

KEY

1 mol =  $6.022 \times 10^{23}$  r.p.  
 1 mol = molar mass from PT

### Mole Conversion Practice (two steps)

#### Mass to Particles, Particles to Mass

Answer the following questions with the correct amount of significant figures. Make sure that all problems are set-up using the factor-label method and show all your work and units.

1. How many grams are in  $6.022 \times 10^{24}$  atoms of beryllium?

$$\frac{6.022 \times 10^{24} \text{ atoms Be}}{6.022 \times 10^{23} \text{ atoms Be}} \times \frac{1 \text{ mol Be}}{1 \text{ mol Be}} \times \frac{9.01 \text{ g Be}}{1 \text{ mol Be}} = 90.10 \text{ g Be}$$

2. Calculate the number of grams that are in  $3.01 \times 10^{21}$  f.u.'s of NaCl.

$$\frac{3.01 \times 10^{21} \text{ fu NaCl}}{6.022 \times 10^{23} \text{ fu NaCl}} \times \frac{1 \text{ mol NaCl}}{1 \text{ mol NaCl}} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = 292 \text{ g NaCl}$$

3. How many grams are in  $1.506 \times 10^{24}$  molecules of phosphorus trichloride? ( $\text{PCl}_3$ )  $\begin{matrix} 3(35.45) \\ + 1(30.97) \end{matrix}$

$$\frac{1.506 \times 10^{24} \text{ molecules PCl}_3}{6.022 \times 10^{23} \text{ molecules PCl}_3} \times \frac{1 \text{ mol PCl}_3}{1 \text{ mol PCl}_3} \times \frac{137.32 \text{ g PCl}_3}{1 \text{ mol PCl}_3} = 343.3 \text{ g PCl}_3$$

4. How many atoms are in 54.0 g of aluminum?

$$\frac{54.0 \text{ g Al}}{26.98 \text{ g Al}} \times \frac{1 \text{ mol Al}}{1 \text{ mol Al}} \times \frac{6.022 \times 10^{23} \text{ atoms Al}}{1 \text{ mol Al}} = 1.21 \times 10^{24} \text{ atoms Al}$$

5. How many molecules are in 69.45 g of carbon monoxide? ( $\text{CO}$ )

$$\frac{69.45 \text{ g CO}}{28.01 \text{ g CO}} \times \frac{1 \text{ mol CO}}{1 \text{ mol CO}} \times \frac{6.022 \times 10^{23} \text{ molecules CO}}{1 \text{ mol CO}} = 1.493 \times 10^{24} \text{ molecules CO}$$

6. Calculate the number of formula units in 169.7 g of lithium sulfate?  $\text{Li}^+(\text{SO}_4)^{-2}$   $\text{Li}_2(\text{SO}_4)$

$$\frac{169.7 \text{ g Li}_2(\text{SO}_4)}{109.94 \text{ g Li}_2\text{SO}_4} \times \frac{1 \text{ mol Li}_2\text{SO}_4}{1 \text{ mol Li}_2\text{SO}_4} \times \frac{6.022 \times 10^{23} \text{ fu Li}_2\text{SO}_4}{1 \text{ mol Li}_2\text{SO}_4} = 9.295 \times 10^{23} \text{ fu Li}_2\text{SO}_4$$

$\begin{matrix} 2(6.94) \\ 1(32.06) \\ 4(16.00) \\ \hline 109.94 \end{matrix}$

7. How many grams are in  $1.20 \times 10^{25}$  atoms of helium?

$$\frac{1.20 \times 10^{25} \text{ atoms He}}{6.022 \times 10^{23} \text{ atoms He}} \times \frac{1 \text{ mol He}}{1 \text{ mol He}} \times \frac{4.00 \text{ g He}}{1 \text{ mol He}} = 79.7 \text{ g He}$$