1. Early in the morning, when the temperature is 5.00°C, gasoline is pumped into a car's 53.0 liter steel gas tank until it is filled to the top. Later in the day the temperature rises to 27.0°C. The volume thermal expansion coefficient for gas is 9.50×10^{-4} /°C, while the linear thermal expansion coefficient for steel is 1.20×10^{-5} /°C. Will the level of gasoline go down in the tank, or will some gas spill out of the tank? If you think the level drops calculate the difference in volume between the tank and the gas; if you think some gas spills out determine how much spills.

2. For a particular human body, the core temperature is 37.0°C, and the skin, with a surface area of 1.15 m^2, has a temperature of 33.8°C.

   (a) Find the rate of heat transfer (in watts) out of the body under the following assumptions.

   (i) The average thickness of tissue between the core and the skin is 1.20 cm.
   (ii) The thermal conductivity of the tissue is that of water (0.600 W/(m K)).

   (b) Without repeating the calculation of part (a), what rate of heat transfer would you expect if the skin temperature were to fall to 30.6°C?
   Explain.

3. A 29.0 g ice cube at 0.0°C is added to 110 g of water in a 62 g aluminum cup. The cup and the water have an initial temperature of 22.0°C. Find the equilibrium temperature of the cup and its contents. The specific heat of water is 4186 J/(kg °C); the specific heat of aluminum is 900 J/(kg °C); the latent heat of fusion of water is 3.35×10^5 J/kg.

4. A 5.00 g copper bullet is fired into a fence post. The initial speed of the bullet is 210 m/s, and when it comes to rest half its kinetic energy goes into heating the bullet. How much does the bullet's temperature increase? The specific heat of copper is 387 J/(kg °C).