

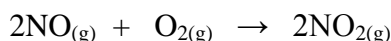
1. Under constant pressure, 792 mmHg, a sample of hydrogen gas initially at 88 °C and 9.6 L is cooled until its final volume is 3.4 L. What is the final temperature of this gas? (3 pts) **Charles's Law: V vs T at constant P**

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

$$T_1 = 88 + 273 = 361 \text{ K}$$

$$T_2 = \frac{V_2 T_1}{V_1} = \frac{(3.4 \text{ L})(361 \text{ K})}{(9.6 \text{ L})} = \mathbf{128 \text{ K}}$$

2. Consider the formation of nitrogen dioxide from nitric oxide and oxygen:



If 9.0 L of NO are reacted with excess O₂ at STP, what is the volume in liters of the NO₂ Produced? (3 pts) **Ideal Gas Law: PV = nRT**

STP (Standard Temperature and Pressure): 1 atm and 0 °C (273 K)

$$n_{no} = \frac{PV}{RT} = \frac{(1 \text{ atm})(9.0 \text{ L})}{\left(0.0821 \frac{\text{L atm}}{\text{mol K}}\right)(273 \text{ K})} = 0.402 \text{ mol NO}$$

$$0.402 \text{ mol NO} \times \frac{2 \text{ mol NO}_2}{2 \text{ mol NO}} = 0.402 \text{ mol NO}_2$$

$$V = \frac{n_{NO_2} RT}{P} = \frac{(0.402 \text{ mol}) \left(0.0821 \frac{\text{L atm}}{\text{mol K}}\right) (273 \text{ K})}{(1 \text{ atm})} = \mathbf{9.0 \text{ L}}$$

3. Using the half-reaction method, balance the following redox reaction under acidic conditions. (4 pts)



Half-Reactions:

