CH30S **Moles, Molecules, and Atoms Conversions** **WS 5**

1. Determine the number of moles of each atom in 4 moles of NH_4OH.

$4\,mol\ NH_4OH \times 1 = 4\,mol\ N$

$\times 5 = 20\,mol\ H$

$\times 1 = 4\,mol\ O$

2. How many moles of each element are in 0.20 moles of $NaNO_3$?

$0.2\,mol\ NaNO_3 \times 1 = 0.2\,mol\ Na$

$\times 2 = 0.2\,mol\ N$

$\times 3 = 0.6\,mol\ O$

3. Calculate the number of moles of each element in 4.6g of nitrogen dioxide.

$4.6g\ NO_2 \times \frac{1\,mol}{46g} = 0.1\,mol\ NO_2 \times 1 = 0.1\,mol\ N$

$\times 2 = 0.2\,mol\ O$

4. Calculate the number of moles of each element in 0.148g of magnesium nitrate.

$0.148g\ Mg(NO_3)_2 \times \frac{1\,mol}{148.3g} = 0.001\,mol\ Mg(NO_3)_2 \times 1 = 0.001\,mol\ Mg$

$\times 2 = 0.002\,mol\ N$

$\times 6 = 0.006\,mol\ O$

5. Calculate the number of moles of each element in 2.64g of carbon dioxide.

$2.64g\ CO_2 \times \frac{1\,mol}{44g} = 0.06\,mol\ CO_2 \times 1 = 0.06\,mol\ C$

$\times 2 = 0.12\,mol\ O$

6. Determine the number of individual atoms of each element in 0.30 moles of N_2O_5.

$0.30\,mol\ N_2O_5 \times \frac{6.02\times10^{23}}{1\,mol} = 1.806\times10^{23}\,molecules \times 2 = 3.612\times10^{23}\,atoms\ N$

$\times 5 = 9.03\times10^{23}\,atoms\ O$

7. Calculate the number of atoms of each element in 9.6g of $(NH_4)_2CO_3$

$9.6g\ (NH_4)_2CO_3 \times \frac{1\ mol}{96.08g} = 0.0774\ mol \times \frac{6.02\times10^{23}}{1\ mol} = 4.66\times10^{22}$ molecules $(NH_4)_2CO_3$

4.66×10^{22} molecules

$\times 2 = 9.315\times10^{22}$ atoms N 1.8×10^{23}

$\times 8 = 3.73\times10^{23}$ atoms H 4.5×10^{23}

$\times 1 = 4.66\times10^{22}$ atoms C 6.02×10^{22}

$\times 3 = 1.397\times10^{23}$ atoms O 1.8×10^{23}

8. What is the mass of a single atom of potassium?

$1\ atom \times \frac{1\ mol}{6.02\times10^{23}\ atoms} = 1.66\times10^{-24}\ mol\ K \times \frac{39.1g}{1\ mol} = \boxed{6.49\times10^{-23}\ g}$

9. What is the mass of 15 molecules of silicon tetrafluoride?

$15\ molecules \times \frac{1\ mol}{6.02\times10^{23}\ molecules} = 2.49\times10^{-23}\ mol \times \frac{104.1g}{1\ mol} = \boxed{2.6\times10^{-21}\ g}$