

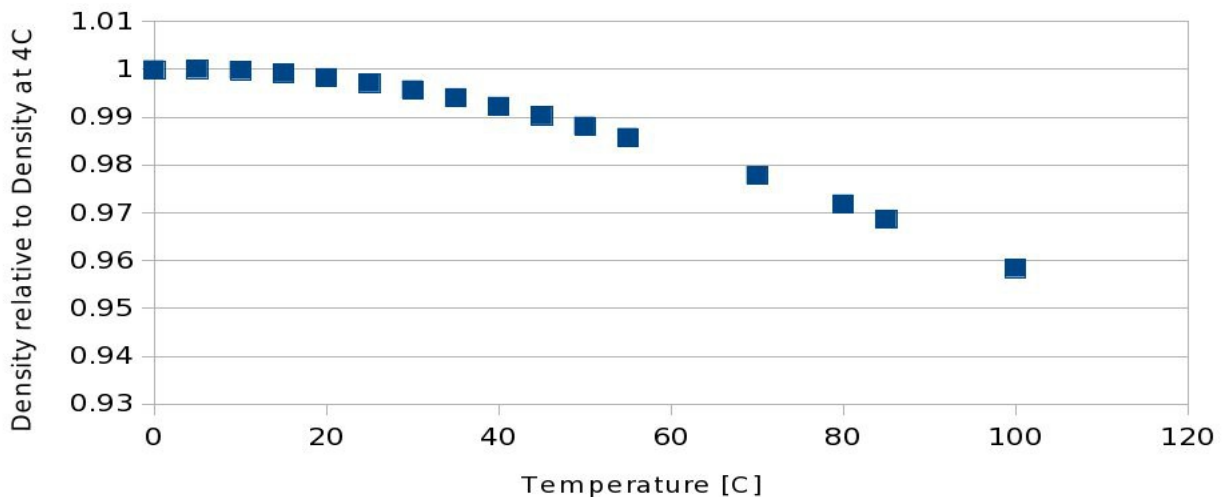
Lab 07

Density of water as a function of temperature

Mass density is defined as $\rho \equiv \frac{\text{Mass}}{\text{Volume}}$. In our scientific units, density will have units of kg/m^3 . Today we are going to look at (other people's data) regarding the density of water and will finish by doing our own experiment for this.

From the CRC, 48 edition, we can find data regarding the density of water at atmospheric temperature. I have plotted the tabulated data below.

Relative Density of Water (CRC48th ed)



Here is an explanation of this data: as temperature increases, the average distance between water (H_2O) molecules increases. At temperatures close to freezing, the water density is seen to be relatively flat. However as temperature increases, we see that the relative density of water decreases. What is plotted here is relative density which is defined by:

$$\text{Relative Density} = \frac{\text{Density of water at the temperature}}{\text{Density of water at 4 C}}$$

What you can clearly see from this is that hot water is less dense than cold water. This property is extremely important for proper operation of thermal solar panels if you want to not have to use electrical pumps to move the hot water around. We will talk more about “thermosiphon” later, and measure properties related to it.

Our experiment today is the following: I will heat a container of water which has food coloring in it. After a time, the container will be placed into cooler water and we will observe the motion of the water. You may also look at the movies I have provided for this.

Your paragraph today is the following: make your observations of the experiment and explain in your own words in 4 sentences what you see, and your understanding of why it happens. As a reference today, the URL to these instructions will suffice.