

Water Heat Capacity Experiment

This activity was created by Brenna.

Heat capacity describes how much heat energy is needed to raise the temperature of a substance, or how much heat energy must be lost to lower the temperature of that substance. Water has a very high heat capacity. A high heat capacity means that it takes a while for water to change temperature, even when the air and ground around it are heating up or cooling off. In fact, water needs over 4 times as much heat energy as air does for the same temperature change!

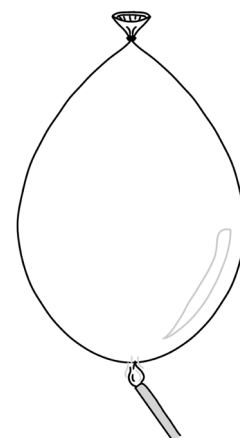
Around the world, this explains why places near the coast like Vancouver or Boston have much milder climates than places inland, like Winnipeg or Kansas City. The nearby ocean water keeps these places cooler in the summer and warmer in the winter, because it doesn't change temperature easily. Water takes a long time to heat up, but it also holds on to that heat really well.

To learn more about the heat capacity of water, let's do an at home experiment!

MATERIALS

- 2 Balloons
- Water
- Lighter or matches
- A phone or stopwatch

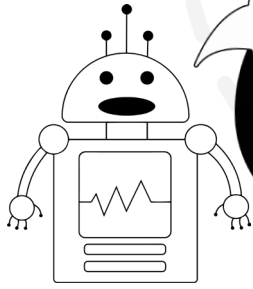
- 1 Start by filling one balloon with air, and the other with water. Tie a secure knot in each so the air or water cannot escape.
- 2 Hold up the balloon filled with air and bring the lighter or match underneath, so the fire is close to the surface of the balloon. Time how long it takes until the balloon pops.
- 3 Now, hold up the balloon filled with water. Repeat the process and hold the flame up to the bottom of this balloon. Time how long it takes this balloon to pop.



NOTE: Please be careful with fire! Check with a parent or guardian before trying this out and be sure to avoid getting the fire too close to yourself or any flammable objects. We also recommend doing this outside or somewhere you don't mind getting wet with water.

Date: _____

Name: _____



Esiw here! Science experiments and computer code both use **variables**, which are data values that can be changed and will influence the end result. For this experiment, the length of time that the balloon lasted before it popped was dependent on the variable of what the balloon was filled with. Use your data from the experiment to fill out the code below!

for each trial of the experiment:

if balloon is filled with _____ :

time until popped = _____

else if balloon is filled with _____ :

time until popped = _____



Consider the place you live, or places you have lived before. Are there big fluctuations in the temperature? Does it change temperature a lot (and get really hot at certain times of year, but really cold at other times?)

Would you rather live in a place with a consistent temperature, or a place that experiences these big changes in temperature?

→ RESULTS

You probably noticed that the balloon filled with air popped almost immediately, but the balloon filled with water took a while longer before it was affected by the fire. For the balloon of air, the rubber quickly heated up and melted. But for the second balloon, the water inside absorbed a lot of the thermal energy from the fire. This protected the rubber from the hot flame, and it could last much longer before it eventually popped.