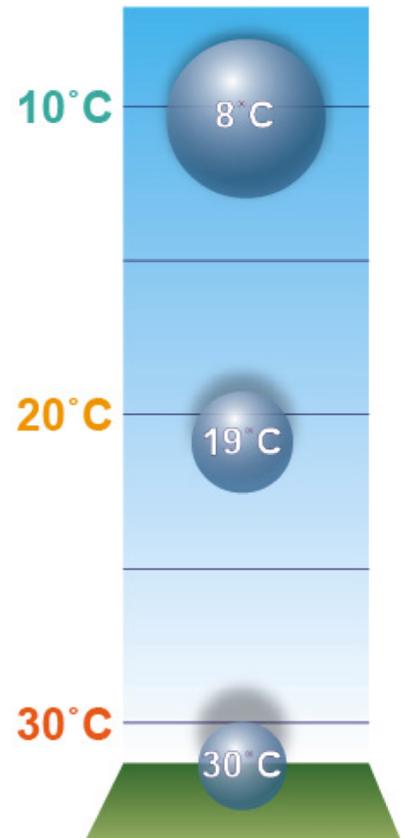


## Adiabatic Processes in the Atmosphere: Canned Air

An adiabatic process is one where heat is not transferred between a system (such as a parcel of air in the atmosphere) and its surroundings; energy is only transferred by work on the system. When a fluid (such as air) is compressed (work is being done on it), the compressed fluid increases in temperature. Likewise, adiabatic cooling occurs when a fluid experiences an increase in volume (decrease in pressure). This change in temperature is the basis for air conditioning and refrigeration.

Although this seems like a confusing concept, adiabatic processes have important implications for heating and cooling in the atmosphere. Consider the figure to the right where an imaginary body of air (known as an air parcel) rises in the atmosphere. The temperature scale on the left in the diagram represents the air temperature at different altitudes. In addition, the temperature inside the air parcel is also indicated. At higher altitudes, it expands due to the lower air pressure at higher elevations. The expansion of the volume of the air parcel results in a reduction in the temperature inside the air parcel. In this example, the temperature of the air parcel reduces from 30°C to 8°C (even colder than the air surrounding the air parcel). There are many processes in the atmosphere that cause air to rise (updraft) and the reduction in temperature in the air parcel affects the development of clouds and thunderstorms.



[NOAA](#)

How can a complex topic adiabatic cooling be demonstrated or introduced to students?



[Wikimedia User: PiccoloNamek](#)

As a class demonstration or a phenomenon for students to explore, an aerosol can of air can be used to demonstrate adiabatic cooling. When the aerosol can is discharged, there is a perceptible cooling of the can due to the decrease in gas pressure. In addition, the stream of air coming out of the can is cool.

It is advisable for students to wear safety glasses and to be instructed not to aim the stream of air toward themselves or others.