

11-3 Gas Stoichiometry

Volume - Volume

- Treat coefficients as a molar ratio
Moles and Volumes are directly related (Avogadro's Law)

Volume - Mass

- Use Ideal Gas Law to convert between volume and moles
- Use mole ratio (stoichiometry) to relate moles of the gas and the other reactant/product you are looking for
- Use molar mass to convert between mass and moles

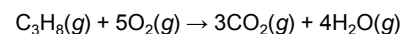
Volume - Mass

- Opposite order from Volume - Mass problems

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11-3 Gas Stoichiometry

Volume - Volume



What will be the volume of CO_2 produced from the complete combustion of 0.350 L of propane? (Assume the same temperature and pressure)

$$0.350 \text{ L C}_3\text{H}_8 \left[\frac{3\text{CO}_2}{1\text{C}_3\text{H}_8} \right] = 1.05 \text{ L CO}_2$$

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Volume - Mass



How many grams of calcium carbonate must be decomposed to produce 5.00 L of CO_2 gas with 1 atm of pressure at 273 K?

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

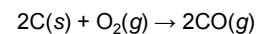
$$n = \frac{(1 \text{ atm})(5.0 \text{ L})}{(0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}})(273 \text{ K})} = 0.223 \text{ mol CO}_2$$

$$0.223 \text{ mol CO}_2 \left[\frac{1 \text{ CaCO}_3}{1 \text{ CO}_2} \right] \left[\frac{100.1 \text{ g}}{\text{mol}} \right] = 22.3 \text{ g CaCO}_3$$

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11-3 Gas Stoichiometry

Mass - Volume



How many liters of carbon monoxide at 300 K and 0.247 atm can be produced from the burning of 65.5 g of carbon?

$$65.5 \text{ g C} \left[\frac{\text{mol}}{12.0 \text{ g}} \right] \left[\frac{2 \text{ CO}}{2 \text{ C}} \right] = 5.46 \text{ mol CO}$$

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

$$V = \frac{(5.46 \text{ mol})(0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}})(300 \text{ K})}{(0.247 \text{ atm})} = 544 \text{ L CO}$$

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