W-6C General Chemistry Week 19 1/31

How many molecules of P_2O_5 would be produced from 90 g of P and 110 g of O_2

$$4\,P + 5\,O_2 \rightarrow 2\,P_2O_5$$

Given → Molar mass reactant → molar ratio → molecules

$$90\,g\,P * \frac{1\,mol\,P}{30.974\,g} * \frac{2\,mol\,P_2O_5}{4\,mol\,P} * \frac{6.022*10^{23}\,molecules}{1\,mol\,P_2O_5}$$

$$= 8.75*10^{23}\,molecules$$

$$110\,g\,O_2 * \frac{1\,mol\,O_2}{31.998\,g} * \frac{2\,mol\,P_2O_5}{5\,mol\,O_2} * \frac{6.022*10^{23}}{1\,mol\,P_2O_5}$$

$$= 8.28*10^{23}\,molecules$$

limiting reagent

8.3*10^23

How many molecules CO_2?

120g C_8H_{18}

210g O_2 → limiting reagent

$$2\,C_8H_{18} + 25\,O_2 \longrightarrow 16\,CO_2 + 18\,H_2O$$

Given * Molar Mass reactant * Molar Ratio * [molar mass / molar volume / molar / Avogadro's]

$$120g\,C_8H_{18} * \frac{1\,mol\,C_8H_{18}}{114.232\,g} * \frac{16\,mol\,CO_2}{2\,mol\,C_8H_{18}} * \frac{6.022*10^{23}\,molecules}{1\,mol\,CO_2}$$

$5.06*10^{24}$ molecules CO_2

$8*12.011 = 96.088$

$18*1.008 = 18.144$

114.232

Given * Molar Mass reactant * Molar Ratio * [ ]

$$210g\,O_2 * \frac{1\,mol\,O_2}{31.998g\,O_2} * \frac{16\,mol\,CO_2}{25\,mol\,O_2} * \frac{6.022*10^{23}\,molecules}{1\,mol\,CO_2}$$

$2.53*10^{24}$ molecules

To find the amount of the excess reagent:

$$210\,g\,O_2 * \frac{1\,mol\,O_2}{31.998\,g\,O_2} * \frac{2\,mol\,C_8H_{18}}{25\,mol\,O_2} * \frac{114.232\,g\,C_8H_{18}}{1\,mol\,C_8H_{18}}$$

O_2 ↑ limiting reagent

$$59.98\,g\,C_8H_{18}$$

original C_8H_{18}

$120 - 59.98 =$ **60.02 g C_8H_{18} left**

What mass of H_2O is produced

① when 60g of H_2 is reacted with 250g O_2? | 282g H_2O |

$$2H_2 + O_2 \rightarrow 2H_2O$$

② Find limiting reagent | 250g O_2 |

③ Find the mass of the excess reagent. | 28g H_2 |

① Given * molar mass reactant * molar ratio * molar mass product

$$60g\ H_2 * \frac{1\ mol\ H_2}{2.016g\ H_2} * \frac{2\ mol\ H_2O}{2\ mol\ H_2} * \frac{18.015g}{1\ mol\ H_2O}$$

used 32g of H_2 60 − 32 = 28g H_2 in excess

= 536g

$$250g\ O_2 * \frac{1\ mol\ O_2}{31.998g\ O_2} * \frac{2\ mol\ H_2O}{1\ mol\ O_2} * \frac{18.015g}{1\ mol\ H_2O}$$

limiting reagent

= 282g H_2O