Stoichiometry Practice

Liters to Grams : $4FeS_{2(s)} + 11O_{2(g)} \rightarrow 2Fe_2O_{3(s)} + 8SO_{2(g)}$

9. If 5 L of oxygen completely reacted how many grams of Fe_2O_3 would theoretically be made?

$\frac{5\ L\ O_2}{22.4\ L/mol} = 0.2232\ mol\ O_2 \times \frac{2\ mol\ Fe_2O_3}{11\ mol\ O_2} = 0.0406\ mol\ Fe_2O_3 \times 159.7\ \frac{g}{mol} = \boxed{6.48\ g\ Fe_2O_3}$

10. 230 L of toxic SO_2 gas was recovered during a reaction, how many grams of FeS_2 did it take to produce it?

$\frac{230\ L\ SO_2}{22.4\ L/mol} = 10.27\ mol\ SO_2 \times \frac{4\ mol\ FeS_2}{8\ mol\ SO_2} = 5.134\ mol\ FeS_2 \times 119.97\ \frac{g\ FeS_2}{mol} = \boxed{616\ g\ FeS_2}$

Moles to Grams : $2Al_{(s)} + 3FeO_{(s)} \rightarrow Al_2O_{3(s)} + 3Fe_{(s)}$

11. If 3.000 moles of Al reacted how many grams of Fe would we theoretically expect to be produced?

$3.000\ mol\ Al \times \frac{3\ mol\ Fe}{2\ mol\ Al} = 4.5\ mol\ Fe \times 55.85\ \frac{g}{mol} = \boxed{251\ g\ Fe}$

12. If 5.0 moles of Al_2O_3 were recovered, how many grams of FeO did we start with?

$5.0\ mol\ Al_2O_3 \times \frac{3\ mol\ FeO}{1\ mol\ Al_2O_3} = 15.0\ mol\ FeO \times 71.85\ \frac{g}{mol} = \boxed{1078\ g\ FeO}$

Molecules to Liters : $2NaI + Br_2 \rightarrow 2NaBr + I_2$

13. I need 3.47 x10^{24} molecules of NaBr, how many liters of Bromine should I put into the reaction?

$\frac{3.47\ E24\ molecules\ NaBr}{6.02E23\ \frac{molecules}{mol}} = 5.764\ mol\ NaBr \times \frac{1\ mol\ Br_2}{2\ mol\ NaBr} = 2.882\ mol\ Br_2 \times \frac{22.4\ L/mol}{159.8\ g/mol} = \boxed{64.6\ L\ Br_2}$

14. If 12.34 x 10^{30} molecules of NaI react, what volume container should we use to capture all of the Iodine produced?

$\frac{12.34\ E30\ molecules\ NaI}{6.02E23\ \frac{molecules}{mol}} = 2.050E7\ mol\ NaI \times \frac{1\ mol\ I_2}{2\ mol\ NaI} = 1.025E7\ mol\ I_2 \times 22.4\ \frac{L}{mol} =$

$\boxed{2.30E8\ L\ I_2}$

Stoichiometry Practice

Grams to moles:

1. Convert 10.0 grams of H_2 to moles of H_2

$$\frac{10\ g\ H_2}{2.016\ g/mol} = 4.96\ mol\ H_2$$

2. How many moles are in 21 grams H_2SO_4

$$\frac{21\ g\ H_2SO_4}{98.076\ g/mol} = 0.214\ mol\ H_2SO_4$$

Grams to molecules:

3. A Balloon with 5 grams of CO_2 has how many molecules?

$$\frac{5\ g\ CO_2}{44.01\ g/mol} = 0.1136\ mol\ CO_2 \times 6.02E23\ \frac{molecules}{mol} = 6.84E22\ molecules\ CO_2$$

4. You exhale $3.7x10^{-2}$ g of CO_2 with each breath, how many molecules is that?

$$\frac{3.7E-2\ g\ CO_2}{44.01\ g/mol} = 8.407E-4\ mol\ CO_2 \times \frac{6.02E23\ molecules}{mol} = 5.06E20\ molecules\ CO_2$$

Grams to atoms:

5. You exhale $3.7x10^{-2}$ g of CO_2 with each breath, How many atoms of C is that?

$$\frac{3.7E-2\ g\ CO_2}{44.01\ g/mol} = 8.407E-4\ mol\ CO_2 \times \frac{6.02E23\ molecules}{mol} = 5.06E20\ molecules\ CO_2 \times \frac{1\ atom\ C}{1\ molecule\ CO_2} = 5.06E20\ atom\ C$$

6. How many atoms of O are in 20.00 g of Sulfuric acid (H_2SO_4)?

$$\frac{20.00\ g\ H_2SO_4}{98.076\ g/mol} = 0.2039\ mol\ H_2SO_4 \times \frac{6.02E23\ molecules}{mol} = 1.228E23\ molecules\ H_2SO_4 \times \frac{4\ atom\ O}{1\ molecule\ H_2SO_4} = 4.91E23\ atom\ O$$

Grams to Grams: $4FeS_{2(s)} + 11O_{2(g)} \rightarrow 2Fe_2O_{3(s)} + 8SO_{2(g)}$

7. Using the equation above, how many grams of Fe_2O_3 would be produced from 754 g of FeS_2 reacting completely?

$$\frac{754\ g\ FeS_2}{119.97\ g/mol} = 6.285\ mol\ FeS_2 \times \frac{2\ mol\ Fe_2O_3}{4\ mol\ FeS_2} = 3.142\ mol\ Fe_2O_3 \times \frac{159.7\ g}{mol} = 502\ g\ Fe_2O_3$$

8. How many grams of Oxygen would be needed to completely react with 850 g FeS_2 according the above equation?

$$\frac{850\ g\ FeS_2}{119.97\ g/mol} = 7.085\ mol\ FeS_2 \times \frac{11\ mol\ O_2}{4\ mol\ FeS_2} = 19.48\ mol\ O_2 \times \frac{32.00\ g}{mol} = 623\ g\ O_2$$