$$2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$$

5.000 g ? g

$$g\,H_2 \rightarrow mol\,H_2 \rightarrow mol\,O_2 \rightarrow g\,O_2$$

$$\frac{5.000\ g\ H_2}{1}\left(\frac{1\ mol\ H_2}{2.016\ g\ H_2}\right)\left(\frac{1\ mol\ O_2}{2\ mol\ H_2}\right)\left(\frac{32.00\ g\ O_2}{1\ mol\ O_2}\right)$$

$$= 39.68\ g\ O_2$$

Nitrogen combines with hydrogen to form ammonia. What mass of ammonia can be formed by a mixture containing 3.106 g of nitrogen and 2.554 g of hydrogen?

nitrogen + hydrogen → ammonia

LIMITING EXCESS

$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

3.106 g 2.554 g ? g

$g\ N_2 \rightarrow mol\ N_2 \rightarrow mol\ NH_3 \rightarrow g\ NH_3$

$$\frac{3.106\ g\ N_2}{1}\left(\frac{1\ mol\ N_2}{28.02\ g\ N_2}\right)\left(\frac{2\ mol\ NH_3}{1\ mol\ N_2}\right)\left(\frac{17.034\ g\ NH_3}{1\ mol\ NH_3}\right)$$

$= 3.776\ g\ NH_3$ ✓

$g\ H_2 \rightarrow mol\ H_2 \rightarrow mol\ NH_3 \rightarrow g\ NH_3$

$$\frac{2.554\ g\ H_2}{1}\left(\frac{1\ mol\ H_2}{2.016\ g\ H_2}\right)\left(\frac{2\ mol\ NH_3}{3\ mol\ H_2}\right)\left(\frac{17.034\ g\ NH_3}{1\ mol\ NH_3}\right)$$

$= 14.39\ g\ NH_3$ ✗

$$
\begin{array}{r}
14.01 \\
+\ 3.024 \\
\hline
17.034
\end{array}
$$

$$
\begin{array}{r}
1.008 \\
\times\ 3 \\
\hline
3.024
\end{array}
$$

What mass of H_2 will be left over at the end of the reaction, assuming 100% yield?

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$$

3.106 g 2.554 g

→ 3.776 g

5.660 g TOTAL SYSTEM MASS

− 3.776 g MASS OF PRODUCT FORMED

1.884 g MASS OF EXCESS REACTANT LEFT OVER

	N_2	H_2	NH_3
BEGINNING	3.106 g	2.554 g	0.000 g
END	0,000 g	1.884 g	3.776 g

$$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$$

3.106 g ? g

$$g\,N_2 \rightarrow mol\,N_2 \rightarrow mol\,H_2 \rightarrow g\,H_2$$

$$\frac{3.106\ g\ N_2}{1}\left(\frac{1\ mol\ N_2}{28.02\ g\ N_2}\right)\left(\frac{3\ mol\ H_2}{1\ mol\ N_2}\right)\left(\frac{2.016\ g\ H_2}{1\ mol\ H_2}\right)$$

$$= 0.670\ g\ H_2 \text{ (used)}$$

$$2.554\ g\ H_2 \text{ (available)}$$

$$-\ 0.670\ g\ H_2 \text{ (used)}$$

$$1.884\ g\ H_2 \text{ (remaining)}$$