① Chem11 - Mole Unit Pre-Test

Find the molar mass of calcium phosphate.

$Ca_3(PO_4)_2$

$Ca = 3(40.1) = 120.3$

$P = 2(31.0) = 62.0$

$O = 8(16.0) = 128$

$310.3\ g/mol$

How many moles are there in a 124 g sample of C_8H_{18}?

$C = 8(12.0) = 96$

$H = 18(1.0) = 18$

$114\ g/mol$

$mol = (124\ g)\left(\frac{mol}{114\ g}\right)$

$= 1.09\ mol$

What is the mass of 5.99 mol of $C_6H_2Cl_4$?

$C = 6(12.0) = 72.0$

$H = 2(1.0) = 2.0$

$Cl = 4(35.5) = 142.0$

$216.0\ g/mol$

$m = \left(\frac{216.0\ g}{mol}\right)(5.99\ mol) = 1.29 \times 10^3\ g$

What is the percentage composition of iron in $FeCl_3$?

$Fe = 55.8 = 55.8$

$Cl = 3(35.5) = 106.5$

$162.3\ g/mol$

$Fe = \frac{55.8}{162.3} \times 100 = 34.4\%$

$Cl = \frac{106.5}{162.3} \times 100 = 65.6\%$

What is the mass of 400.0 mL of fluorine gas at STP?

$F_2 = 2(19.0) = 38.0\ g/mol$

$m = \left(\frac{38.0\ g}{mol}\right)\left(\frac{mol}{22.7\ L}\right)(.400\ L)$

$= 0.670\ g$

What is the volume of 3.66×10^{32} molecules of fluorine gas at STP?

$V = \left(\frac{22.7\ L}{mol}\right)\left(\frac{mol}{6.02 \times 10^{23}\ molec}\right)\left(3.66 \times 10^{32}\ molec\right)$

$= 1.38 \times 10^{10}\ L$

A gas has an empirical formula CH_2. If 0.850 L of the gas at STP has a mass of 1.59 g, what is the molecular formula?

$MM = (1.59\text{g})\left(\frac{22.7\text{L}}{\text{mol}}\right)\left(\frac{1}{0.850\text{L}}\right) = 42.5\ \frac{\text{g}}{\text{mol}}$

$C = 12.0$
$H = 2.0$
$14.0\ \text{g/mol}$

$\frac{42.5}{14.0} = 3$

C_3H_6

What is the concentration of aqueous sodium chloride, when 5.00 g of NaCl is dissolved in 500.0 mL of water?

$Na = 23.0$
$Cl = 35.5$
$58.5\ \frac{\text{g}}{\text{mol}}$

$(5.00\text{g})\left(\frac{\text{mol}}{58.5\text{g}}\right)\left(\frac{1}{.500\text{L}}\right) = 0.171\text{M}$

What is the volume used to make 0.0250 M of NaF using 2.00 g of NaF?

$Na = 23.0$
$F = 19.0$
$42.0\ \frac{\text{g}}{\text{mol}}$

$V = \left(\frac{\text{L}}{.0250\text{mol}}\right)\left(\frac{\text{mol}}{42.0\text{g}}\right)(2.00\text{g}) = 1.90\text{L}$

What is the empirical formula of 26.6 % K, 35.4 % Cr, and 38.0 % O?

$K = (26.6\text{g})\left(\frac{\text{mol}}{39.1\text{g}}\right) = 0.680 \rightarrow 1 = 2$

$Cr = (35.4\text{g})\left(\frac{\text{mol}}{52.0\text{g}}\right) = 0.681 \rightarrow 1 = 2$

$O = (38.0\text{g})\left(\frac{\text{mol}}{16.0\text{g}}\right) = 2.375 \rightarrow 3.5 = 7$

$K_2Cr_2O_7$

What is the new concentration when 125 mL of 0.82 M CaS is mixed with a 375 mL solution of 3.0 M CaS?

$\left(\frac{.82\text{mol}}{\text{L}}\right)(.125\text{L}) = .1025\text{mol}$

$\left(\frac{3.0\text{mol}}{\text{L}}\right)(.375\text{L}) = 1.125\text{mol}$

$\frac{1.2275\text{mol}}{.5\text{L}} = 2.5\text{M}$

What is the resulting concentration when 750 mL of water is added to 250 mL of a 0.10 M KCl solution?

$C_1V_1 = C_2V_2$

$C_2 = \frac{C_1V_1}{V_2} = \frac{(250\text{mL})(.10\text{M})}{1000\text{mL}}$

$= 0.025\text{M}$

$= 2.5 \times 10^{-2}\text{M}$