

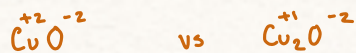
Formula

Ionic

metal + non metal

NaCl

Sodium chloride



copper (II) oxide vs copper (I) oxide

w/ polyatomic ion

$CaCO_3$

calcium carbonate

Covalent

*prefix system

2 non-metals

↳ binary (2 elements)

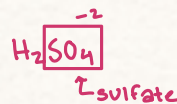
CO_2 - carbon dioxide

H_2O - dihydrogen monoxide

Acids → H _____

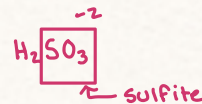
Oxy acids

H polyatomic ion



Sulfuric acid

vs



sulfurous acid

binary acids H _____
non-metal

hydro _____ ic acid

HCl - hydrochloric acid

HF - hydrofluoric acid

one gas: $PV = nRT$

before/after: $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

direct relation: $\frac{V_1}{T_1} = \frac{V_2}{T_2}$, $\frac{P_1}{T_1} = \frac{P_2}{T_2}$
(↑↑ or ↓↓)
 $\frac{V_1}{n_1} = \frac{V_2}{n_2}$, $\frac{P_1}{T_1} = \frac{P_2}{T_2}$

indirect relation $P_1 V_1 = P_2 V_2$
(↑↓ or ↓↑)

% error = $\frac{\text{actual value} - \text{collected value}}{\text{actual value}} \times 100$

$P_T = \sum P_1, P_2, P_3 \dots$

$\chi_i = \frac{n_i}{n_2} = \frac{P_i}{P_2}$

$$n = \frac{m}{M} \quad m = n(M) \quad M = \frac{m}{n}$$

$$\# \text{ of particles} = n \times \frac{6.02 \times 10^{23}}{1.00 \text{ mol}}$$

$$P_g > P_{atm}: P_g = P_{atm} + P_a$$

$$P_g < P_{atm}: P_g = P_{atm} - P_a$$

$$P_g = P_{atm}: P_g = P_{atm}$$

$$\Delta h \text{ (mm)} = P_a \text{ mm Hg}$$

$$1.00 \text{ atm} = 760 \text{ mm Hg} = 760 \text{ torr}$$

$$= 101.3 \text{ kPa} = 14.7 \text{ psi} = 1.01 \text{ bar}$$

$$1 \text{ mg} \div 1000 = 0.001 \text{ g}$$

$$1 \text{ mL} \div 1000 = 0.001 \text{ L}$$

$$1 \text{ mm} \div 10 = 0.1 \text{ cm}$$

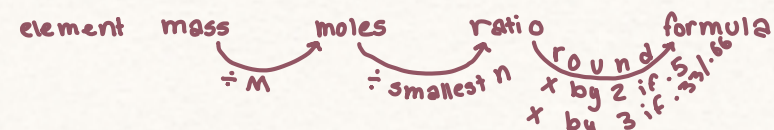
molar volume = L/mol

molar mass = g/mol

density (D) = g/L

$$\text{molar volume} = \frac{M}{D} = \frac{g}{\text{mol}} \times \frac{L}{g} = \frac{L}{\text{mol}}$$

empirical formula: DO NOT ROUND UNTIL RATIO



molecular formula = EM x ? → MM

EF x ? → MF
(multiply subscripts)

% composition = $\frac{\text{mass element}}{\text{mass molecule}} \times 100$

how many H atoms in 125g CH_3Cl ?

$$\hookrightarrow M = 12.01 + 3(1.01) + 35.45 = 50.49 \text{ g/mol}$$

mass $\rightarrow n_T \rightarrow n_H \rightarrow \# \text{ H atoms}$

$$125 \text{ g} \times \frac{1 \text{ mol } T}{50.49 \text{ g}} \times \frac{3 \text{ mol } H}{1 \text{ mol } T} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol } H}$$

$$= 4.47 \times 10^{24} \text{ H atoms}$$

6.



$$\Delta h = 199.8 - 136.5$$

$$P_L = 63.3 \text{ mm Hg} \times \frac{101.3 \text{ kPa}}{760 \text{ mmHg}} = 8.44 \text{ kPa}$$

$$P_{atm} = 17.4 \text{ psi} \times \frac{101.3 \text{ kPa}}{14.7 \text{ psi}} = 120 \text{ kPa}$$

$$P_g > P_{atm}$$

$$P_g = P_{atm} + P_L$$

$$= 120 + 8.44$$

$$= 128 \text{ kPa}$$

how many atoms are in a drop of mercury that has a diameter of 1.0 mm? (volume of a sphere is $\frac{4}{3}\pi r^3$; density of mercury = 13.6 g/cm^3)

$$M = 200.59 \text{ g/mol}$$

$$D = 13.6 \text{ g/cm}^3 = 136 \text{ g/mm}^3$$

$$V = \frac{4}{3}\pi r^3 = 0.524 \text{ mm}^3$$

$$m = 71.2 \text{ g}$$

$$n = \frac{m}{M}$$

$$n = \frac{71.2 \text{ g}}{200.59 \text{ g/mol}}$$

$$n = 0.355 \text{ mol Hg}$$

$$\frac{136 \text{ g}}{1 \text{ mm}^3} = \frac{m}{0.524 \text{ mm}^3}$$

$$m = 136(0.524) \text{ g}$$

$$m = 71.2 \text{ g}$$

$$0.355 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}}$$

$$= 2.1 \times 10^{23} \text{ Hg atoms}$$

13.

$$PV = nRT$$

$$n = \frac{PV}{RT}$$

$$n = \frac{m}{M}$$

$$M = \frac{m}{n}$$

In an experiment, 28.6 mL of hydrogen gas was collected over water at a pressure of 762 mm Hg and a temperature of 15 °C. If the vapour pressure of water at 15°C is 13 mm Hg, what mass of hydrogen was obtained?

$$T = 15^\circ\text{C} = 288\text{K}$$

$$V = 0.0286\text{L}$$

$$P_T = 762\text{ torr}$$

$$P_{\text{H}_2\text{O}} = 13\text{ torr}$$

$$P_{\text{H}_2} = P_T - P_{\text{H}_2\text{O}}$$

$$= 762 - 13$$

$$= 749\text{ torr}$$

$$749\text{ torr} \times \frac{1\text{ atm}}{760\text{ torr}}$$

$$= 0.992\text{ atm}$$

$$P_{\text{H}_2} \rightarrow n_{\text{H}_2} \rightarrow \text{mass H}_2$$

$$PV = nRT$$

$$n_{\text{H}_2} = \frac{PV}{RT}$$

$$n_{\text{H}_2} = \frac{(0.992\text{ atm})(0.0286\text{L})}{\left(\frac{0.0821\text{ atm}\cdot\text{L}}{\text{mol}\cdot\text{K}}\right)(288\text{K})}$$

$$n_{\text{H}_2} = 0.0012\text{ mol H}_2$$

$$m = n_{\text{H}_2}(M)$$

$$m = 0.0012(2(1.01))$$

$$m = 0.0024\text{ g}$$

$$m = 2.4\text{ mg}$$

$$m = 2.4 \times 10^{-3}\text{ g}$$

14. $D = 0.601\text{ g/mL}$

$$V = 15\text{ mL}$$

$$\text{mass} = ?$$

$$M = 4(12.01) + 10(1.01)$$

$$= 58.14\text{ g/mol}$$

$$MV = 22.4\text{ L/mol}$$

$$\frac{0.601\text{ g}}{1\text{ mL}} = \frac{m}{15\text{ mL}}$$

$$m = 9.0\text{ g}$$

$$mV = \frac{M}{D}$$

$$= \frac{200.59\text{ g}}{1\text{ mol}} \times \frac{1\text{ mL}}{13.546\text{ g}}$$

$$MV = 14.8\text{ mL/mol}$$

16.

$$D = 19.42\text{ g/cm}^3$$

$$\frac{19.42\text{ g}}{1\text{ cm}^3} = \frac{m}{5.0\text{ cm}^3}$$

$$m = 5.0(19.42\text{ g})$$

$$m = 97.1\text{ g}$$

$$n = \frac{m}{M}$$

$$= \frac{97.1\text{ g}}{196.97\text{ g/mol}}$$

$$n = 0.49\text{ mol Au}$$

17.

$$MV = \frac{M}{D}$$

$$= \frac{159.8\text{ g}}{1\text{ mol}} \times \frac{1\text{ mL}}{3.53\text{ g}}$$

$$= 45.27\text{ mL/mol}$$

$$\frac{45.27\text{ mL}}{1\text{ mol}} = \frac{15.0\text{ mL}}{n}$$

$$\frac{15.0}{45.27} = n$$

$$n = 0.33\text{ mol Br}_2 \times \frac{6.02 \times 10^{23}}{1\text{ mol}}$$

$$= 1.99 \times 10^{23}\text{ molecules Br}_2$$