

Physics 1135: Homework for Recitation #28: Heat transfer

1. You are making ice tea by adding ice to 1.8 liters of hot tea, initially at 80°C . How many kilograms of ice, initially at 0°C , are required to bring the mixture to 10°C ?
2. A king is ordering his alchemist to determine the material of an ancient medallion. The alchemist heats the medallion of mass 100g to a temperature of 100°C and then drops it into his cauldron which is a 0.25 kg copper bowl containing 0.2kg of water of an initial temperature of 20°C . He waits until equilibrium has established and measures the final temperature to be 22°C . Find the specific heat of the medallion and determine the material.
3. An article on the internet claims that drinking ice cold beverages is a good way to lose weight.
 - a) Calculate how much energy is needed to 0.2 kg water initially at 5°C to body temperature of 37°C . Give the answer in Joules and in kilocalories (kcal; this is commonly used as food calories).
 - b) It requires 3500 kcal to burn off 0.454kg (one pound) of fat. How many liters of cold water would have to be consumed to achieve that?
4. A rod is composed of two segments of the same cross sectional area. One third of the length consists of copper, and two thirds of aluminum. The copper end is placed in a furnace held at a temperature of 300°C . The aluminum end is placed in an ice bath held at 0°C . Calculate the temperature at the point where the two segments are joined.