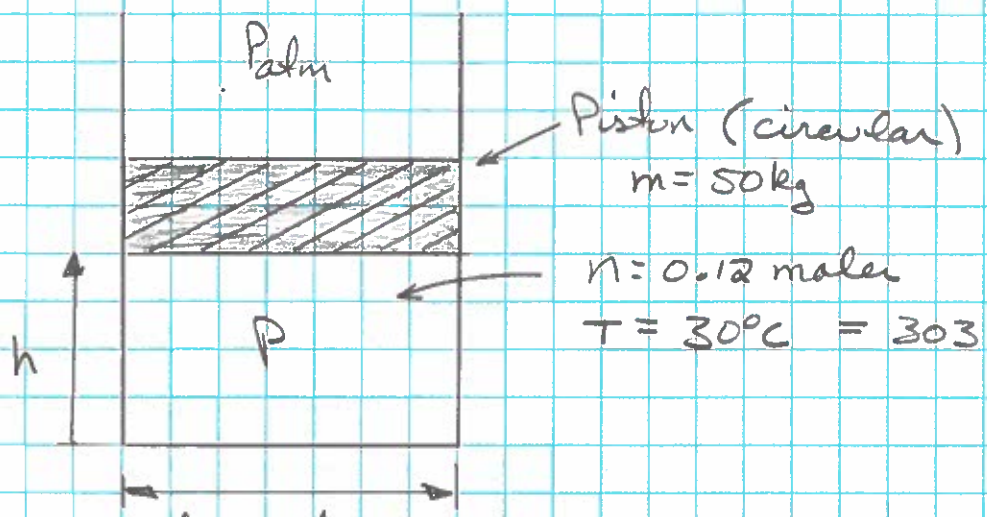
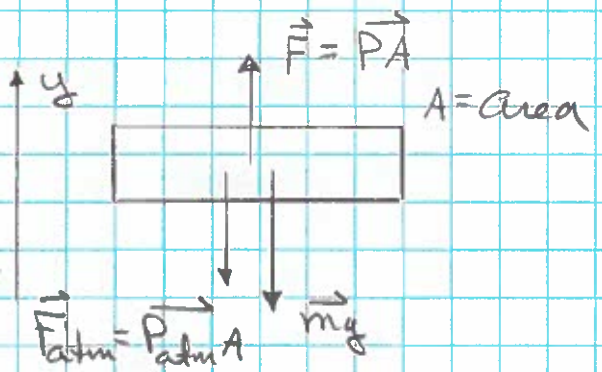


a.) The piston is in equilibrium:

Piston FBD:



$$\Sigma F_y = PA - P_{atm}A - mg = 0$$

So, $$P = P_{atm} + \frac{mg}{A}$$

$$= P_{atm} + \frac{mg}{\pi r^2}$$

So, $P = 1.64 \times 10^5$ Pa

Now, for gas inside:

$$PV = nRT \Rightarrow V = \frac{nRT}{P} = 1.84 \times 10^{-3}\ m^3$$

and,

$$V = Ah = \pi r^2 h$$

$$\therefore \boxed{h = \frac{V}{\pi r^2} = 0.234\ m}$$

b.) for $T_2 = T + 100°C = 403K$, the piston moves to h_2, but the pressure inside the cylinder is constant.

So $P_2 = P = 1.64 \times 10^5 Pa$

For $p = const$, $PV = nRT \Rightarrow \frac{nR}{P} = \frac{V}{T} = const.$

So,

$$\frac{V}{T} = \frac{V_2}{T_2} \quad \text{or} \quad \frac{Ah}{T} = \frac{Ah_2}{T_2}$$

and,

$$h_2 = h\left(\frac{T_2}{T}\right) = 0.312\ m$$

i.e. piston moves a distance

$$\boxed{h_2 - h_1 = 0.078\ m}$$