[tex2] Heating the air in a room

Calculate the amount of energy ΔQ that must be supplied to heat the air in a room from 0°C to 20°C under three different circumstances. For each case, calculate also the change in internal energy ΔU of the air in the room. Mass density of air at STP (0°C and 1atm): $\rho = 0.00129\text{g/cm}^3$. Specific heats of air: $c_V = 0.169\text{cal/gK}$, $c_p/c_V \equiv \gamma = 1.41$. Express all results in SI units.
(a) The room has rigid, insulating walls. The volume is 27m^3. The initial pressure is 1atm.
(b) The room has insulating walls. One wall is mobile. The process takes place at constant pressure (1atm). The initial volume is 27m^3.
(c) The room has rigid, insulating walls. The volume is 27m^3. One wall has a small hole through which air leaks out slowly. The process takes place at constant pressure (1atm).

Solution: