

Gas:  $\text{CO}_2$

Goal: How many gallons @ 30 PSI can a 200z tank fill? (at 70°F)  
(in tank) (How many times can 5 gal tank be pressurized?)

Known:

$$200\text{z} = 567 \text{ grams}$$

$$70^\circ\text{F} = 294.26 \text{ K}$$

$$\text{Volume per mole: } 22.4 \text{ L/mol @ STP}$$

$$30 \text{ psi} = 2.04138 \text{ ATM}$$

$$\text{STP} = 273 \text{ kelvin}$$

$$= 1 \text{ ATM}$$

$$\text{Molar Mass} = 44.01 \text{ g/mol}$$

→ Solution

$$\text{How many moles? } \frac{567 \text{ grams}}{44.01 \text{ grams/mol}} = \boxed{12.88 \text{ Moles}}$$

$$\text{Volume @ STP? } 12.88 \text{ Moles} * 22.4 \text{ L/mol} = \boxed{288.59 \text{ Liters}}$$

Volume @ 70°F, 30 PSI?

$$P_1 = 1 \text{ ATM}$$

$$V_1 = 288.59 \text{ L}$$

$$T_1 = 273 \text{ K}$$

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \Rightarrow X = \frac{P_1 V_1 T_2}{T_1 P_2} = \frac{1 \text{ ATM} * 288.59 \text{ L} * 294.26 \text{ K}}{273 \text{ K} * 3.04138 \text{ ATM}}$$
$$X = 102.28 \text{ L} * 0.264 \frac{\text{Gal}}{\text{L}}$$

\* →

$$P_2 = 30 \text{ PSI} = 2.04138 \text{ ATM} + 1 \text{ ATM} \quad [\text{To get gage pressure}] = 3.04138 \text{ ATM}$$

$$V_2 = X$$

$$T_2 = 70^\circ\text{F} = 294.26 \text{ K}$$

$$X = 27 \text{ Gallons} = 5 \text{ fills}$$

$$\downarrow \quad 5 \text{ gallon/tank}$$

1 200z Tank of  $\text{CO}_2$  could  
pressurize a 5 gallon tank to  
30psi at 70°F 5 Times