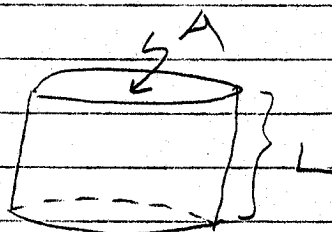


2. After the container is placed in the hot room with the lid on, the volume of air trapped inside is

$$m = \rho_h V$$



$$V = LA$$

where

$$P_h = \rho_h R T_h$$

but the problem states that the hot room is in pressure equilibrium with the cool room, so

$$P_h = P_c$$

and

$$\rho_h = \frac{P_c}{R T_h}$$

and

$$m = \frac{P_c V}{R T_h}$$

when the container is removed, it contains the same mass and has the same volume \Rightarrow same density

$$\rho_h = \frac{m}{V}$$