Gas Stoichiometry Worksheet

The following reactions take place at a pressure of 1.0 atm and a temperature of 298 K.

1) Given:

$$CaCO_{3(s)} \rightarrow CO_{2(g)} + CaO_{(s)}$$

How many grams of calcium carbonate will be needed to form 4.29 liters of carbon dioxide?

2) Given:

$$2\ C_6H_{6(g)} + 15\ O_{2(g)} \rightarrow 12\ CO_{2(g)} + 6\ H_2O_{(g)}$$

If 2.45 liters of benzene are consumed in this reaction, how many liters of water can be formed?

Solutions

The following reactions take place at a pressure of 1.00 atm and a temperature of 300 K.

1) Given:

$$CaCO_{3(s)} + \text{heat} \rightarrow CO_{2(g)} + CaO_{(s)}$$

How many grams of calcium carbonate will be needed to form 4.29 liters of carbon dioxide?

$$n = \frac{PV}{RT} = \frac{(1.00 \text{ atm})(4.29 \text{ L } CO_2)}{(0.0821 \text{ L atm/mole K})(300 \text{ K})} = 0.1742 \text{ moles } CO_2$$

$$0.1742 \text{ mole } CO_2 \times \frac{1 \text{ mole } CaCO_3}{1 \text{ mole } CO_2} \times \frac{100.09 \text{ g } CaCO_3}{1 \text{ mole } CaCO_3} = 17.4 \text{ g } CaCO_3$$

2) Given:

$$2\ C_6H_{6(g)} + 15\ O_{2(g)} \rightarrow 12\ CO_{2(g)} + 6\ H_2O_{(g)}$$

If 2.45 liters of benzene are consumed in this reaction, how many liters of water can be formed?

$$n = \frac{PV}{RT} = \frac{(1.00 \text{ atm})(2.45 \text{ L } C_6H_6)}{(0.0821 \text{ L atm/mole K})(300 \text{ K})} = 0.0995 \text{ moles } C_6H_6$$

$$0.0995 \text{ mole } C_6H_6 \times \frac{2 \text{ mole } H_2O}{2 \text{ mole } C_6H_6} = 0.0995 \text{ mole } H_2O$$

$$V = \frac{nRT}{P} = \frac{(0.0995 \text{ mole } H_2O)(0.0821 \text{ L atm/mole K})(300 \text{ K})}{(1 \text{ atm})} = 2.45 \text{ L } H_2O$$