



# Science Virtual Learning

## MPI Physics 210

### Thermodynamics 6: Calorimetry 1

May 14, 2020



Lesson: MPI Thermodynamics 6 - Calorimetry 1  
May 14, 2020

**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>

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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)
<i>Elemental solids</i>		<i>Other solids</i>	
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	<i>Liquids</i>	
Iron	448	Alcohol (ethyl)	2 400
Lead	128	Mercury	140
Silicon	703	Water (15°C)	4 186
Silver	234	<i>Gas</i>	
		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  $50.0^{\circ}\text{C}$  into  $0.215$  kg of water at  $20.0^{\circ}\text{C}$ , what will their final temperature be? The specific heat for zinc is  $377$  J/(kg $\cdot^{\circ}\text{C}$ ).

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.

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Video: <https://youtu.be/FqZrZZbQ9IM>

## 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  $-15.0^{\circ}\text{C}$  is placed in 0.500 kg of water at  $20.0^{\circ}\text{C}$ . What is the final temperature?

## Homework 2

- Try to solve the problem yourself, then watch the solution video:
- [https://youtu.be/bsB\\_jB8WEGA](https://youtu.be/bsB_jB8WEGA)

2. A bathtub is filled with 302 kg of water at  $27.0^{\circ}\text{C}$ . How much mass of water at  $95.0^{\circ}\text{C}$  would have to be added to the tub to bring the overall temperature to  $37.0^{\circ}\text{C}$ ?



That's it!

