

Name: _____

Geosciences 306, Mineralogy
First Midterm, 2006
100 pts

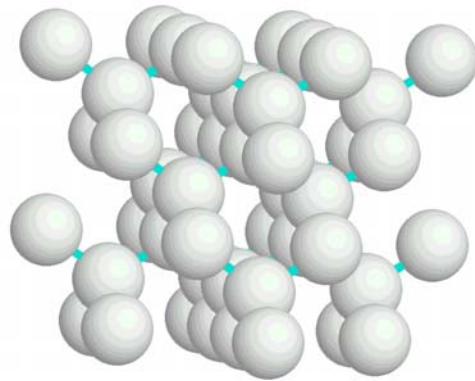
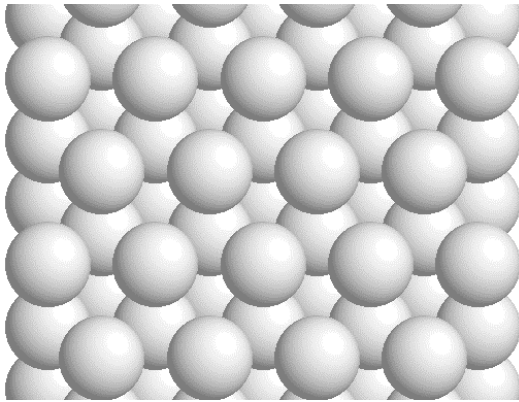
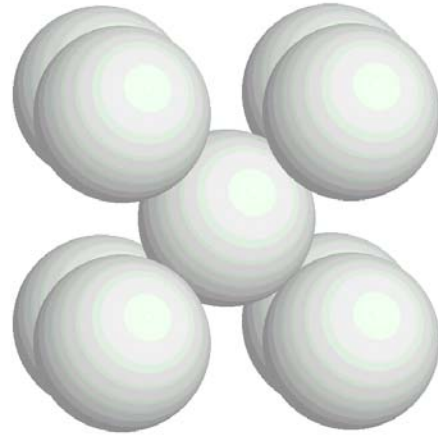
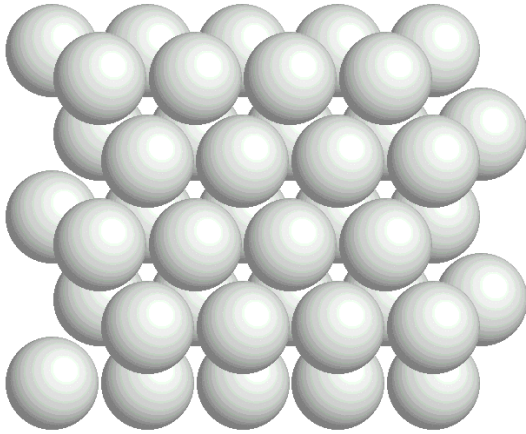
1. (10 pts) What are the 4 most abundant elements in the Earth and what are their atomic percentages?

2. (20 pts) Describe the electronic structures of atomic iron (Fe) and atomic magnesium (Mg) using spin diagrams. Make spin diagrams of Mg^{2+} , Fe^{2+} , and Fe^{3+} .

3. (20 pts) List the four general observations about the sizes of atoms.

4. (20 pts) List 7 common types of bonding found in minerals along with a short description and example of each.

5. (10 pts) Label the packing type for each of the following diagrams.



6. (20 pts) Celestine, a strontium sulfate with composition SrSO_4 , forms beautiful blue crystals that are commonly found in limestone.
- Determine the coordination numbers of Sr and S using the radius ratio rules.
 - Determine the bonding arrangement around the O atom by computing the Sr-O and S-O bond strengths and using Pauling's rules.
 - Compute the Sr-O and S-O bond lengths.
 - If you melted celestine, which of the two bonds would break first?

$$r(\text{Sr}) = 1.35 \text{ \AA}$$

$$r(\text{S}) = 0.31 \text{ \AA}$$

$$r(\text{O}) = 1.35 \text{ \AA}$$