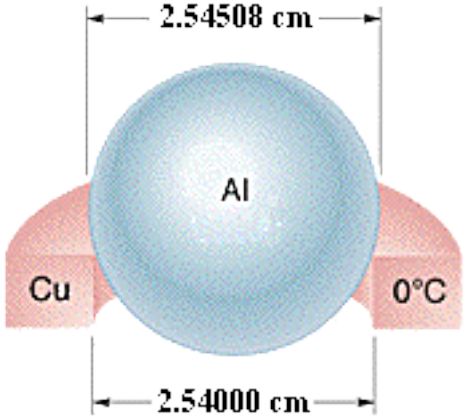
The Pyrex glass mirror in the telescope at the Mt. Palomar Observatory has a diameter of 200 in. The temperature ranges from -10°C to 50°C on Mt. Palomar. In micrometers, what is the maximum change in the diameter of the mirror, assuming that the glass can freely expand and contract?

[965 μm]

An aluminum cup of 110 cm^3 capacity is completely filled with glycerin at 21°C. How much glycerin, if any, will spill out of the cup if the temperature of the cup and glycerin is raised to 34°C? (The coefficient of volume expansion of glycerin is 5.1 x 10^{-4}/C°.)

[0.631 cm^3]

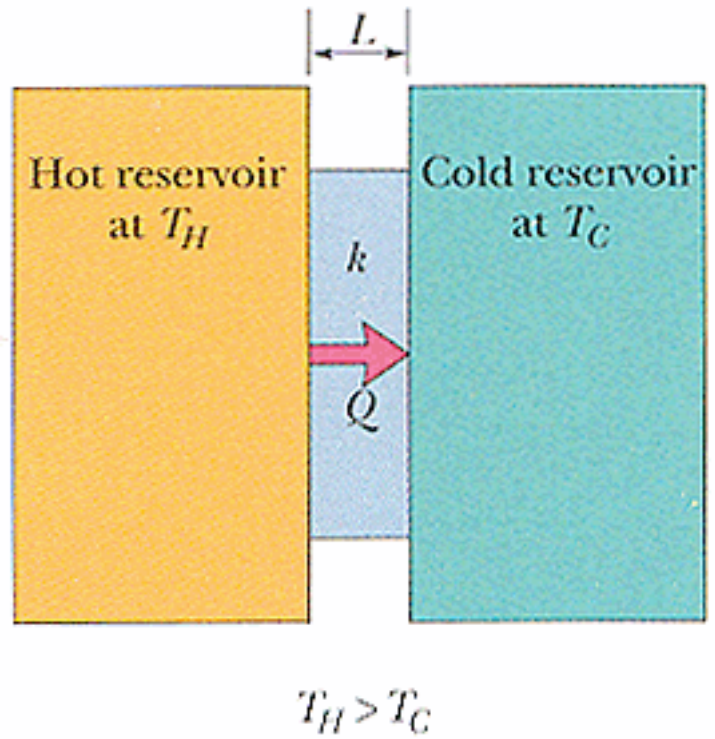
A 22.0 g copper ring has a diameter of 2.54000 cm at its temperature of 0.000°C. An aluminum sphere has a diameter of 2.54508 cm at its temperature of 108.0°C. The sphere is placed on top of the ring (Fig. 19-39), and the two are allowed to come to thermal equilibrium, with no thermal energy transferred to the surroundings. The sphere just passes through the ring at the equilibrium temperature. What is the mass of the sphere?



[0.0281 kg]

What mass of steam at 100°C must be mixed with 165 g of ice at its melting point, in a thermally insulated container, to produce liquid water at 55°C?

[38.1 g]



Consider the slab shown in Fig. 19-25. Suppose that L = 27.0 cm, A = 90.0 cm^2, and the material is copper. If T_H = 102°C, T_C = 12.0°C, and a steady state is reached, find the conduction rate through the slab.

[1200 J/s]

(a) Calculate the rate at which body heat is conducted through the clothing of a skier in a steady-state process, given the following data: the body surface area is 1.3 m^2 and the clothing is 1.0 cm thick; the skin surface temperature is 36°C, whereas the outer surface of the clothing is at 1.0°C; the thermal conductivity of the clothing is 0.020 W/m·K.

[91 J/s]

(b) What would the answer to (a) be instead if, after a fall, the skier's clothes became soaked with water of thermal conductivity 0.60 W/m·K?

[2730 J/s]