

1 Specific Heat

Specific heat of an object is the amount of heat energy that has to be supplied to the object so that its temperature increases by one Kelvin (or one degree centigrade). That is, if specific heat is c , then the amount of heat required to increase the temperature by ΔT is

$$Q = c\Delta T.$$

Specific heat here is measured in *Joules/K*. Of course, the bigger the object, the larger is its specific heat. Thus one usually works with specific heat per unit of mass (specific heat of a unit mass of a particular substance). For example, the specific heat of water is $4200\text{Joules}/(\text{kg} \cdot \text{K})$. The specific heat of iron is $450\text{Joules}/(\text{kg} \cdot \text{K})$.

2 Problems

1. An iron ball of diameter 1cm is heated to 200 degrees centigrade and placed into a thermos containing 200g water. What will be the final temperature of the water (i.e. after the temperatures of the water and the iron ball become equal)? The density of iron is $7.9\text{g}/\text{cm}^3$.

2. A glass of hot tea has a temperature of 100 degrees centigrade. The total volume of the tea is 200ml . How much cold water (with temperature 20 degrees centigrade) should one add to the tea so that its temperature becomes 70 degrees centigrade?

3. A glass of water (200ml) is poured from a height of 1m into an empty thermos. Because the mechanical energy of the water is converted into heat, the final temperature of the water in the thermos will be slightly larger than the initial temperature of the water in the glass. Compute this temperature increase.