

WHAT IS THE DIFFERENCE BETWEEN HEAT AND TEMPERATURE?

Heat is a measure of the *TOTAL* kinetic energy (energy of motion) of the particles in a substance.

Temperature is a measure of the *AVERAGE* kinetic energy (energy of motion) of the particles in a substance.

Remember that an increase in the speed of particles of a substance causes an increase in the thermal energy or heat of that substance. This increase in heat energy will cause an increase in the temperature as well.

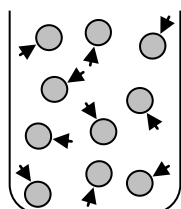
Consider the following example. There are two containers of water. One container has 10 mL of water in it, while the other has 40 mL of water in it. The temperature in each container is 50 degrees Celsius. While they have the same temperature, their thermal energies are different. Why?

In order to better understand this, I am going to simplify this a bit. Take a look at each container below. Notice how they both contain the same *KIND(s)* of particles moving at the same *KINETIC ENERGY* (speed). The small container has 10 particles and the larger container has 40 particles.

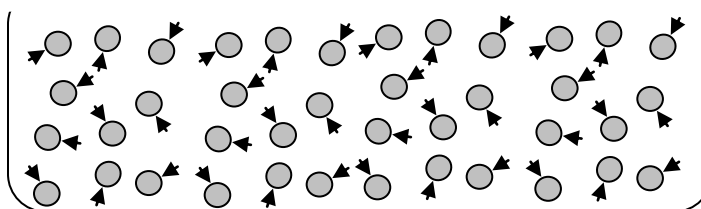
- The **TOTAL KINETIC ENERGY** (heat) in the larger container is greater than in the small because there are more particles in the larger container.
- They both have the same **AVERAGE KINETIC ENERGY** (temperature) because they are all moving at the same speed.

Pretend each particle is moving at say... 1 mile per hour. We can't really measure the speed of molecules in miles per hour, but let's just use this example to better understand what is going on.

- The average of 10 particles moving at one mile per hour is 1 mile per hour.
- The average of 40 particles moving at one mile per hour is still 1 mile per hour.



Water
Temperature - 50°C



Water
Temperature - 50°C

The container of water on the right has a greater thermal energy due to the fact there are a greater number of particles. They have the same temperature since the average speed of the particles in each container is the same.