11-1A) About how long would it take a 1 kW heating element to melt 1 kg of ice at 0^oC? (1 cal = 4.2 J; L_m(ice) = 80 cal/g.)
(a) 4.0 s (b) 36 s (c) 6 min (d) 1.0 hr (e) 10 hr

11-2A) How high must a 75.0 kg person climb to work off the equivalent of a large piece of chocolate cake rated at 500 (food) Calories? 1 (food) Calorie = 10^3 calories.
(a) 2.8 m (b) 28 m (c) 280 m (d) 2,800 m (e) 28,000 m

11-3A) 1 kcal of heat is added to 10 g of ice initially at -5^oC. If none of the heat is lost to the surroundings, about what should be the final temperature of the system? (c(ice) = 0.5 cal/g•^oC; L_m(ice) = 80 cal/g; c(H_20) = 1 cal/ g•^oC.)
(a) 2^oC (b) 18^oC (c) 80^oC (d) 100^oC (e) None of these is close.

11-4A) A 100 gm block of copper, c(Cu)= 0.1 cal/gm^oC, initially at 100^oC, is quickly submerged in a tank containing 30 gm of water, c(H_20)= 1 cal/g•^oC initially at 0^oC. Neglect the heat capacity of the tank walls, assume that no heat leaks out the sides of the tank, and neglect any work due to thermal expansion. About what is the equilibrium temperature of the water plus block?
(a) 50^oC (b) 25^oC (c) 2.5^oC (d) 75^oC (e) None of these.

11-5A) The specific heat of Aluminum (Al) is more than twice that of copper (Cu). Equal mass blocks of Al and Cu, both initially at 0^oC, are each dropped into identical calorimeters filled with water at 60^oC. When equilibrium is reached,
(a) the temperature of the Cu is higher. (b) the temperature of the Al is higher. (c) the temperatures of the Cu and Al are the same. (d) which temperature is higher depends upon the masses of the blocks. (e) You don't have enough information to tell.

11-6A) A 100 g cube of ice at 0^oC is dropped into 1.0 kg of water that is initially at 80^oC. If no heat flows into our out of the water-ice system, what is the final temperature of the system after the ice has melted? ? Take L_m(ice) = 80 cal/g and c(H_20) = 1 cal/g•^oC.
(a) 6.5^oC (b) 80^oC (c) 85^oC (d) 0^oC (e) 65^oC

11-7A) An average person requires an energy per day of about 2500 Cal (1 (Food) Cal = 1000 usual cal). About how many Watts of continuous power generation does this energy/day correspond to?
(a) 120 (b) 12 (c) 1.2 (d) 1200 (e) None of these is close.

11-8A) If the surface temperature of the Sun were reduced by half, about how much smaller would be the energy radiated by the sun?
(a) ½ (b) ¼ (c) 1/8 (d) 1/16 (e) 1/64

11-9A) The thermal conductivities of glass (k = 0.84) and wood (0.10) and dry air (0.02) differ substantially from each other. The ratios of heat flow for wood (w) and glass (g) to that for dry air (da), through a wall of fixed length L, A, and ΔT should be:
H_g/H_{da} and H_w/H_{da} =
(a) 42, 5 (b) 5, 42 (c) 0.024, 0.2 (d) 0.017, .002 (e) None of these is close.

11-10A) About what is the rate of heat flow in J/s through a Cu block of length 8 cm and cross-sectional area 15 cm^2 with a temperature difference of 30^oC across the block? Take k(Cu) = 400 J/s•m•^oC.
(a) 2300 (b) 230 (c) 23 (d) 2.3 (e) 0.23

11-11A) Which one of the following statements is WRONG?
(a) Heat is energy that flows between a system and its environment by virtue of a temperature difference that exists between them.
(b) Units that can be used for heat include cal, BTU, and J.
(c) Most metals conduct heat better than wood does.
(d) Adding a small amount of heat to any system always causes the temperature of that system to rise.
(e) Dry air is a very good insulator, if it is constrained so that it can't move and thereby convect heat.

11-12A) In a room at a uniform comfortable temperature, metallic objects normally feel colder to the touch than do wooden objects. The primary reason for this occurance is:
(a) A given mass of wood contains more heat than the same mass of metal.
(b) Heat tends to flow from metal to wood.
(c) Metal conducts heat better than wood does.
(d) The equilibrium temperature of metal is lower than that of wood.
(e) The organic human body resembles wood more than it resembles metal.

11-13A) Which one of the following statements about heat transport involving conduction, convection, or radiation, is WRONG?

(a) The filament in an incandescent light bulb gives off most of its energy by radiation.
(b) The heat transfer through a single pane of window glass occurs mostly by conduction.
(c) Atmospheric convection has a strong effect on global climate patterns.
(d) A furnace blower produces forced convection of the air in a room.
(e) Energy from the Sun reaches us mostly by convection.

11-1B) About how long would it take a 1 kW heating element to boil 1 kg of water at 100^oC? (1 cal = 4.2 J; $L_v(H_20)$ = 540 cal/g.)
(a) 40 min (b) 4 min (c) 7 hr (d) 70 hr (e) 3 s

11-2B) About how many 10 kg (22 lb) weights must a 75.0 kg person lift onto a 1 m high table to work off a large piece of chocolate cake rated at 500 (food) Calories? 1 (food) Calorie = 10^3 calories.
(a) 210 (b) 21,000 (c) 2,100 (d) 21 (e) 210,000.

11-3B) About how many calories of heat are needed to change a 40 g ice cube from ice at -10^oC to steam at 110^oC?
Take c(ice) = 0.5 cal/g•^oC, L_m(ice) = 80 cal/g, $c(H_20)$ = 1 cal/g•^oC, and $L_b(H_2O)$ = 540 cal/g.
(a) 2900 (b) 290 (c) 29,000 (d) 290,000 (e) 29

11-4B) About what mass of water at 25.0^oC must be allowed to come to thermal equilibrium with a 3.00 kg gold bar initia lly at 100^oC to reach a final equilibrium temperature of 50.0^oC? [Use c(Au) = 0.03 cal/g•^oC, c(water) = 1 cal/g•^oC, and take no heat lost or gained.]
(a) 0.18 g (b) 1800 g (c) 1.8 g (d) 18 g (e) 180 g

11-5B) The specific heat of Go ld (Au) is about one-third that of copper (Cu). Equal mass blocks of Au and Cu, both initially at 0^oC, are each dropped into identical calorimeters filled with water at 60^oC. When equilibrium is reached,
(a) the temperature of the Cu is higher. (b) the temperature of the Au is higher. (c) the temperatures of the Cu and Au are the same.
(d) which temperature is higher depends upon the masses of the blocks. (e) You don't have enough information to tell.

11-6B) If no heat flows into or out of the coffee-ice system, about how many 100 g ice cubes initially at 0^oC does it take to cool a 400 g glass of coffee (which is essentially just water) from an initial temperature of 100^oC to an equilibrium temperature of 0^oC and thereby make ice coffee? Take L_m(ice) = 80 cal/g and $c(H_20)$ = 1 cal/g•^oC.
(a) 5 (b) 4 (c) 3 (d) 6 (e) You don't have enough information to tell.

11-7B) Each of 50 people sitting in a room puts out about 120 W of heat. About how many Megacal/hr does this correspond to?
(a) 0.05 (b) 0.5 (c) 5 (d) 50 (e) 500

11-8B) Star A has twice the radius and twice the absolute temperature of start B. About what is the ratio of the power radiated by star A to that radiated by start B?
(a) 4 (b) 8 (c) 16 (d) 32 (e) 64

11-9B) The thermal conductivities of glass (k = 0.84) and wood (0.10) and dry air (0.02) differ substantially from each other. The ratios of heat flow for dry air (da) and wood (w) to that for glass (g), through a wall of fixed length L, A, and ΔT should be:
H_{da}/H_g and H_w/H_g =
(a) 42, 5 (b) 5, 42 (c) 0.024, 0.12 (d) 0.017, .002 (e) None of these is close.

11-10B) What is the rate of heat flow in J/s through a wooden block of length 8 cm and cross-sectional area 15 cm^2 with a temperature difference of 30^oC across the block? Take k(wood) = 0.1 J/s•m•^oC.
(a) 5.6 (b) 5.6×10^{-3} (c) 56 (d) 5.6×10^{-2} (e) 5.6×10^{-1}

11-11B) Which one of the following statements is WRONG?
(a) Heat is energy that flows between a system and its environment by virtue of a temperature difference that exists between them.
(b) Units that can be used for heat include cal, BTU, and J.
(c) Most metals conduct heat less well than wood does.
(d) Adding a small amount of heat to any system need not always cause the temperature of that system to rise.
(e) Dry air is a very good insulator, if it is constrained so that it can't move and thereby convect heat.

11-12B) Your Mom tells you not to stick your tongue on a freezing cold metal pole. What is the main reason why you shouldn't.
(a) Metals generally have small heat capacities.
(b) Heat tends to flow from the pole to your tongue.
(c) The pole will taste bad.
(d) Metals conduct heat away very well, so the water on your tongue could freeze and stick your tongue to the pole.
(e) Mom is never wrong.

11-13B) Which one of the following statements about heat transport involving conduction, convection, or radiation, is WRONG?

(a) The filament in an incandescent light bulb gives off most of its energy by radiation.
(b) The heat transfer through a single pane of window glass occurs mostly by convection.
(c) Atmospheric convection has a strong effect on global climate patterns.
(d) A furnace blower produces forced convection of the air in a room.
(e) Energy from the Sun reaches us mostly by radiation.

11-1A) c 2A) d 3A) b 4A) b 5A) a 6A) e 7A) a 8A) d 9A) a 10A) b 11A) d 12A) c 13A) e

11-1B) a 2B) b 3B) c 4B) e 5B) b 6B) a 7B) c 8B) e 9B) c 10B) d 11B) c 12B) d 13B) b