Ch. 12 concept map (The Solid State)

1. Count atoms in cubic (primitive, body centered cubic, face centered cubic) unit cells (inside the body, on cell sides, on cell faces, on cell corners). Use the counting to determine the formula of crystalline compounds that pack in cubic unit cells.
2. Use the concept of atoms touching in the appropriate parts of the cubic unit cells to calculate various properties (atomic/ionic radius, length of the side of the unit cell, density)
3. Construct a Born-Haber cycle to calculate the lattice enthalpy using tabulated thermodynamic data (enthalpies of formation, evaporation, sublimation, atomization; ionization energies, electron affinities…). Be able to write reactions for these processes.
4. Use band theory to explain electrical conductivity (or absence of it) in metals, semiconductors and insulators.
5. Explain how band gap is affected by atom size.
6. Explain how p-type and n-type semiconductors are formed and how they conduct electricity.
7. Be able to classify a solid as ionic, metallic, molecular, network or amorphous based on its structure and properties.
8. Use a phase diagram to state which phase is present under given pressure and temperature conditions.
9. Use a phase diagram to locate the normal phase transition points (e.g., normal boiling point) and the triple point.
10. Use a phase diagram to predict whether the solid or the liquid phase of a substance is denser.