Science Virtual Learning

MPI Physics 240

Thermodynamics 6: Calorimetry 1

April 29, 2020

Lesson: MPI Thermodynamics 6 – Calorimetry 1
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Objective: To use heat flows between objects to calculate their final temperature

This video discusses how keeping track of heat flows between objects allows you to calculate the final temperature.

https://youtu.be/5RYvrb18NIE

Video: Calorimetry 1

TABLE 19.1 Specific Heats of Some Substances at 25°C and Atmospheric Pressure

Substance	Specific Heat (J/kg · °C)	Substance	Specific Heat (J/kg · °C)
Elemental solids		*Other solids*	
Aluminum	900	Brass	380
Beryllium	1 830	Glass	837
Cadmium	230	Ice (−5°C)	2 090
Copper	387	Marble	860
Germanium	322	Wood	1 700
Gold	129	*Liquids*	
Iron	448	Alcohol (ethyl)	2 400
Lead	128	Mercury	140
Silicon	703	Water (15°C)	4 186
Silver	234	*Gas*	
		Steam (100°C)	2 010

Note: To convert values to units of cal/g · °C, divide by 4 186.

Specific Heat Table

1. Pennies are mostly (97.5%) zinc. If you put 100 pennies (m=0.250 kg) at 50.0°C into 0.215 kg of water at 20.0°C, what will their final temperature be? The specific heat for zinc is 377 J/(kg•°C).

2. In the previous problem, we ignored the fact that the water had to be held in a container, and it also absorbs some heat and warms up. Repeat the problem, but include a 0.0500-kg glass that contains the water. Assume the glass and the water have the same temperature at all times.

Video: https://youtu.be/FqZrZZbQ9lM

Calorimetry - Examples

Homework 1

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/LcmTQMycDRw

1. A 0.844-kg piece of iron at -15.0°C is placed in 0.500 kg of water at 20.0°C. What is the final temperature?

Homework 2

- Try to solve the problem yourself, then watch the solution video:
- https://youtu.be/bsB_jB8WEGA

2. A bathtub is filled with 302 kg of water at 27.0°C. How much mass of water at 95.0°C would have to be added to the tub to bring the overall temperature to 37.0°C?

That’s it!