

- 243.** The human body cannot survive at a temperature of 42°C for very long. Express this quantity in kelvins.
- 244.** Two sticks rubbed together gain $2.15 \times 10^4 \text{ J}$ from kinetic energy and lose 33 percent of it to the air. How much does the sticks' internal energy change?
- 245.** A stone falls 561.7 m. When the stone lands, the internal energy of the ground and the stone increases by 105 J. What is the stone's mass?
- 246.** A 2.5 kg block of ice at 0.0°C slows on a level floor from 5.7 m/s to 0 m/s. If $3.3 \times 10^5 \text{ J}$ cause 1.0 kg of ice to melt, how much of the ice melts?
- 247.** Placing a 3.0 kg skillet in 5.0 kg of water raises the water's temperature 2.25°C and lowers the skillet's temperature 29.6°C . Find the skillet's specific heat.
- 248.** Air has a specific heat of $1.0 \times 10^3 \text{ J/kg}\cdot^{\circ}\text{C}$. If air's temperature increases 55°C when $45 \times 10^6 \text{ J}$ are added to it by heat, what is the air's mass?
- 249.** A 0.23 kg tantalum part has a specific heat capacity of $140 \text{ J/kg}\cdot^{\circ}\text{C}$. By how much does the part's temperature change if it gives up $3.0 \times 10^4 \text{ J}$ as heat?
- 258.** Find the efficiency of an engine that receives 571 J as heat and loses 463 J as heat per cycle.
- 259.** A $5.4 \times 10^{-4} \text{ m}^3$ increase in steam's volume does 1.3 J of work on a piston. What is the pressure?
- 260.** A pressure of 655 kPa does 393 J of work inflating a bike tire. Find the change in volume.
- 261.** An engine's internal energy changes from 8093 J to $2.0920 \times 10^4 \text{ J}$. If 6932 J are added as heat, how much work is done on or by the system?
- 262.** Steam expands from a geyser to do 192 kJ of work. If the system's internal energy increases by 786 kJ, how much energy is transferred as heat?
- 263.** If 632 kJ are added to a boiler and 102 kJ of work are done as steam escapes from a safety valve, what is the net change in the system's internal energy?
- 264.** A power plant with an efficiency of 0.35 percent requires $7.37 \times 10^8 \text{ J}$ of energy as heat. How much work is done by the power plant?
- 265.** An engine with an efficiency of 0.11 does 1150 J of work. How much energy is taken in as heat?
- 266.** A test engine performs 128 J of work and receives 581 J of energy as heat. What is the engine's efficiency?

Chapter 10 Thermodynamics

- 250.** A volume of air increases 0.227 m^3 at a net pressure of $2.07 \times 10^7 \text{ Pa}$. How much work is done on the air?
- 251.** The air in a hot-air balloon does $3.29 \times 10^6 \text{ J}$ of work, increasing the balloon's volume by 2190 m^3 . What is the net pressure in the balloon?
- 252.** Filling a fire extinguisher with nitrogen gas at a net pressure of 25.0 kPa requires 472.5 J of work on the gas. Find the change in the gas's volume.
- 253.** The internal energy of air in a closed car rises 873 J. How much heat energy is transferred to the air?
- 254.** A system's initial internal energy increases from 39 J to 163 J. If 114 J of heat are added to the system, how much work is done on the system?
- 255.** A gas does 623 J of work on its surroundings when 867 J are added to the gas as heat. What is the change in the internal energy of the gas?
- 256.** An engine with an efficiency of 0.29 takes in 693 J as heat. How much work does the engine do?
- 257.** An engine with an efficiency of 0.19 does 998 J of work. How much energy is taken in by heat?

Chapter 11 Vibrations and Waves

- 267.** A scale with a spring constant of 420 N/m is compressed 4.3 cm. What is the spring force?
- 268.** A 669 N weight attached to a giant spring stretches it 6.5 cm. What is the spring constant?
- 269.** An archer applies a force of 52 N on a bowstring with a spring constant of 490 N/m. What is the bowstring's displacement?
- 270.** On Mercury, a pendulum 1.14 m long would have a 3.55 s period. Calculate a_g for Mercury.
- 271.** Find the length of a pendulum that oscillates with a frequency of 2.5 Hz.
- 272.** Calculate the period of a 6.200 m long pendulum in Oslo, Norway, where $a_g = 9.819 \text{ m/s}^2$.
- 273.** Find the pendulum's frequency in problem 272.
- 274.** A 24 kg child jumps on a trampoline with a spring constant of 364 N/m. What is the oscillation period?
- 275.** A 32 N weight oscillates with a 0.42 s period when on a spring scale. Find the spring constant.