Review Topics for Midterm

1. Bonding ~50% test
    1. Hybridization in covalent structures
    2. Trends in periodic table – EN, size, mass, valence
    3. Pauling's ionicity fraction
    4. Shape (nature) of bonding force/energy vs. interatomic separation curves. How force and energy curves influence material properties. Know where E_o,r_o,σ,ε are on the curves and what they mean.
    5. Bonding models: simple and more advanced. Do not memorize formulas but know what each term, or group of terms, means in relation to the bond force/energy and interatomic distance; cohesive energy/atom(U'); lattice energy (V), etc.
    6. Appropriate pair potentials for ionic materials must obviously contain an electrostatic component, a short-range repulsion and an attractive VDW component.
2. Crystal structures ("so far") ~50% test
    1. Definition of crystal structure. Metallic, ionic and covalent crystal structures – where do you expect to find them on periodic table.
    2. Centering operations. Count lattice points (ions or atoms) per unit cell. Determine chemical formula (stoichiometry) and number of formula units per unit cell.
    3. Close packed sites and interstitial sites in metallic and ionic crystal structures.
    4. Calculate linear, planar, volume (bulk) densities (know your Miller indices!).
    5. Classifying crystal structures: packing, compositional ordering, and filling of interstitial sites.
    6. 3 site selection rules for ceramic (majority ionic bonding) crystal structures. Shannon radii table.
    7. Be familiar with all crystal structures we went over in class (applying the above concepts).
    8. Interstitial compounds – where to find them.
    9. Periodic Trends in Bonding and Structure

Pages to Review in DeGraef book (based on order we went over in class)

1st edition

All of Chapter 2

Chapter 17 (pp. 459-493). Note that some of these structure we did not cover in class but concepts we went over still apply.

Chapter 22 (pp. 654-681)

All of Chapter 3

Chapter 10 (pp. 230-237)

2nd edition

All of Chapter 2

Chapter 17 (pp. 425-454). Note that some of these structure we did not cover in class but concepts we went over still apply.

Chapter 21 (pp. 561-585)

All of Chapter 3

Chapter 10 (pp. 230-236)