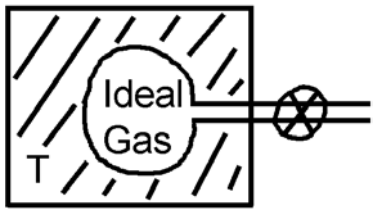
A sphere 20 cm in diameter contains an ideal gas at 1.00 atm and 20.0°C. As the sphere is heated to 100.0°C, gas is allowed to escape. The valve is closed and the sphere is placed in an ice-water bath.



(A) How many moles of gas escape from the sphere as it warms?

(B) What is the pressure in the sphere when it is in the ice water?

Where do we start? The Ideal Gas Law $PV = nRT$

$$\text{given}\begin{cases} T_o = 20^o\,C = 293K \\ P_o = 1\,atm = 1.013\times10^5\,Pa \end{cases}$$

$$\text{inf erred}\begin{cases} V_o \equiv V = 4/3\pi r^3 = .0042\,m^2 \\ n_o = \dfrac{P_o V_o}{RT_o} = .174\,\text{moles} \end{cases}$$

$T' = 373^o\,C$

$T'' = 273^o\,C$

(A) $n' = \dfrac{P_o V_o}{RT'} = .137\,\text{moles}$ note the pressure still 1atm

$\Rightarrow \Delta n = .037\,\text{moles}$

(B) $P = \dfrac{n'RT''}{V_o} = 7.4\times10^4\,Pa = .73\,atm$