Chemistry 2500 Exam Two **Name** _____

1. (8 points) What are the common oxidation numbers for each of the following elements?

a) titanium b) vanadium

c) chromium d) manganese

e) iron f) cobalt

g) nickel h) copper

2. (12 points) Using a band diagram, explain why magnesium is metallic (i.e., is a conductor) even though its 3s band is completely full.

3. (12 points) $LiBaF_3$ has a cubic perovskite structure with Z = 1 and a cell parameter of 3.996 Å. What is its density in g/mL? (1 amu = 1.66054 x 10^{-24} g)

4. (12 points) Draw or describe the rock salt structure; explain what the value of Z is and how one may determined it for this structure.

5. (12 points) Hydrogen fluoride is a strong acid when dissolved in liquid ammonia but is a weak acid when dissolved in liquid water. Explain why.

6. (20 points) For the following partial reaction, use the table of standard electrode potentials to complete and balance; determine E° for the reaction; from E° determine ΔG°.
(R = 8.3145 J/K·mol; F = 96,485 J/V·mol)

$$ClO^-(aq) + MnO_2(s) \rightarrow Cl^-(aq) + MnO_4^-(aq) \qquad \text{(basic solution)}$$

7. (12 points) When dissolved in water, does sodium fluoride form a basic, neutral, or acidic solution? Explain why.

8. (12 points) Place the following compounds in order of increasing lattice energy: magnesium oxide, lithium fluoride, and sodium chloride. Explain your reasoning.