

42. ● You have 750 g of water at 10.0°C in a large insulated beaker. How much boiling water at 100.0°C must you add to this beaker so that the final temperature of the mixture will be 75°C ?
47. ●● A 4.00 kg silver ingot is taken from a furnace, where its temperature is 750°C , and placed on a very large block of ice at 0.00°C . Assuming that all the heat given up by the silver is used to melt the ice and that not all the ice melts, how much ice is melted?
52. ● **Conduction through the skin.** The blood plays an important role in removing heat from the body by bringing this heat directly to the surface where it can radiate away. Nevertheless, this heat must still travel through the skin before it can radiate away. We shall assume that the blood is brought to the bottom layer of skin at a temperature of 37°C and that the outer surface of the skin is at 30.0°C . Skin varies in thickness from 0.50 mm to a few millimeters on the palms and soles, so we shall assume an average thickness of 0.75 mm. A 165 lb, 6 ft person has a surface area of about 2.0 m^2 and loses heat at a net rate of 75 W while resting. On the basis of our assumptions, what is the thermal conductivity of this person's skin?
61. ●● **Basal metabolic rate.** The basal metabolic rate is the rate at which energy is produced in the body when a person is at rest. A 75 kg (165 lb) person of height 1.83 m (6 ft) would have a body surface area of approximately 2.0 m^2 . (a) What is the net amount of heat this person could radiate per second into a room at 18°C (about 65°F) if his skin's surface temperature is 30°C ? (At such temperatures, nearly all the heat is infrared radiation, for which the body's emissivity is 1.0, regardless of the amount of pigment.) (b) Normally, 80% of the energy produced by metabolism goes into heat, while the rest goes into things like pumping blood and repairing cells. Also normally, a person at rest can get rid of this excess heat just through radiation. Use your answer to part (a) to find this person's basal metabolic rate.