the temperature of the products is higher than the temperature of the reactants. This concept is explored in more detail as part of the GCSE curriculum.

There are many exothermic reactions that occur in everyday life, an obvious example is a combustion reaction, and this example clearly demonstrates that the temperature of the product is greater than the reactants. Try to point out reactions such as fireworks or burning a candle which are good examples of exothermic reactions.

Other less obvious exothermic reactions are explored in the Science lab. Reactions between metals and strong acids or bases cause high temperatures to be reached, another example is the addition of Calcium oxide (quicklime) to water, and this can cause water to reach a boiling point after about ten minutes. Another reaction explored in the lab is a displacement reaction between aluminium and iron oxide, this is known as the Thermite reaction, and this reaction gets so hot that molten iron is produced. The Thermite reaction is often used in the repair of railway tracks.

It is important to understand what is happening on an atomic scale during these reactions. All reactions involve two processes, bond making, and bond breaking. The bond-breaking process involves the intake of surrounding thermal energy to break bonds apart, once the particles/atoms are free from their bonds, they then move around and form new bonds with other particles/atoms. When new bonds are made energy is used but some are left over. This excess energy is released as thermal energy to the surroundings.

Overall, the important key points to remember here are that bond breaking takes in energy (Endothermic) and bond making releases energy (Exothermic). All chemical reactions go through this process but if more energy is released making bonds than breaking bonds, we say that the reaction is exothermic.