**Worksheet 1**

1. Write a reaction for the formation of Schottky defects in MO2.
2. What, if any, is the difference between a Schottky defect in Mg and a Schottky defect in MgO?
3. Write a defect reaction for the formation of anion Frenkel defects in CaF2.
4. Would you expect Frenkel defects to be more likely in Al or Al2O3? What factors do we need to consider for answering this question?
5. Write down a point defect reaction for ZnO in which you produce twice as many singly charged defects as doubly charged ones.
6. Write a defect reaction for the formation of fully ionized oxygen vacancies and electrons when oxygen is lost in the reaction M2O3 = M2O3-x + x/2 O2(g).
7. Write a balanced defect reaction equation using the Kroger-Vink notation for substitution of Ca2+ in CaF2 by Y3+.
8. Write defect reactions for dissolution of CaO substitutionally into the anion-Frenkel dominated Y2O3.
9. Draw a Brouwer diagram by showing all the necessary steps for an oxide which predominantly contains oxygen vacancies at reduced oxygen activities and interstitial oxygen ions at high oxygen activities. In an intermediate region the oxide is stoichiometric or close to stoichiometric. Assumed that both the interstitial oxygen ions and the oxygen vacancies are doubly charged.
10. Repeat question 9 for the case where anion Frenkel predominates under the stoichiometric condition.