

- (from Giancoli, Problem 19-39) Suppose 25 mole of an ideal gas of volume $.50 \text{ m}^3$ at 300K is allowed to expand isothermally (constant temperature) to a volume 1.50 m^3 . Find
 - the initial pressure;
 - the work done by the gas;
 - the change in internal energy of the gas;
 - the heat added to the gas.
- Find (a) the work done against atmospheric pressure and, (b) using the latent heat of melting of ice, the change in internal energy of 1.00 kg of ice when it is all melted to water at 0 C , when the atmospheric pressure is $1.01 \times 10^5 \text{ Pa}$. Watch the signs of energy and work terms in this problem, and explain why they are what they are.
- (Giancoli, Problem 19-67) (a) How much power is radiated by a tungsten sphere, with emissivity 0.25 and radius 0.18 m at a temperature of 77 C ?
(b) If the sphere is inside a room whose walls, floor and ceiling are kept at 20 C , what is the net rate of flow of energy out of the sphere?
- (From Giancoli, Problem 19-72) A copper rod and an aluminum rod, each of the same length and the same cross section, are joined end to end, with a solder that gives good thermal contact between them. The end of the copper rod is in a furnace at 250 C , and the end of the aluminum rod is held at 0 C in a mixture of ice and water. Between the furnace and the ice bath the rods are well insulated from the surrounding air. What is the temperature of the half-way point at which the two rods meet?

Other questions, for practice, and for discussion:

- (Giancoli 19-101) An ice sheet forms on a lake. The air above the lake is at -15 C , while the water below the ice sheet is at 0 C . Assume that the heat of fusion of the water freezing on the lower surface is conducted through the sheet to the air above. How much time does it take to form an ice sheet 0.25 m thick?
You need to start this question by considering what is happening at time t when the ice has a thickness $w(t)$. The latent heat needed to freeze the water has to be conducted through the ice sheet. You will need to use a figure for the thermal conductivity of ice. You will then need to integrate the expression for the rate of growth of the ice sheet as a function of w .
- The thermal conductivity of polyurethane foam is shown in table 19-4 of Giancoli as slightly greater than that of air. Why is it used to insulate the cavities between the inner and outer walls of a house, instead of relying on the air in those cavities?