Chapter 3 − Problems 66

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66. Chlorine and Fluorine react to form gaseous chlorine trifluoride. Initially, 1.75[mol] of chlorine and 3.68[mol] of fluorine are combined. (Assume 100% yield for the reaction). (a) Write a balanced equation for the reaction. (b) What is the limiting reactant? (c) What is the theoretical yield of chlorine trifluoride moles? (d) How many moles of excess reactant remain after the reaction is complete?

(a) $Cl_2 + 3\,F_2 \longrightarrow 2\,ClF_3$

(b) $3.68 \cdot \frac{1}{3} = 1.23[\text{mol}_{F_2}] \rightarrow 1.23 < 1.75 \rightarrow \therefore$ Fluorine is the limiting reactant

(c) $2 \cdot 1.23 = 2.46[\text{mol}_{ClF_3}]$

(d) $1.75 - 1.23 = .52[\text{mol}_{Cl_2}]$