

Determine the limiting reagent in a reaction where 20 grams of Fe_2O_3 is in contact with 8 grams of Al . Please be sure to balance the equation.



Solution: Step 1. Balance the chemical equation.



Step 2. calculate the number of moles of each reactant:

$$n_{Fe_2O_3} = \frac{m \text{ of } Fe_2O_3}{M_m \text{ of } Fe_2O_3} = \frac{20 \text{ gm}}{\left(159.6 \frac{\text{gm}}{\text{mol}}\right)} = 0.125 \text{ moles}$$

$$n_{Al} = \frac{m \text{ of } Al}{M_m \text{ of } Al} = \frac{8 \text{ gm}}{\left(27 \frac{\text{gm}}{\text{mol}}\right)} = 0.296 \text{ moles}$$

Determine the limiting reagent.

Step 3. Compare the stoichiometric value. One Way to do this is to ask whether the actual ratio of Al:Fe₂O₃ is greater than the stoichiometric ratio of 2. If it is greater than this means that there is excess Al and Fe₂O₃ is limiting. The ratio is:

$$\text{Ratio} = \frac{n_{Al}}{n_{Fe_2O_3}} = \frac{0.296}{0.125} = 2.368$$

We conclude that Fe₂O₃ is limiting.