

Make your own Galileo Thermometer

this is a tricky experiment to get right

Equipment

- ◇ A small fish tank or similar clear sided container
- ◇ 8 small baby food jars or similarly watertight, lidded containers
- ◇ Sand
- ◇ Water
- ◇ Vaseline or silicone sealant
- ◇ Digital Scales and a measuring cylinder

Method

1 Clean the jars and work out what their volume is – the easiest way to do this is to see how much volume they displace when you put them in a water-filled measuring cylinder. Mark the bottles with temperatures from 5-30°C in 2.5°C intervals.

2 Add some sand to each bottle so that you end up with the densities on the next page, remembering that density = mass/ volume. This is the tricky part! If you want to span a wider temperature range, look up a density chart for water on the web.

3 Seal the jars with a thin layer of petroleum jelly or sealant and screw them tight shut, then put them in the fish tank full of water. Add ice and/ or hot water to the tank to change the temperature, and watch the bottles sink/ rise!

Alternatively, you can add a different mass of sand to each jar and then, using an alcohol in glass thermometer, determine what the water temperature is when they rise.



Temperature Table

Temperature (°C)	Density of bottle g/cm ³
5	0.99997
7.5	0.99988
10	0.99970
12.5	0.99944
15	0.99910
17.5	0.99869
20	0.99820
22.5	0.99766
25	0.99704
27.5	0.99637
30	0.99565

How does it work?

Liquids such as water often expand much more than solids such as glass or metal when they are heated.

Objects float in water if the weight of water they displace is more than their own weight; if the weight of water displaced is less than the object's weight, it will sink. The weight of an object does not change with temperature. The density (weight per unit volume) of a liquid changes with temperature because although the total weight is constant, the total volume changes.