Quiz 6.2 – Limiting Reactants and Percent Yield

Name: Key

Question 1

2.50 *g* of H_2 and 18.2 *g* of O_2 react according to the equation: $2\,H_2(g) + O_2(g) \longrightarrow 2\,H_2O(g)$

2.50 / 18.2 / 0 → 20.7
0.21 / 0 / 20.5 → 20.7

- Which reactant is the *limiting reactant*

$2.50\,g\ H_2 \left|\frac{1\ mol}{2.016\,g}\right|\frac{2\ H_2O}{2\ H_2}\left|\frac{18.015\,g}{1\ mol}\right| = 22.34\,g\ H_2O$

$18.2\,g\ O_2 \left|\frac{1\ mol}{31.999\,g}\right|\frac{2\ H_2O}{1\ O_2}\left|\frac{18.015\,g}{1\ mol}\right| = 20.5\,g\ H_2O$

O_2 is Limiting

- How many *g* of water are produced?

20.5 g

- How many *g* of the excess reactant remain?

$18.2\,g\ O_2 \left|\frac{1\ mol}{31.999\,g}\right|\frac{2\ H_2}{1\ O_2}\left|\frac{2.016\,g}{1\ mol}\right| = 2.29\,g$ $\quad 2.50\,g - 2.29\,g = 0.21\,g$

- If 15.0 *g* of water are actually recovered, what is the % yield?

$\frac{15.0\,g}{20.5\,g} \cdot 100\% = 73.2\%$

Question 2

5.00 *g* of CH_4 and 20.0 *g* of O_2 react according to the equation: $CH_4(g) + 2\,O_2(g) \longrightarrow CO_2(g) + 2\,H_2O(g)$

5.00 / 20.0 / 0 / 0 → 25
0 / 0.05 / 13.72 / 11.23 → 25

- Which reactant is the *limiting reactant*

$5.00\,g\ CH_4 \left|\frac{1\ mol}{16.04\,g}\right|\frac{1\ CO_2}{1\ CH_4}\left|\frac{44.01\,g}{1\ mol}\right| = 13.72\,g\ CO_2$

$20.0\,g\ O_2 \left|\frac{1\ mol}{31.999\,g}\right|\frac{1\ CO_2}{2\ O_2}\left|\frac{44.01\,g}{1\ mol}\right| = 13.75\,g$

CH_4 is Limiting

- How many *g* of water and carbon dioxide are produced?

13.72 g CO_2

$5.00\,g\ CH_4 \left|\frac{1\ mol}{16.04\,g}\right|\frac{2\ H_2O}{1\ CH_4}\left|\frac{18.015\,g}{1\ mol}\right| = 11.23\,g\ H_2O$

- How many *g* of the excess reactant remain?

$5.00\,g\ CH_4 \left|\frac{1\ mol}{16.04\,g}\right|\frac{2\ O_2}{1\ CH_4}\left|\frac{31.999\,g}{1\ mol}\right| = 19.95\,g\ O_2$ $\quad 20.0 - 19.95 = 0.05\,g\ O_2$

- If 10.5 *g* of water are actually recovered, what is the % yield?

$\frac{10.5\,g}{11.23\,g} \cdot 100\% = 93.5\%$