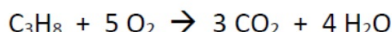
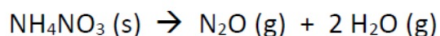


Day 3.3 Warm-Up

1. 26 g of propane, C_3H_8 reacts with excess O_2 to produce CO_2 and H_2O according to the balanced equation below. Calculate the volume of CO_2 produced at $25^\circ C$ and 1.3 atm.



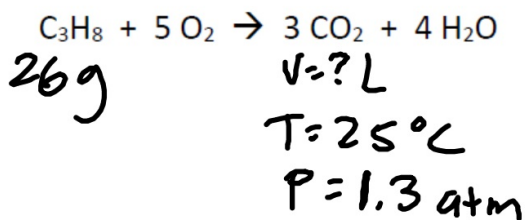
2. A balloon of helium gas occupies a volume of 2.5 L at a temperature of $30^\circ C$. Calculate the temperature at which the balloon will occupy a volume of 4.6 L at constant pressure.



3. A 0.03 mol sample of $NH_4NO_3(s)$ is placed in a 1 L evacuated flask, which is then sealed and heated. The $NH_4NO_3(s)$ decomposes completely according to the balanced equation above. Calculate the total pressure in the flask measured at 400 K.

Day 3.3 Warm-Up

1. 26 g of propane, C_3H_8 reacts with excess O_2 to produce CO_2 and H_2O according to the balanced equation below. Calculate the volume of CO_2 produced at $25^\circ C$ and 1.3 atm.



$$\frac{26 \text{ g } C_3H_8}{44.11 \text{ g } C_3H_8} \times \frac{1 \text{ mol } C_3H_8}{1 \text{ mol } C_3H_8} \times \frac{3 \text{ mol } CO_2}{1 \text{ mol } C_3H_8} = 1.8 \text{ mol } CO_2$$

$$PV = nRT$$
$$(1.3 \text{ atm}) V = (1.8 \text{ mol}) \left(0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}} \right) (298 \text{ K})$$
$$V = 33 \text{ L}$$

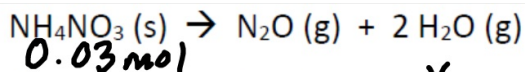
2. A balloon of helium gas occupies a volume of 2.5 L at a temperature of 30°C. Calculate the temperature at which the balloon will occupy a volume of 4.6 L at constant pressure.

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

$$\frac{2.5 \text{ L}}{303 \text{ K}} = \frac{4.6 \text{ L}}{T_2}$$

$$T_2 = 557 \text{ K}$$

$$T_2 = 560 \text{ K} = 287^\circ \text{C}$$



3. A 0.03 mol sample of $\text{NH}_4\text{NO}_3(\text{s})$ is placed in a 1 L evacuated flask, which is then sealed and heated. The $\text{NH}_4\text{NO}_3(\text{s})$ decomposes completely according to the balanced equation above. Calculate the total pressure in the flask measured at 400 K.

T

$$\frac{0.03 \text{ mol NH}_4\text{NO}_3 / 1 \text{ mol N}_2\text{O}}{1 \text{ mol NH}_4\text{NO}_3} = 0.03 \text{ mol N}_2\text{O}$$

$$PV = nRT$$

$$P_{\text{N}_2\text{O}} (1 \text{ L}) = (0.03 \text{ mol}) \left(0.0821 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}} \right) (400 \text{ K})$$

$$P_{\text{N}_2\text{O}} = 0.9852 \text{ atm}$$

$$\frac{0.03 \text{ mol NH}_4\text{NO}_3 / 2 \text{ mol H}_2\text{O}}{1 \text{ mol NH}_4\text{NO}_3} = 0.06 \text{ mol H}_2\text{O}$$

$$P_{\text{H}_2\text{O}}(1\text{L}) = 0.06 \text{ mol H}_2\text{O} \left(0.0821 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}} \right) (400\text{K})$$
$$P_{\text{H}_2\text{O}} = 1.9704 \text{ atm}$$

$$\therefore P_T = P_{\text{N}_2\text{O}} + P_{\text{H}_2\text{O}} = 0.9852 \text{ atm} + 1.9704 \text{ atm}$$

$$P_T = 3 \text{ atm}$$

$$n_T = n_{\text{N}_2\text{O}} + n_{\text{H}_2\text{O}} = 0.03 \text{ mol} + 0.06 \text{ mol}$$

$$n_T = 0.09 \text{ mol}$$

$$P_T(1\text{L}) = (0.09 \text{ mol}) \left(0.0821 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}} \right) (400\text{K})$$

$$P_T = 3 \text{ atm}$$