

GEOL3010 Coupled Substitutions**Problem Set 5**

1. a. The mineral omphacite is a pyroxene that is intermediate in composition between jadeite ($\text{NaAlSi}_2\text{O}_6$) and diopside ($\text{CaMgSi}_2\text{O}_6$). Calculate the composition in weight percent oxides of an omphacite that is 60 mol percent diopside and 40 mol percent jadeite.

Formula $\text{Ca}_{0.6}\text{Na}_{0.4}\text{Mg}_{0.6}\text{Al}_{0.4}\text{Si}_2\text{O}_6$				
Oxide	Mols PFU	MWOx	Grams Oxide	Wt% Oxide
SiO_2	2.0	60.086	120.172	57.03
Al_2O_3	0.2	101.963	20.393	9.68
MgO	0.6	40.312	24.187	11.48
CaO	0.6	55.96	33.576	15.93
Na_2O	0.2	61.980	<u>12.396</u>	5.88
			210.723	

- b. Calcium Tschermaks pyroxene (CaAlAlSiO_6) forms complete crystalline solution with diopside ($\text{CaMgSi}_2\text{O}_6$). Calculate the composition in weight percent oxides of a pyroxene that is 50 mol percent Ca-Tschermaks pyroxene and 50 mol percent diopside.

Formula $\text{Ca}_{1.0}\text{Mg}_{0.5}\text{Al}_{0.5}\text{Al}_{0.5}\text{Si}_{1.5}\text{O}_6$				
Oxide	Mols PFU	MWOx	Grams Oxide	Wt% Oxide
SiO_2	1.5	60.086	90.129	41.49
Al_2O_3	0.5	101.963	50.982	23.47
MgO	0.5	40.312	20.156	9.28
CaO	1.0	55.96	55.96	25.76
			217.227	

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2. Plagioclase feldspars are intermediate in composition between end-members anorthite ($\text{CaAl}_2\text{Si}_2\text{O}_8$) and albite ($\text{NaAlSi}_3\text{O}_8$). Listed below are two plagioclase feldspar analyses. Calculate the mole percentages of the end-members for each.

a.

Oxide	Wt%	MWOx	Moles Oxide	Moles Cation	Moles Oxygen	Cations PFU
SiO_2	48.07	60.086	0.8000	0.8000	1.6000	2.200
Al_2O_3	33.37	101.963	0.3273	0.6546	0.9818	1.800
CaO	16.31	55.96	0.2915	0.2915	0.2915	0.801
Na_2O	2.25	61.980	0.0363	0.0726	0.0363	0.200
	100.				2.9096 x 2.7495=8	



20% Albite 80% Anorthite

b.

Oxide	Wt%	MWOx	Moles Oxide	Moles Cation	Moles Oxygen	Cations PFU
SiO_2	59.45	60.086	0.9894	0.9894	1.9788	2.650
Al_2O_3	25.70	101.963	0.2521	0.5041	0.7562	1.350
CaO	7.33	55.96	0.1310	0.1310	0.1310	0.350
Na_2O	7.52	61.980	0.1213	0.2427	0.1213	0.650
	100.				2.9873 x 2.6780=8	



65% Albite 35% Anorthite