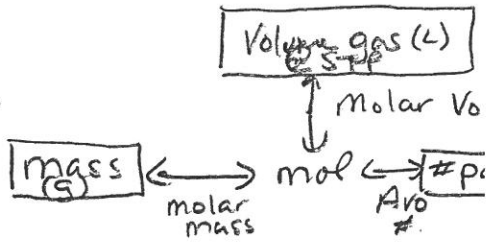
* Don't forget to convert to moles before you use mole ratio.



Stoichiometry Practice KEY

mole ratio

Show all work in your notebook, including dimensional analysis and units!

1. 4 Fe + 3 O_2 → 2 Fe_2O_3 (4 mol, 3 mol, 2 mol)

a) How many moles of iron would be needed to react with 3.82 moles of oxygen?

$$3.82\ mol\ O_2 \times \frac{4\ mol\ Fe}{3\ mol\ O_2} = 5.09\ mol\ Fe$$

mole ratio

b) How many ~~molecules~~ f.u. of iron (III) oxide can be produced from 13.5 moles Fe?

13.5 mol ? # f.u.

$$4\ Fe + 3O_2 \rightarrow 2\ Fe_2O_3$$

$$13.5\ mol\ Fe \times \frac{2\ mol\ Fe_2O_3}{4\ mol\ Fe} \times \frac{6.02\times10^{23}\ f.u.\ Fe_2O_3}{1\ mol\ Fe_2O_3} = 4.06\times10^{24}\ f.u.\ Fe_2O_3$$

mole ratio; Avo's #

c) How many moles of O_2 are needed to produce 34.7 g of Fe_2O_3?

? mol 34.7 g

$$4Fe + 3O_2 \rightarrow 2\ Fe_2O_3$$

$$34.7\ g\ Fe_2O_3 \times \frac{1\ mol\ Fe_2O_3}{159.7\ g\ Fe_2O_3} \times \frac{3\ mol\ O_2}{2\ mol\ Fe_2O_3} = 0.326\ mol\ O_2$$

molar mass; mole ratio

2. 2 C_4H_{10} + 13 O_2 ---> 8 CO_2 + 10 H_2O

a) When 0.624 moles of O_2 are reacted, how many moles of carbon dioxide are produced?

0.624 mol ? mol

$$2\ C_4H_{10} + 13\ O_2 \rightarrow 8\ CO_2 + 10\ H_2O$$

$$0.624\ mol\ O_2 \times \frac{8\ mol\ CO_2}{13\ mol\ O_2} = 0.384\ mol\ CO_2$$

b) How many grams of C_4H_{10} are needed to produce 3.7 moles of water?

? g 3.7 mol

$$2\ C_4H_{10} + 13\ O_2 \rightarrow 8\ CO_2 + 10\ H_2O$$

$$3.7\ mol\ H_2O \times \frac{2\ mol\ C_4H_{10}}{10\ mol\ H_2O} \times \frac{58.1\ g\ C_4H_{10}}{1\ mol\ C_4H_{10}} = 43\ g\ C_4H_{10}$$

c) What volume of O_2 gas is needed to react with 2.56 g of C_4H_{10}? AT STP

2.56 g ? L

$$2\ C_4H_{10} + 13\ O_2 \rightarrow 8\ CO_2 + 10\ H_2O$$

$$2.56\ g\ C_4H_{10} \times \frac{1\ mol\ C_4H_{10}}{58.1\ g\ C_4H_{10}} \times \frac{13\ mol\ O_2}{2\ mol\ C_4H_{10}} \times \frac{22.4\ L\ O_2}{1\ mol\ O_2} = 6.42\ L\ O_2$$

3. $\underline{2}\ KClO_3 \rightarrow \underline{2}\ KCl + \underline{3}\ O_2$

a) When 62.0 g of potassium chlorate are reacted, how many moles of KCl will be formed?

62.0 g → ? mol

$2\ KClO_3 \longrightarrow 2\ KCl + 3\ O_2$

$62.0\text{ g } KClO_3 \times \frac{1\text{ mol } KClO_3}{122.5\text{ g } KClO_3} \times \frac{2\text{ mol } KCl}{2\text{ mol } KClO_3} = \boxed{0.506\text{ mol } KCl}$

b) How many molecules of O_2 are produced from 2.85 g of $KClO_3$?

2.85 g → ? molecules

$2\ KClO_3 \longrightarrow 2\ KCl + 3\ O_2$

$2.85\text{ g } KClO_3 \times \frac{1\text{ mol } KClO_3}{122.5\text{ g } KClO_3} \times \frac{3\text{ mol } O_2}{2\text{ mol } KClO_3} \times \frac{6.02\times10^{23}\text{ molecules } O_2}{1\text{ mol } O_2} = \boxed{2.10\times10^{22}\text{ molecules } O_2}$

c) 3.54 g of oxygen was produced. How many grams of potassium chlorate were used?

? g → 3.54 g

$2\ KClO_3 \longrightarrow 2\ KCl + 3O_2$

$3.54\text{ g } O_2 \times \frac{1\text{ mol } O_2}{32.0\text{ g } O_2} \times \frac{2\text{ mol } KClO_3}{3\text{ mol } O_2} \times \frac{122.5\text{ g } KClO_3}{1\text{ mol } KClO_3} = \boxed{9.03\text{ g } KClO_3}$

2.10×10^{22} molecules O_2

4. $\underline{4}\ NH_3 + \underline{7}\ O_2 \dashrightarrow \underline{4}\ NO_2 + \underline{6}\ H_2O$

a) What mass of NO_2 can be produced from 8.46×10^{22} molecules of oxygen?

8.46×10^{22} molecules → ? g

$4\ NH_3 + 7\ O_2 \longrightarrow 4\ NO_2 + 6\ H_2O$

$8.46\times10^{22}\text{ molecules } O_2 \times \frac{1\text{ mol } O_2}{6.02\times10^{23}\text{ molecules } O_2} \times \frac{4\text{ mol } NO_2}{7\text{ mol } O_2} \times \frac{46.0\text{ g } NO_2}{1\text{ mol } NO_2} = \boxed{3.69\text{ g } NO_2}$

b) 23.7 g of NH_3 would be able to produce how many moles of H_2O?

23.7 g → ? mol

$4\ NH_3 + 7\ O_2 \longrightarrow 4\ NO_2 + 6\ H_2O$

$23.7\text{ g } NH_3 \times \frac{1\text{ mol } NH_3}{17.0\text{ g } NH_3} \times \frac{6\text{ mol } H_2O}{4\text{ mol } NH_3} = \boxed{2.09\text{ mol } H_2O}$

c) How many grams of O_2 are needed to produce 1.26×10^{28} molecules of H_2O?

? g → 1.26×10^{28} molecules

$4\ NH_3 + 7\ O_2 \longrightarrow 4\ NO_2 + 6\ H_2O$

$1.26\times10^{28}\text{ molecules } H_2O \times \frac{1\text{ mol } H_2O}{6.02\times10^{23}\text{ molecules } H_2O} \times \frac{7\text{ mol } O_2}{6\text{ mol } H_2O} \times \frac{32.0\text{ g } O_2}{1\text{ mol } O_2} = \boxed{7.81\times10^{5}\text{ g } O_2}$

d) How many moles of NH_3 are needed to react completely with 22.05 L of oxygen? at STP

? moles → 22.05 L

$4\ NH_3 + 7\ O_2 \longrightarrow 4\ NO_2 + 6\ H_2O$

$22.05\text{ L } O_2 \times \frac{1\text{ mol } O_2}{22.4\text{ L } O_2} \times \frac{4\text{ mol } NH_3}{7\text{ mol } O_2} = \boxed{0.5625\text{ mole } NH_3}$