Properties of Matter – Temperature

Temperature (symbolized *T*) is an expression of heat energy. Temperature can mean different things in different situations.

Thermodynamic temperature is a measure of the kinetic energy in molecules or atoms of a substance. The greater this energy, the faster the particles are moving, and the higher the reading an instrument will render. This is the method lay people most often use.

Spectral temperature is defined according to the wavelength at which the electromagnetic (EM) energy that an object emits is greatest. The shorter the wavelength, the higher the frequency of maximum EM energy, and the higher the spectral temperature of the glowing object. This is the temperature scheme that astronomers use to measure the heat in distant objects such as the sun's corona or the gas and dust between stars.

The Celsius or centigrade thermometer developed by defining the melting point of water to be zero degrees and the boiling point of water to be 100 degrees. Your study group will use these properties of water to calibrate a thermometer and measure the temperature of an unknown material.

1. Obtain a thermometer without a scale from your instructor.

2. Place the thermometer in ice water and determine the height of the red liquid (Alcohol and a dye)

3. Place the same thermometer in boiling water (be careful) and determine the height of the red liquid.

4. Make a scale by dividing the differences in heights into 100 units.

5. Measure the temperature of the unknown mixture.

Answer the following Questions?

1. What are the possible sources of error for this experiment?

2. Why can you use ice water and boiling water to calibrate your thermometer? Are there any other materials or ways that you could use to calibrate the thermometer?

3. If you were a water molecule how would you describe the differences between the temperatures of the two calibration liquids?

4. How could you measure the temperature that was higher than the highest temperature that your thermometer could read?