TH-GC General Chemistry Week 17 1/26

Methane breaks down into carbon and hydrogen gas.

How many grams of hydrogen is produced by the complete decomposition of 150. g of methane (CH_4)?

$$1\ CH_4 \longrightarrow C + 2\ H_2$$

ratio stoichiometric

150g CH_4

$$150.\ g\ CH_4 * \frac{1\ mol\ CH_4}{16.043\ g\ CH_4} * \frac{2\ mol\ H_2}{1\ mol\ CH_4} * \frac{2.016\ g\ H_2}{1\ mol\ H_2}$$

molar mass of CH_4

1 C = 1 * 12.011 g/mol = 12.011

4 H = 4 * 1.0085 g/mol + 4.032

16.043 g/mol

molar mass CH_4

37.6 g H_2

molar mass of H_2

2 H = 2 * 1.008 = 2.016 g/mol

How many atoms of carbon? 150g CH_4

$$CH_4 \longrightarrow C + 2H_2$$

$$150.\ g\ CH_4 * \frac{1\ mol\ CH_4}{16.043\ g\ CH_4} * \frac{1\ mol\ C}{1\ mol\ CH_4} * \frac{6.022 * 10^{23}\ atoms}{1\ mol\ C}$$

$56.3 * 10^{23}$ atom

$5.63 * 10^{24}$ atoms

How many liters of H_2 gas is produced

molar volume → 22.4 L/mol

$$CH_4 \longrightarrow C + \boxed{2H_2}$$

150 g CH_4

$$150\text{ g } CH_4 * \frac{1\text{ mol } CH_4}{16.043\text{ g } CH_4} * \frac{2\text{ mol } H_2}{1\text{ mol } CH_4} * \frac{22.4\text{ L}}{1\text{ mol } H_2}$$

amount · ratio · question

419 L H_2

86 g of Al_2O_3 decomposed into how many grams of Al?

$$2Al_2O_3 \longrightarrow 4Al + 3O_2$$

$$86\text{ g } Al_2O_3 * \frac{1\text{ mol } Al_2O_3}{101.961\text{ g } Al_2O_3} * \frac{4\text{ mol Al}}{2\text{ mol } Al_2O_3} * \frac{26.982\text{ g Al}}{1\text{ mol Al}}$$

amount Al_2O_3 · molar ratio

45.5 g Al

Al: 2 * 26.982 = 53.964

O: 3 * 15.999 = 47.997

101.961