Calculate the mass of 22650 L of oxygen gas at 25.0 C and 1.18 atm pressure.

↑ O_2

*Volume of a 10'x10'x8' room

1 - Convert volume of oxygen gas to moles using ideal gas equation
2 - Convert moles oxygen gas to mass using formula weight.

$$PV = nRT \qquad \frac{PV}{RT} = n$$

$P = 1.18\ \text{atm}$

$V = 22650\ \text{L}$

$R = 0.08206\ \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}}$

$T = 25.0°\text{C} = 298.2\ \text{K}$

$n = ?\ \text{mol}\ O_2$

(1)
$$n_{O_2} = \frac{(1.18\ \text{atm})(22650\ \text{L})}{\left(0.08206\ \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}}\right)(298.2\ \text{K})} = 1092.222357\ \text{mol}\ O_2$$

$32.00\ \text{g}\ O_2 = \text{mol}\ O_2$

(2)
$$1092.222357\ \text{mol}\ O_2 \times \frac{32.00\ \text{g}\ O_2}{\text{mol}\ O_2} = \boxed{35\bar{0}00\ \text{g}\ O_2}$$

35.0 kg
~77 lb

$$2\,HCl + Na_2CO_3 \rightarrow CO_2 + H_2O + 2\,NaCl$$

If 48.90 mL of hydrochloric acid solution react with sodium carbonate to produce 125.0 mL of carbon dioxide gas at 0.950 atm and 290.2 K. What is the molar concentration of the acid?

We need to find out M of HCl: $M_{HCl} = \dfrac{\text{mol HCl}}{\text{L HCl solution}}$ ← 48.90 mL = 0.04890 L

1 - Convert 125.0 mL of carbon dioxide gas to moles using ideal gas equation.
2 - Convert moles carbon dioxide to moles HCl using chemical equation.
3 - Calculate molarity of HCl using the moles HCl and the volume.

① $n = \dfrac{PV}{RT}$ | $P = 0.950$ atm, $V = 125.0$ mL $= 0.1250$ L, $R = 0.08206 \dfrac{L \cdot atm}{mol \cdot K}$, $T = 290.2$ K

$$n_{CO_2} = \frac{(0.950\text{ atm})(0.1250\text{ L})}{\left(0.08206 \frac{L\cdot atm}{mol\cdot K}\right)(290.2\text{ K})} = 0.004986019\text{ mol } CO_2$$

2 mol HCl = mol CO_2

② $$0.004986019\text{ mol } CO_2 \times \frac{2\text{ mol HCl}}{\text{mol } CO_2} = 0.009972038\text{ mol HCl}$$

③ $$M_{HCl} = \frac{\text{mol HCl}}{\text{L HCl solution}} = \frac{0.009972038\text{ mol HCl}}{0.04890\text{ L}} = \boxed{0.204\text{ M HCl}}$$

Here are the sample exchange reactions we did in class for review today:

NO REACTION

$$Na_3PO_4(aq) + KCl(aq) \longrightarrow \sout{K_3PO_4(aq) + NaCl(aq)}$$

Na^+ PO_4^{3-} K^+ Cl^-

No reaction here, since both "prodiucts" are soluble ionic compounds (which iexist in water as separate ions - just like before the "reaction"!)

$$Na_3PO_4(aq) + 3AgNO_3(aq) \longrightarrow 3NaNO_3(aq) + \underline{\underline{Ag_3PO_4(s)}}$$

Na^+ PO_4^{3-} Ag^+ NO_3^-

Formation of the solid silver(I) phosphate drives this reaction.