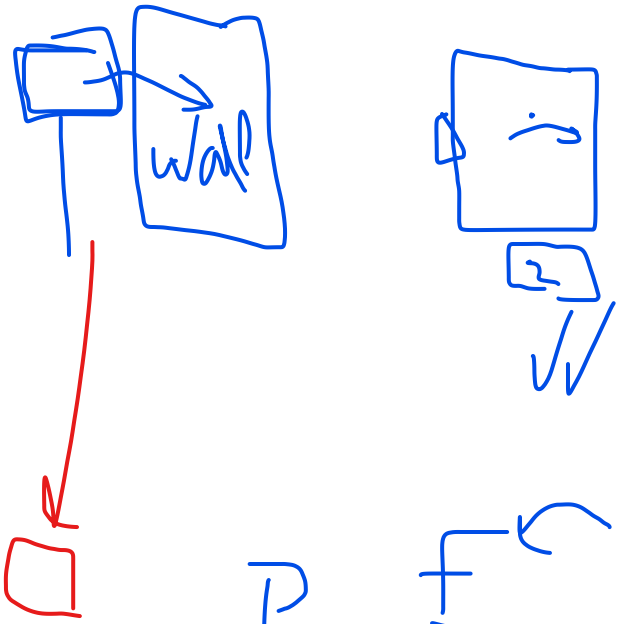
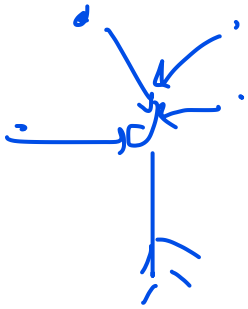


$$f = m \times a$$

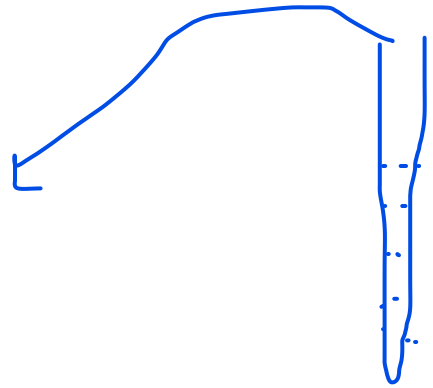
$$\frac{Kg \cdot m}{s^2}$$

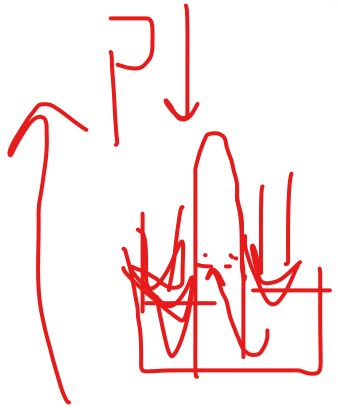
$$P = \frac{F}{A} \quad \begin{matrix} F \leftarrow N \\ A \leftarrow m^2 \end{matrix} \quad = N/m^2 = \text{Pascal}$$

$$P = \frac{Kg \cdot m}{s^2 \cdot m^2} = \frac{Kg}{s^2 \cdot m}$$

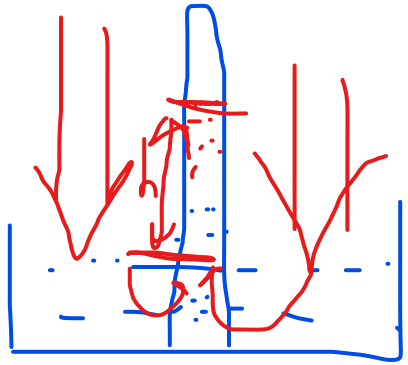


Barometer





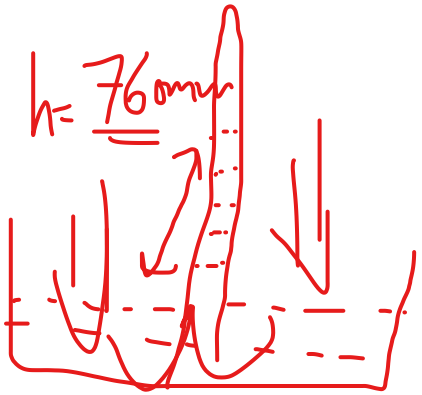
$\frac{m}{V}$ density



$P_{atm} = \rho g h$

Pascal

kg/m^3 $9.8\ m/s^2$ m



h = 760mm

$1\ atm. = 760\ mm\ Hg$

$1\ atm. = 101325\ Pa.$

$P_w = P_{Hg}$

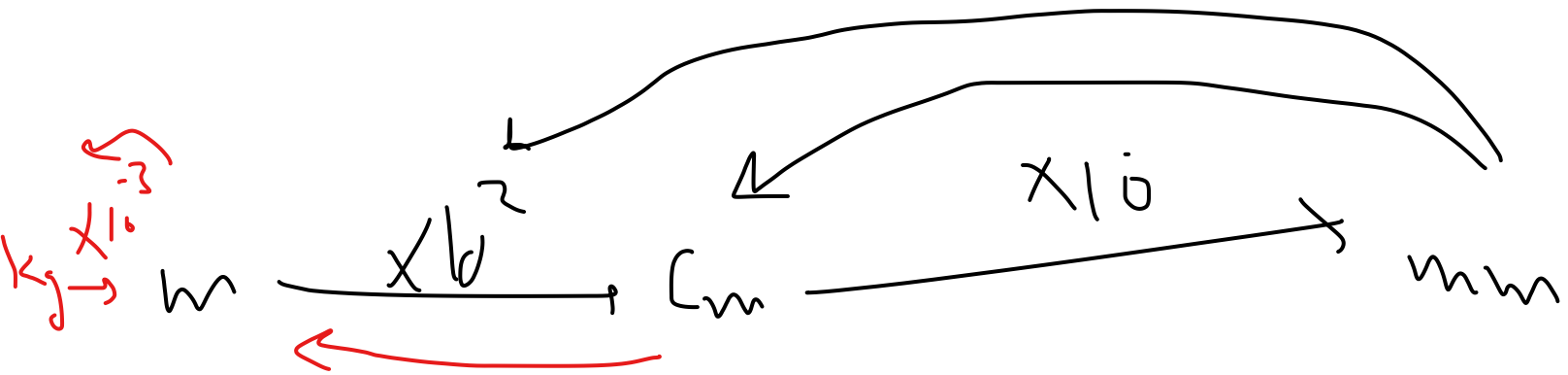
$(\rho g h)_w = (\rho g h)_{Hg}$

$\rho_w = 1\ g/cm^3$

$\rho_{Hg} = 13.6$

$1 \times 9.8 \times h_w = 13.6 \times 9.8 \times 760\ mm$

$h_w = 10336\ mm = 1033\ cm = 0.33\ m$



$\rho = 1.18\ g/cm^3$

$h = 9.25\ m$

$P = \rho g h$

$P = \frac{1.118 \times 10^{-3}\ kg}{1 \times (10^{-2})^3\ m^3} \times 9.25\ m \times 9.8\ \frac{m}{s^2}$

$=$ P2.

$h = 9.14\ m$

$P = 757\ mm\ Hg$

$\rho = ??$

$P = \rho g h$

$757\ mm\ Hg \times \frac{1\ atm}{760\ mm\ Hg} \times \frac{1.325\ Pa}{1\ atm} =$

$P = \rho g h$

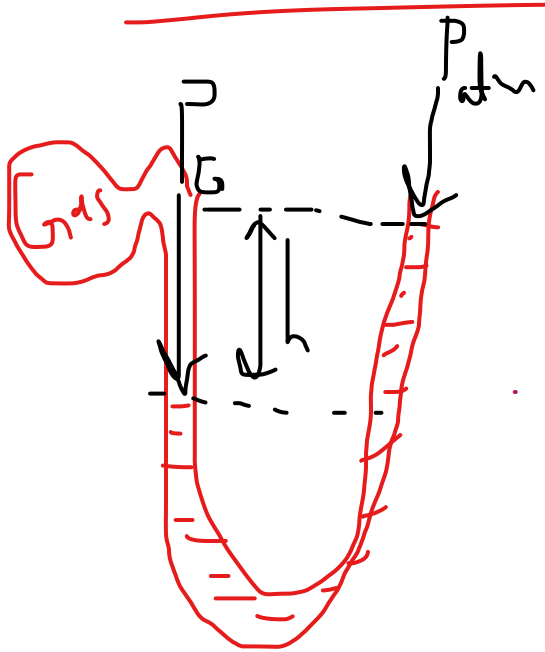
$= \rho \times 9.8 \times 9.14$

$\rho = \text{---}\ kg/m^3$

100925

Manometer

$\Delta P = \rho g h$

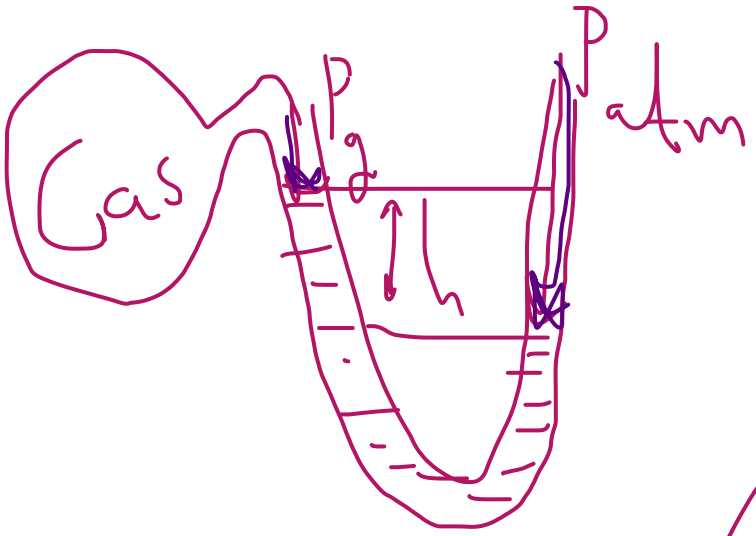


$P_G > P_{atm}$

$P_G - P_{atm} = \rho g h$

latm
101325 Pa.

$P_{Gas} = P_{atm} + \rho g h$



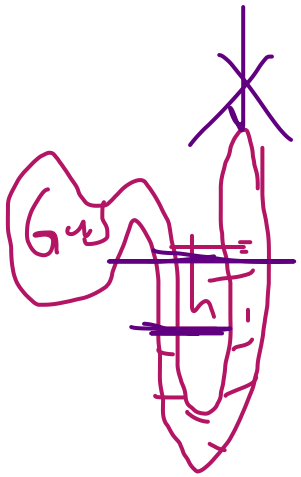
$$P_{atm} > P_G$$

$$\Delta P = \rho g h$$

$$P_{atm} - P_G = \rho g h$$

$$-P_G = \rho g h - P_{atm} \quad \div -1$$

$$* \boxed{P_G = P_{atm} - \rho g h} *$$



$\rho = \rho g h$

ρ : kg/m^3

$g = 9.8\ m/s^2$

$P_{Gas} = ?$

$P_{Gas} < P_{atm}$

$1\ atm = 760\ mm\cdot Hg$

$1\ atm = 101325\ Pa$

$d = 13.6\ g/cm^3$

$P_{Gas} = P_{atm} - \rho g h$

$P_{atm} = 748.2\ mm\ Hg$

$h = ?\ mm\ Hg$

$$P_{Gas} = \left(748.2\ \text{mmHg} \times \frac{1\ \text{atm}}{760\ \text{mmHg}} \times \frac{101325\ \text{Pa}}{1\ \text{atm}}\right) - \left(\frac{13.6 \times 10^{-3}}{1 \times 10^{-3}} \times 9.8 \times 8.6 \times 10^{-3}\right)$$

$$= 98605.51\ \text{Pa} \times \frac{1\ \text{atm}}{101325\ \text{Pa}} \times \frac{760\ \text{mmHg}}{1\ \text{atm}}$$

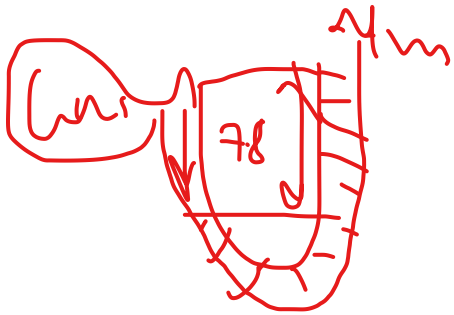
$$= 739.6\ \text{mmHg}$$

$$\boxed{P_g} = \boxed{P_{atm}} - \boxed{\rho g h}$$

$$P_G = 748.2\ \text{mmHg} - 8.6\ \text{mmHg}$$

$$= 739.6\ \text{mmHg}$$

$P_{atm} < P_{Cu}$



$h = 7.8\ mm\ Hg$

$P_C = P_{atm} + \rho g h$

$= 748.2\ mm\ Hg + 7.8\ mm\ Hg$

$P_{Cas} = \_\_\_\_\ mm\ Hg$

$\rho = 1.26\ g/cm^3$

$h = 8.6\ mm$

$P_{atm} = 748.2\ mm\ Hg$

$P_{atm} > P_G$

$P_G = P_{atm} - \rho g h$

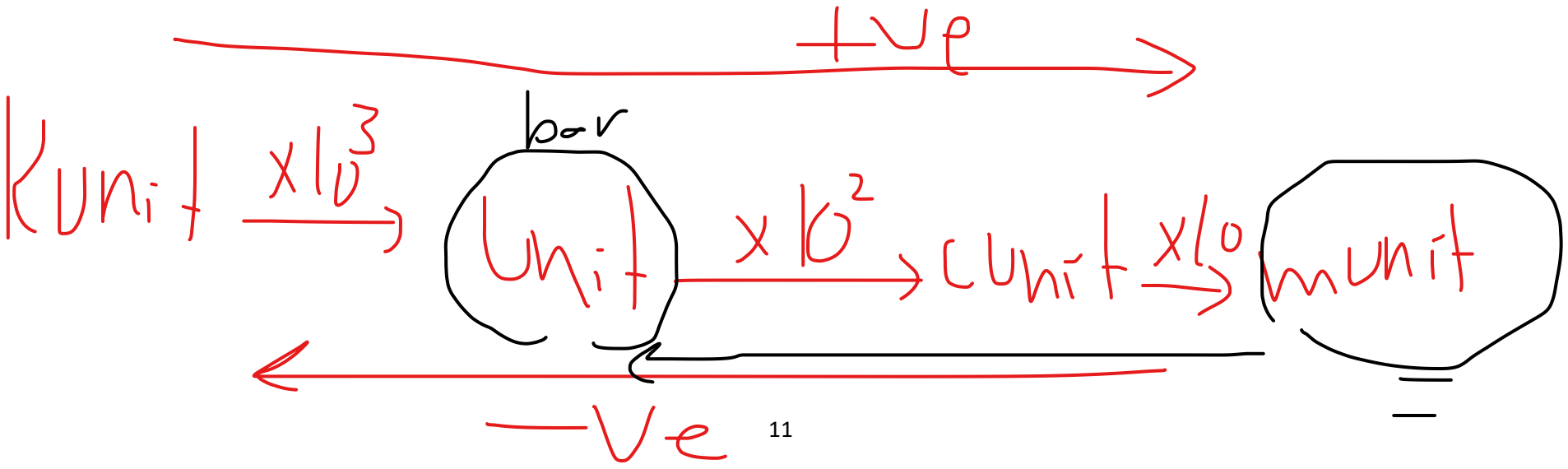
$P_G = \left(748.2\ mmHg \times \frac{1\ atm}{760\ mmHg} \times \frac{101325\ Pa}{1\ atm}\right) - \left(\frac{1.26 \times 10^{-3}}{1 \times 10^{-3}} \times 1.8 \times 6.6 \times 10^{3}\right)$

$= \neq P_{a.}$

1 atm = 760 mmHg (torr)

1 atm = 101325 Pa.

1 bar = 100000 Pa.



$d = 4.1\ cm$ ⊖ πr^2 $P = ??$ (torr.)

$r = \frac{d}{2}$

$m = 1\ kg$

$g = 9.8\ m/s^2$

$$P = \frac{F}{A} = \frac{m \times g}{\pi r^2} = \frac{1 \times 9.8}{\pi \times (\frac{4.1}{2} \times 10^{-2})^2} = 7422.8\ Pa.$$

$$7422.8\ Pa. \times \frac{1\ atm}{101325\ Pa.} \times \frac{760\ torr}{1\ atm}$$

$$= 55.67\ torr$$

A :.

$m = 1\ kg$

diameter $= 2.6\ cm$

$P = ??$

$$P = \frac{F}{A} = \frac{mg}{\pi r^2} = \frac{1 \times 9.8}{\pi \times \left(\frac{2.6}{2} \times 10^{-2}\right)^2}$$

$$P = 18458.2\ Pa.$$

$$18458.2\ Pa \times \frac{1\ atm}{101325\ Pa} \times \frac{760\ mm\text{-}Hg}{1\ atm} = 138.4\ mm\text{-}Hg$$

$m = 1\,kg$

$P = 100 \times 10^{-3} = 0.1\ bar \times \frac{100\,000\ Pa.}{1\ bar} = 10\,000\ Pa.$

$m = ??$

$r = \frac{4.10}{2}\ Cm$

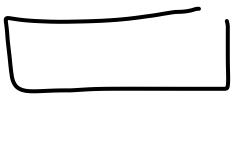
$P = \frac{F}{A} = \frac{mxg}{A}$

$10\,000 = \frac{(m) \times 9.8}{\pi \times \left(\frac{4.1}{2} \times 10^{-2}\right)^2}$

$m = 1.34\ kg$

$\Delta m = 1.34 - 1 = 0.34\ kg$

Ideal Gases



→ Boyle's Law :-

T ⟶ constant ↑P ∝ 1/V↓

$$P_1 V_1 = P_2 V_2$$

$$P = k \times \frac{1}{V}$$

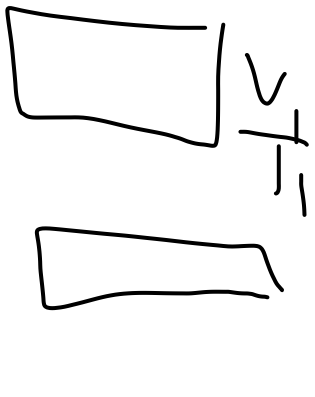
→ Charles Law

P ⟶ Constant

15

$V \propto T$

$V = KT$



$t^{\circ}C + 273.15$

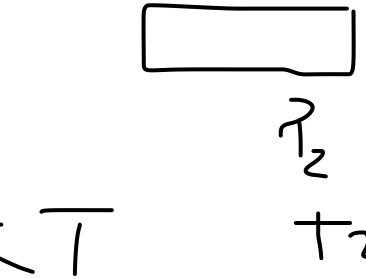
$t^{\circ}C + 273.15$

$$\frac{T_1}{T_2} = \frac{V_1}{V_2}$$

→ Gay-Lussac

$P \propto T$

$P = KT$



V → Constant

$t^{\circ}C + 273$

$$\frac{P_1}{P_2} = \frac{T_1}{T_2}$$

$t^{\circ}C + 273$

Avogadro's Law ..

P, T, V, n

$V \propto n$

$$\frac{V_1}{V_2} = \frac{n_1}{n_2}$$

$$n = \frac{\text{mass}}{}$$

$P \propto \frac{1}{V}$

$P \propto T$

$V \propto T$

$PV \propto 1$

$V \propto n$

$P V \propto T n$

$PV = nRT$ ideal gas eq

Pressure (atm.) P_a.

Volume (l) m^3

mole

Temp? (K)

0.082 $l \cdot atm / K \cdot mol$

$=$

8.31 $Pa \cdot m^3 / K \cdot mol$

STP

$T = 0\,^\circ C = 273.15\ K$ $\quad n = 1\ mol$

$P = 1\ bar\ (100\,208\ Pa)$ $\quad V = 22.4\ l$

$$\frac{P_1 V_1}{n_1 T_1} = \frac{P_2 V_2}{n_2 T_2}$$

Cl_2

$m = 13.7\,g$

$T = 45 + 273.15$

$PV = nRT$

$P = 745\,mmHg$ Pa./dtn

$pV = \frac{m}{M} RT$ m^3 ρ 8.31 $0.08V^2$

$V = ??$

$745\,mmHg \times \frac{1\,atm}{760\,mmHg} \times (V) = \frac{13.7}{(35.44 \times 2)} \times 0.082 \times (45+273.15)$

$V = \quad - \quad \ell$

$m = 20.7\ g$

$T = -25\ ^{\circ}C$

$P = 752\ mmHg$

$PV = nRT$

$PV = \frac{m}{M}RT$

$752\ mmHg \times \frac{1\ atm}{760\ mmHg} \times V = \frac{20.2}{14 + (3 \times 1)} \times 0.082 \times (-25 + 273.15)$

$V = \frac{\quad}{\quad} l$

$0.993\ \text{bar} \times \frac{100\,000\ \text{Pa}}{1\ \text{bar}} \times \frac{1\ \text{atm}}{101325\ \text{Pa}} = \frac{\quad}{\quad}\ \text{atm}$

$P = ?$

$T = 75 + 273.15\ K$

No. of molecules $= 1 \times 10^{26}$ molec. $=$ no. of moles $\times 6.02 \times 10^{23}$

$V = 305\ ml$

$\overset{?}{PV} = nRT$

$$PV = \frac{\text{no. of molecules}}{6.02 \times 10^{23}} RT$$

$$P \times (305 \times 10^{-3}) = \left[\frac{1 \times 10^{20}}{6.02 \times 10^{23}} \times 0.082 \times (75 + 273.15) \right]$$

$$P = 0.02 \text{ atm}$$

$$2027.9$$

$$6.02 \text{ atm} \times \frac{101.325 \text{ Pa}}{1 \text{ atm}} = \text{— Pa} \times 10^{-3} = 2.02 \text{ kPa}.$$

$n = ??$

$V = 5\ell$

$P = 10.5\ atm$

$T = 30^{\circ}C$

$$PV = nRT$$

$$10.5 \times 5 = n \times 0.082 \times (30 + 273.15)$$

$n =$ mol

---

molecules $= ??$

$V = 3.45\ m^3$

$P = 6.67 \times 10^{-7}\ Pa.$

$T = 25\ ^{\circ}C$

$$PV = nRT$$

$$= \frac{\text{molec.}}{6.02 \times 10^{23}}$$

8.31

$$6.67 \times 10^{-7} \times 3.45 = \frac{\text{mole}}{6.02 \times 10^{23}} \times (8.31 \times (25 + 273.15))$$

molecules: 5.8×10^{14} molecules

$T_1 = 0\,^\circ C$

$V_1 = 1\,l$

$P_1 = 1\,bar$

$T_2 = 100\,^\circ C$

$V_2 = 1\,l$

$P_2 = ??$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{1 \times 1}{273.15} \neq \frac{P \times 1}{(100 + 273.15)}$$

$$273.15 \times P = (100 + 273.15)$$

$$P = 1.36 \text{ bar}$$

$V_1 = 1$ ml

$T_1 = 35.2\ ^\circ C$

$P = 2.14$ atm

$V_2 = ??$ ml

$T_2 = 37.8\ ^\circ C$

$P = 1.02$ atm

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{2.14 \times 1}{(35.2 + 273.15)} = \frac{1.02 \times V}{(37.8 + 273.15)}$$

$V =$ mL

$V_1 = 1\ l$

$T_1 = 0\ ^\circ C$

$P_1 = 1\ bar$

$n_1 = 1\ mol$

$V_2 = 1\ l$

$T_2 = 100\ ^\circ C$

$P_2 = 1\ bar$

$n_2 = ??$

$$\frac{P_1 V_1}{n_1 T_1} = \frac{P_2 V_2}{n_2 T_2}$$

$$\frac{1 \times 1}{(0+273.15) \times 1} \neq \frac{1 \times 1}{(100+273.15) \times n_2}$$

$(100 + 273.15)\, n_2 = 273.15$

$n_2 = 0.73$ mol

$\Delta n = 1 - 0.73 = 0.27$ mol

$\text{mol} = \frac{\square}{\square}$

$0.27 * \frac{\square}{(1 \times 2)}$

$\square = 0.27 \times (1 \times 2)$

$= \square$ g