

Name: _____

Date: _____

Evaporative Cooling

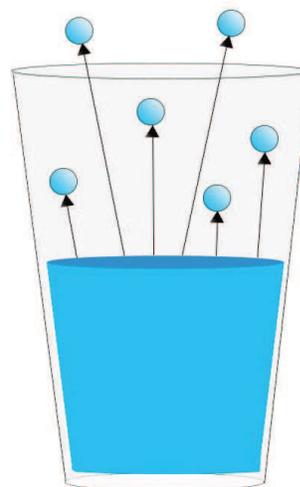
The lid on a hot drink does more than just protect a person from a spill. The lid also helps to keep the hot drink warm for a longer time. You gathered evidence of this in your investigations. But if drinks warm up or cool down because energy is transferring into or out of the cup system, then why does the lid matter so much? And why does the lid matter more for keeping drinks hot as opposed to keeping drinks cold?



A cup with a lid on it is better at keeping liquids hot than a cup without a lid. This is because the lid slows down matter loss from the system. Matter is lost when some of the liquid particles at the surface get enough energy to turn into a gas. These gas particles float out of the cup. This process is called *evaporation*.

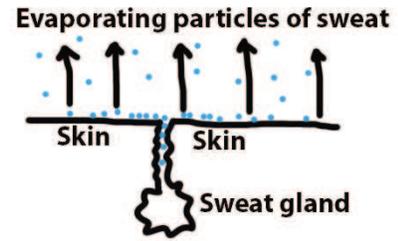
As water evaporates out of a cup of hot tea, you might see steam. This steam is caused by evaporation, but it is not gas particles that you see. When gas particles that evaporated float away from the hot tea, they begin to cool off. Some of the water condenses back into water droplets that float in the air above the cup. These droplets form the clouds above the cup that we call steam.

As a particle of gas leaves the cup system, the energy of that particle's movement also leaves the system. The particles that evaporate have above-average kinetic energy. When they evaporate, it lowers the average kinetic energy of the remaining liquid. This means there will be a temperature drop. This is called *evaporative cooling*.



Evaporative cooling is a process that allows energy to transfer from a hot system to a cooler system. More surface area for evaporation helps speed up the energy transfer. So, a cup without a lid allows more evaporative cooling to happen compared to a cup that has a lid with only small gaps and holes.

Evaporative cooling is not just a process that cools hot beverages. It is also the process that your body uses to cool off on a hot day. Your sweat glands push water through tiny holes in your skin until your body is coated in sweat. The water evaporates, taking energy away with it. This lowers the average kinetic energy at the surface of your skin, cooling you off.



Summarize important ideas you learned from the reading.