HW 1	Inorganic Materials Chemistry	Name:	
Points:	**C7780**	**Date:**	
Max. 100 points	**Fall 2012**	**A**	

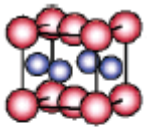
1. Assume that CaO reacts with CeO_2 and forms $CaCeO_3$. What could be the structure type of this compound? _____

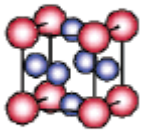
Write balanced chemical equations for the reactions taking place at the interfaces I and II (assume counter diffusion of both cations) and calculate the Kirkendall ratio for this process.

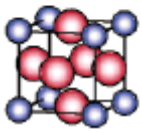
	I	II	
	CaO	**$CaCeO_3$**	**CeO_2**

2. Derive Miller indices for planes that intersects the cell axes at a/2, 2b/3, 2c.

3. Give stoichiometric formulas for these structures. Large atoms = A, small atoms = B







4. Specific surface area of α-Fe_2O_3 was measured by nitrogen adsorption at 77 K and its value is 120 $m^2\ g^{-1}$. Density of this oxide is 5.277 g cm^{-3}. Calculate the particle size assuming a spherical particle shape.

5. Maghemite γ-Fe_2O_3 crystallizes in a defect inverse spinel structure (as Fe_3O_4), but some positions of Fe^{3+} in octahedral holes must be vacant, in order to maintain stoichiometry. What part of these holes must be empty in comparison with Fe_3O_4.
□ = vacancy, empty hole, (X) = tetrahedral position, [Y] = octahedral position
Fill stoichiometric coeficients at the horizontal lines:

(Fe)___ [Fe___, □____] O_4