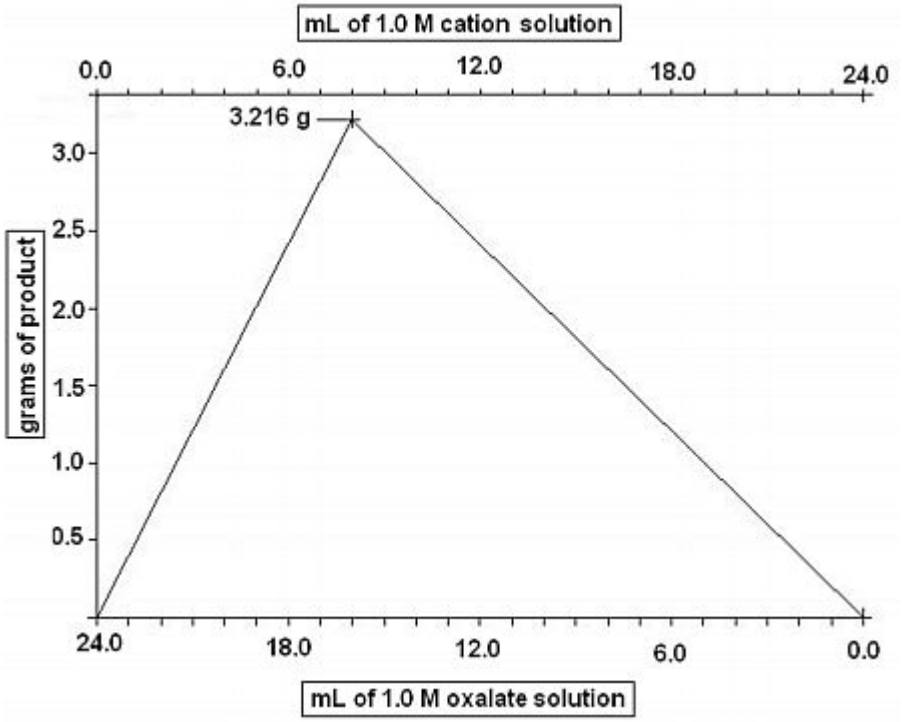
Instructor: Jorge Ramos CHE 103 (___) Lab Quiz # 1

(0.5) Name: _____

(2.5) Various solutions were prepared by combining different volumes of 1.0 M solution containing cation Φ^{n+} and oxalate anion. They react as follows:

$$\mathbf{m\Phi^{n+} + nC_2O_4^{2-} \rightarrow \Phi_n(C_2O_4)_m}$$

where $\Phi_n(C_2O_4)_m$ is the insoluble product whose mass was plotted on the ordinate. Determine the empirical formula of $\Phi_n(C_2O_4)_m$ and the molar mass of Φ^{n+}.



Apex at 8.00 mL :16.00 mL → empirical formula = $\mathbf{\Phi_8(C_2O_4)_{16}}$ = $\mathbf{\Phi(C_2O_4)_2}$

Mol of product = [8.00 X 10^{-3} L **or** (1/2)16.00 X 10^{-3} L] X 1.0 mol/L = 8.00 X 10^{-3} mol

Molar mass of $\mathbf{\Phi(C_2O_4)_2}$ = 3.216 g / 8.00 X 10^{-3} mol = 402 g/mol

Molar mass of $\mathbf{\Phi}$ = 402 g/mol - [2 X 88.0 g/mol] = 226 g/mol

(2.0) A new prototype spaceship uses beer as fuel. The fuel tank capacity is 7.5 X 10^6 L and the spaceship spends 10.0 kg of beer 1000.0 km of travel. How far can the spaceship travel with a full tank of beer? Beer has a density of 0.795 g/cm^3. Assume the crew will not drink the beer.

Tank capacity in mL = 7.5 X 10^6 L X 1000 mL/L = 7.5 X 10^9 mL

Mass of beer = 7.5 X 10^9 mL X 0.795 g/mL = 5.96 X 10^9 g = 5.96 X 10^6 kg

Beer consumption rate in kg/km = [10.0 kg / 1000.0 km = 0.010 kg/km

Distance the ship can travel = 5.96 X 10^6 kg / 0.010 kg/km = 5.96 X 10^8 km