Cup of Water Phenomena Experience:

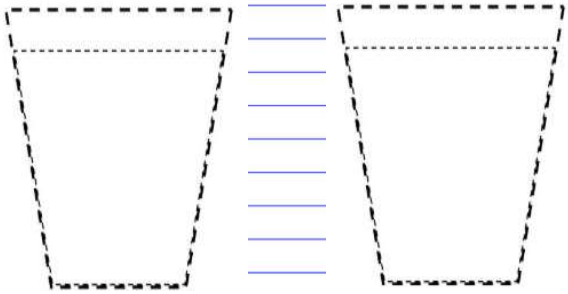
I Notice	I Wonder

Food Coloring Lab: OpenSciEd 6.2 Lesson10

Jot Observations after 30-60 seconds of observation

Food Coloring

Observations:



Cold water Hot water

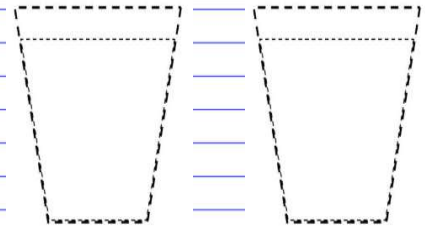
What similarities and differences did you notice between the cold and hot water?

Food Coloring Lab: OpenSciEd 6.2 Lesson10

After observation of cold and hot water. Predict what you think would happen to room temperature water

Food Coloring

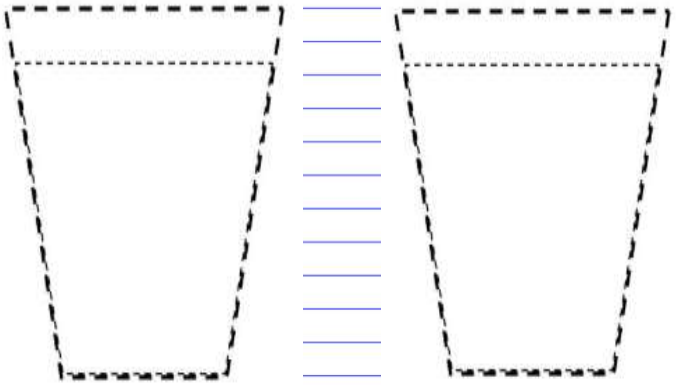
Observations:



Cold water Hot water

Room-Temperature Water

Prediction Observation



What similarities and differences did you notice between the cold and hot water?

Name: _____ Date: _____

James Joule's Experiment

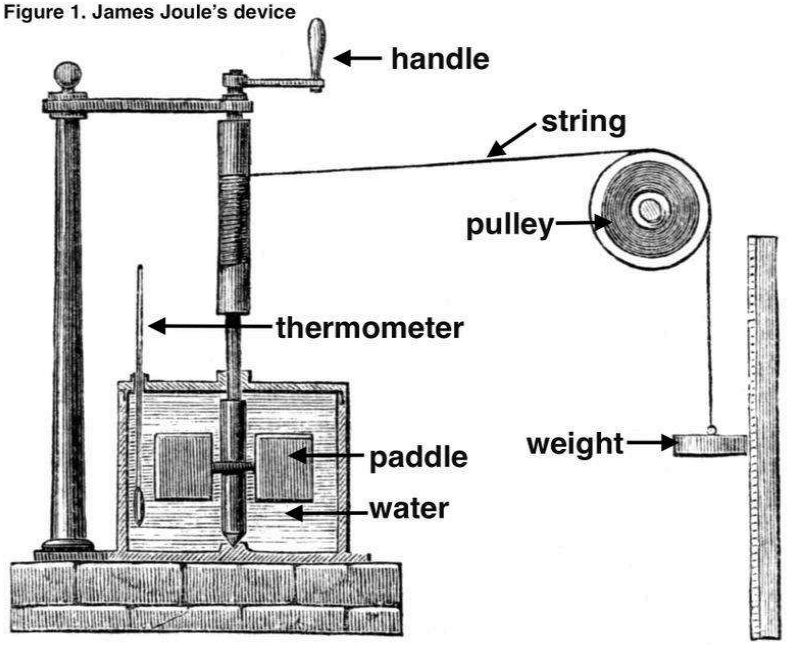
How is the movement in water related to its temperature?

In the early nineteenth century, parts of the world experienced an increase in industrialization as factories began to appear throughout much of Europe and the United States. Along with the growth in factories, new inventions allowed for more careful investigations of scientific phenomena that had previously puzzled scientists for centuries. In 1850, a scientist named James Joule set out to better understand a phenomenon seen in many factories at the time--certain liquids got dangerously hot as they were pressed and pushed through pipes and machinery.

James Joule's Experiment

To investigate this problem, Joule knew that he needed a lab setup in which a liquid could be moved around inside a sealed container to create the same kinds of movements of liquids inside machinery. However, Joule also needed a way to measure the temperature of the liquid while it was moving. So, he designed and built the device you see in Figure 1.

Figure 1. James Joule's device



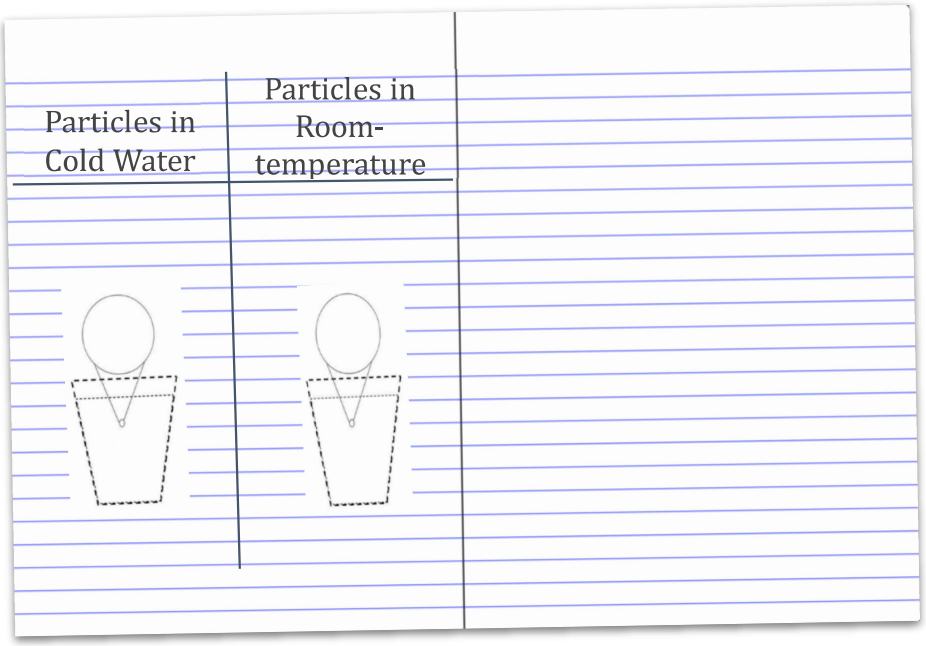
In this device, there is a weight that pulls on a string around a pulley, which then turns a handle. This handle is attached to a paddle that sits inside a sealed container of water. As the handle turns, it spins the paddle, which stirs the water in the container. Also sitting inside the container of water is a thermometer. As the paddle turns, the thermometer measures any temperature change in the water inside the container.

Joule's Findings

In operating the device, Joule observed that when the weight fell quickly, the paddle spun faster, and the temperature of the water increased quickly. The opposite also turned out to be true. If the weight fell slowly, the paddle spun slower, and the temperature of the water increased slowly. Joule's device helped scientists observe and accurately measure temperature change caused by the movement of liquids.

Notes and summary of important ideas:

Draw and Label Below the image what you think particles in cold water would look like compared to room-temperature.



Name: _____ Date: _____

Investigating Particle Collisions in Different States of Matter

Activity	What did we use to represent particles?	What state of matter is this similar to?	What interactions did we see between the particles that resulted in speed changes?	How does this connect to what can cause changes in the kinetic energy of the particles in the cup system?
1	Computer-simulated particles spaced far apart, moving about freely			
2	Rolling 2 marbles into each other along a tray			
3	Rolling 1 marble into a cluster of marbles			
4	Rolling 1 marble into a cluster of marbles with a layer of magnetic marbles in between			

Making Sense

Apply what you just did to the particles of matter in our previous cup experiments. We put room-temperature water inside a cup and surrounded it with cold water. The cold water outside the cup increased in temperature and the room-temperature water inside the cup decreased in temperature. What did you figure out today about particle collisions that could help explain these temperature changes?