

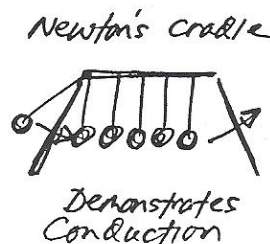
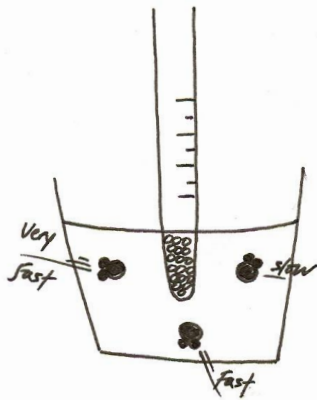
## Aim: What is temperature and how is it measured?

"I'm not feeling well. Can you take my ~~heat~~ temperature?"

1) **Temperature** and **heat** are related, but they are not the same thing.

2a) According to the **Kinetic Molecular Theory**, everything around us and within us is in constant motion.

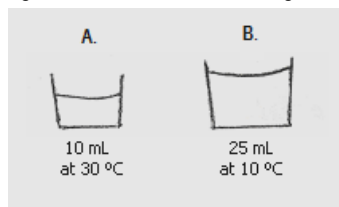
How do we know this? Because everything has a temperature.



b) When a thermometer is plunged into hot water, the water molecules **collide** with the mercury atoms within the bulb and, thereby, **transfer** their energy to them. As a result, the mercury rises (expands).  
(See demo for Newton's Cradle.)

c) **Temperature** is a measure of the **average kinetic energy** of the particles that make up an object. We say average because all the particles are not moving at the same speed. A thermometer is like a "molecular speedometer".

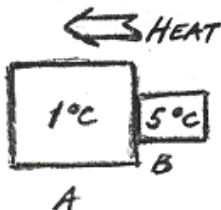
Which of the following beakers of water has a higher average KE? Answer: A



3a) **Temperature** doesn't depend on the amount of matter.

3b) **Hotter** objects have a **higher average KE**. This means their particles are moving **faster**.

In which direction will heat flow when the objects below touch each other? How could you prove this?

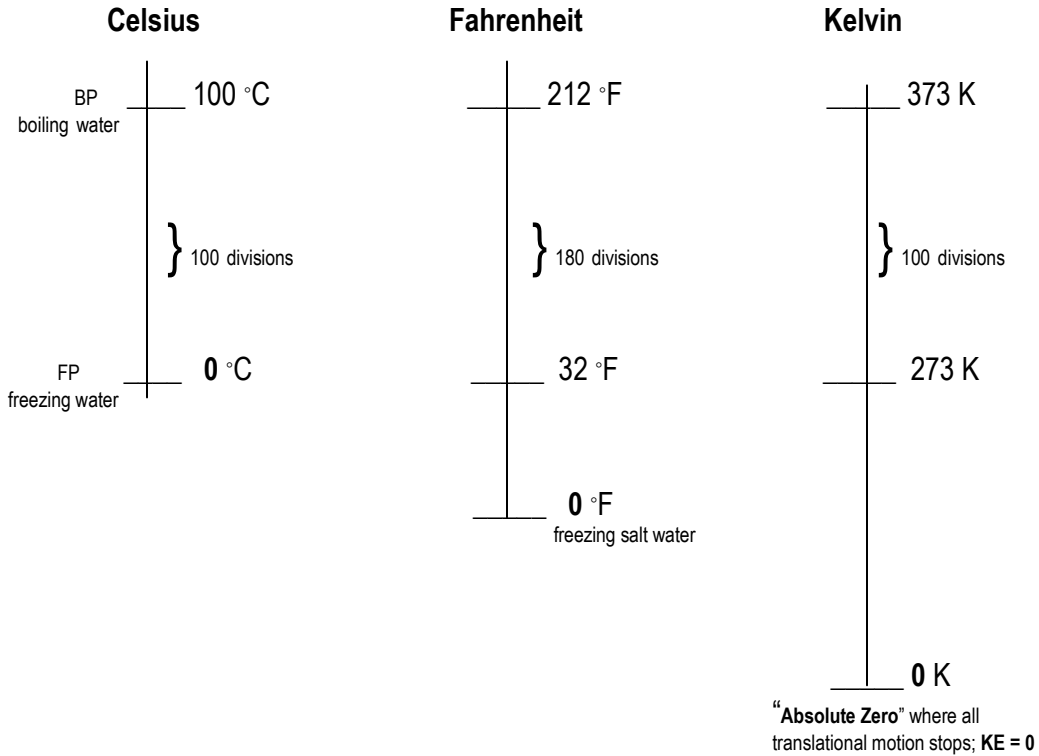


4a) Heat flows from **higher to lower** temperature objects.

4b) Usually, when heat **enters** an object, its temperature **increases**; the opposite occurs when heat leaves an object.

## 5. Thermometers

To build a thermometer you need **two** fixed points of reference.



**Note:** Since the number of divisions between the FP and BP of water on both scales is the same, the **change in temperature** ( $\Delta T$ ) for °C and K is the **same**.

So, if the temperature changes by 10 in °C, it will change by about 20 in °F, and exactly 10 in K.

We **don't** use a degree symbol with K because it's an absolute unit – where zero really means zero KE; C and F are relative units – where zero means something else.

## 6. Converting between temperature scales

$$\left\{ \begin{array}{l} \mathbf{K = ^\circ C + 273} \\ \mathbf{^\circ C = K - 273} \end{array} \right\} \quad \begin{array}{l} \text{Simply, to convert from } ^\circ\text{C to K, add 273} \\ \text{\& to convert from K to } ^\circ\text{C, minus 273} \end{array}$$

ex)  $25\text{ }^\circ\text{C} = \underline{\quad} \text{K}$        $\text{K} = 273 + 25 = 298$

ex)  $25 \text{ K} = \underline{\quad} \text{ }^\circ\text{C}$        $^\circ\text{C} = 25 - 273 = -248$