GEOL3010 Mineral Stoichiometry Problem Set 4

1. For the following mineral chemical analyses, determine the mineral formula. Express cation formulae to three decimal places for a specific (integer) number of anions (oxygens). Example: $(Mg_{0.891}Fe_{0.109})Si_{1.000}O_3$

a.

Oxide	Wt%	MWOx	Moles Oxide	Moles Cation	Moles Oxygen
SiO_2	42.7	60.086			
MgO	57.3	40.312			

Mole ratios Mg: Si: O

b.

Oxide	Wt%	MWOx	Moles Oxide	Moles Cation	Moles Oxygen
SiO_2	68.74	60.086			
Al_2O_3	19.44	101.963			
Na_2O	11.81	61.9796			
	100.00				
	Mole ratios				

c.

Oxide	Wt%	MWOx	Moles Oxide	Moles Cation	Moles Oxygen
SiO_2	52.65	60.086			
FeO	11.65	71.8464			
MgO	11.13	40.312			
CaO	24.57	55.96			
	100.00				

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2. a. The mineral pyrope is the magnesian end-member of the garnets. It has the chemical formula $Mg_3Al_2Si_3O_{12}$. Express this as weight percents of the appropriate oxides.

Oxide	Mols PFU	MWOx	Grams Oxide	Wt% Oxide
SiO_2		60.086		
Al_2O_3		101.963		
MgO		40.312		

b. Complete crystalline solution exists between pyrope and almandine ($Fe_3Al_2Si_3O_{12}$). Garnet compositions are commonly expressed as mole percents of the end-members. A garnet that is 37mol% almandine and 63mol% pyrope may be abbreviated Pyr63Alm37. Express this composition as weight percentages of the appropriate oxides. (Is the iron ferrous (+2) or ferric (+3)? First, write out the formula!)

Formula: Mg__ Fe__ Al____ Si__ O_{12}

Oxide	Mols PFU	MWOx Oxide	Grams \Oxide	Wt%
SiO_2		60.086		
Al_2O_3		101.963		
FeO		71.8464		
MgO		40.312		