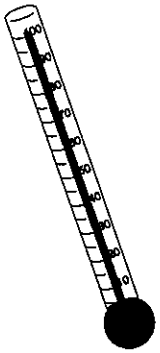
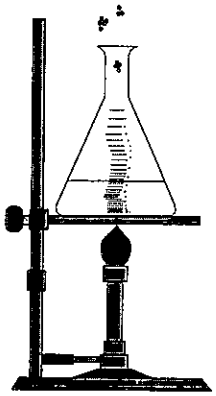
Specific Heats of Common Materials



Heats up Faster

MATERIAL	SPECIFIC HEAT (Joules/gram • °C)
Liquid water	4.18
Solid water (ice)	2.11
Water vapor	2.00
Dry air	1.01
Basalt	0.84
Granite	0.79
Iron	0.45
Copper	0.38
Lead	0.13

Heats up Faster



Overview:

Substances do not all heat up or cool down at the same rate. When heat (measured in joules) is absorbed by substances and does not go through a phase change, the temperature increases. Measuring how fast substances increase in temperature compared to water, gives us this chart called Specific Heats of Common Materials.

The Chart:

The Specific Heat chart shows how fast a substance heats up compared to liquid water, with water having a value of 4.18 joules/gram • °C. Any substance that heats up faster than water will have a specific heat value less than 4.18, and any substance that heats up slower than water has a specific heat higher than 4.18. As shown by the Specific Heats of Common Materials chart, lead, with the lowest value 0.13, would heat up the fastest. Copper having a specific heat of 0.38 would heat up slower than lead, but would heat up faster than all of the substances having a larger specific heat value. Granite and basalt, both being rocks, are used to represent land materials. From their respective specific heat values, it can be seen that land heats up much faster than water (about 5×'s as fast).

Additional Information:

- If a substance heats up fast, it also cools down fast. Thus, land not only heats up faster than water, but it also cools down faster than water. This is why the sand on a beach becomes much hotter than the body of water during a summer day, but cools down much faster than the water at night. This is also why large bodies of water have a major affect on the climate of coastal areas. Water, having a large specific heat, heats up very slowly, and cools down very slowly. This property of water causes coastal areas to have a smaller annual range of temperature compared to inland cities at the same latitude.

- Joules is the derived unit of energy in the international system of units (SI - metric system).