12 Thermal Energy

1. The freezing point of bromine –7.25°C. Its boiling point is 59.35°C.

   What is the state of bromine at the following temperatures?

   a. 251 K

   b. 305 K

   c. 342 K

2. Octane, a substance found in petroleum, boils at 126°C and is a liquid over a range of 183 Celsius degrees. What is the melting point of octane in kelvins?

3. How much energy is required to heat a clay pizza baking stone, which has a specific heat of 860 J/kg•K, from 25°C to 235°C? The mass of the stone is 4.8 kg.

4. A 2.0-kg slab of concrete requires 11 kJ to raise its temperature from 23°C to 29°C. What is the specific heat of concrete?

5. A blacksmith lifts a 0.73-kg iron horseshoe from a forge at a temperature of 835°C and quenches the shoe in 45 kg of water at 23°C. What is the final temperature of the horseshoe and water?

6. A silversmith pours 55.0 g of molten silver at 975°C into a mold and lets it cool to 25°C. How much heat does the silver transfer to the environment? The melting point of silver is 961°C and the specific heat of molten silver is 288J/kg•K.

7. Angie adds a block of ice at -4°C to cool 2.2 kg of water at 42°C in an insulated jug. When the water has cooled to 5°C, she removes the remaining ice. What is the mass of water in the jug?

8. A cubic meter of water in a perfectly insulated container is exposed to solar energy during a 24-hour period as shown below.
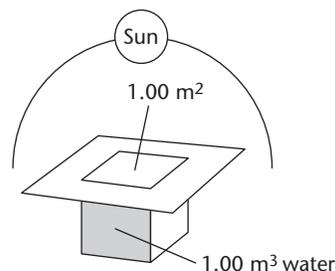
   At the end of the 24 hours, the temperature of the water increases by 0.60°C. If all the solar energy was absorbed by the water though a 1.00 m² surface, what is the daily solar energy intensity measured in J/m²? (The density of water is 1.00×10^3 kg/m³.)