

Honors Chemistry Review Chapter 11

- Find the density of ammonia at STP.
- What is the mass of 750. ml of sulfur dioxide at STP?
- What is the volume of 125 g of butane at 27 ° C and 780. mm Hg?
- Find the pressure exerted by 0.635 moles of oxygen if it occupies 325 ml at 50.0°C.
- What is the molar mass of a gas if 9.71 g occupies 560. ml at 22° C and 740. mm?
- Ammonia reacts with oxygen to make nitrogen and water. What volume of oxygen is needed to produce 414 ml of nitrogen at STP?
- What mass of hydrochloric acid must be reacted with calcium carbonate to make 50.0 ml of carbon dioxide at 24 ° C and 1.15 atm?
- Carbon dioxide reacts with calcium oxide to make calcium carbonate. How many grams of calcium carbonate can be formed from 50.0 L of a mixture of gases that is 53.0% by volume carbon dioxide at STP?
- How many liters of hydrogen chloride can be made by reacting 15.0 L of hydrogen with 12.0 L of chlorine at STP?

Molar Volume (1 + 2)

Ideal Gas Law (3 + 4)

Molar Volume (5)

Gas Stoich.

1. NH_3 , STP $\frac{17.04 \text{ g}}{\text{mol}} \left(\frac{1 \text{ mol NH}_3}{22.414 \text{ L}} \right) = 0.7604 \frac{\text{g}}{\text{L}} \text{ NH}_3$

2. 750. ml SO_2 $\left(\frac{1000 \text{ mL SO}_2}{1000 \text{ mL}} \right) \left(\frac{1 \text{ mol SO}_2}{22.414 \text{ L SO}_2} \right) \left(\frac{64.07 \text{ g SO}_2}{1 \text{ mol SO}_2} \right) = 2.14 \text{ g SO}_2$

3. $PV = nRT$

$$V = \frac{nRT}{P}$$

125 g Butane, C_4H_{10}
 $125 \text{ g C}_4\text{H}_{10} \left(\frac{1 \text{ mol C}_4\text{H}_{10}}{58.14 \text{ g C}_4\text{H}_{10}} \right) = 2.15 \text{ mol C}_4\text{H}_{10}$

$$= \frac{(2.15 \text{ mol C}_4\text{H}_{10}) (0.08206 \text{ L}\cdot\text{atm}) (300. \text{K})}{1.03 \text{ atm}} = 51.4 \text{ L C}_4\text{H}_{10}$$

4. $PV = nRT$

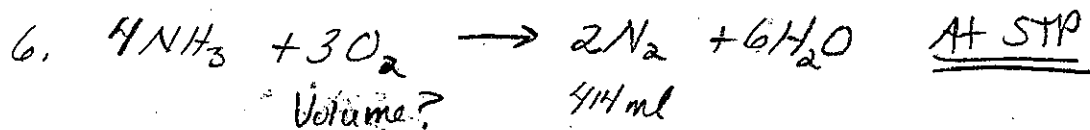
$$P = \frac{nRT}{V} = \frac{(0.635 \text{ mol O}_2) (0.08206 \text{ L}\cdot\text{atm}) (323 \text{K})}{0.325 \text{ L}} = 51.8 \text{ atm}$$

5. MM 9.71g

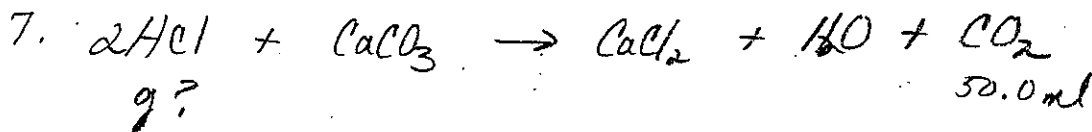
$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2} \quad V_2 = \frac{V_1 P_1 T_2}{T_1 P_2} = \frac{(560. \text{ mL}) (740. \text{ mmHg}) (273.15 \text{K})}{(295 \text{K}) (760.0 \text{ mmHg})} = 505 \text{ mL}$$

$$\frac{9.71 \text{ g}}{505 \text{ mL}} \left(\frac{1000 \text{ mL}}{1.00 \text{ L}} \right) \left(\frac{1 \text{ mol}}{22.414 \text{ L}} \right) = 431 \frac{\text{g}}{\text{mol}}$$

525 mL $\left(\frac{1.00 \text{ L}}{1000 \text{ mL}} \right) \left(\frac{1 \text{ mol}}{22.414 \text{ L}} \right) = 0.0225 \text{ mol}$
 $\text{MM} = \frac{9.71 \text{ g}}{0.0225 \text{ mol}} = 432 \frac{\text{g}}{\text{mol}}$



$$414 \text{ ml N}_2 \left(\frac{3 \text{ ml O}_2}{2 \text{ ml N}_2} \right) = 621 \text{ ml O}_2 \quad (0.621 \text{ L O}_2)$$

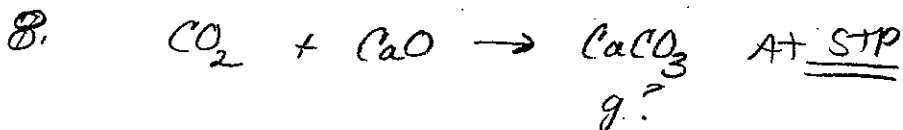


$24^\circ\text{C} \rightarrow 297\text{K}$

1.15 atm

$$PV = nRT \quad n = \frac{PV}{RT} = \frac{(1.15 \text{ atm})(0.0500 \text{ L CO}_2)}{(0.08206 \text{ L}\cdot\text{atm}) / (\text{K}\cdot\text{mol})(297\text{K})} = 0.00236 \text{ mol CO}_2$$

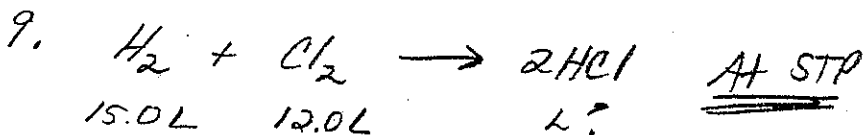
~~$$0.00236 \text{ mol CO}_2 \left(\frac{2 \text{ mol HCl}}{1 \text{ mol CO}_2} \right) \left(\frac{36.46 \text{ g HCl}}{1 \text{ mol HCl}} \right) = 0.172 \text{ g HCl}$$~~



50.0 L Mixture Gases

53.0% CO_2

$$50.0 \text{ L Gas Mixture} \left(\frac{53.0 \text{ L CO}_2}{100. \text{ L Gas Mixture}} \right) \left(\frac{1 \text{ mol CO}_2}{22.41 \text{ L CO}_2} \right) \left(\frac{1 \text{ mol CaCO}_3}{1 \text{ mol CO}_2} \right) \left(\frac{100.09 \text{ g CaCO}_3}{1 \text{ mol CaCO}_3} \right) = 118 \text{ g CaCO}_3$$



LR!
 $15.0 \text{ L H}_2 \left(\frac{2 \text{ L HCl}}{1 \text{ L H}_2} \right) = 30.0 \text{ L HCl}$

$12.0 \text{ L Cl}_2 \left(\frac{2 \text{ L HCl}}{1 \text{ L Cl}_2} \right) = 24.0 \text{ L HCl}$