ENGR/MSE 170 Midterm review

- Exam date: 4/30/2007 Mon, lecture time
- Place: Mueller 153
- Close book, notes and neighbors
- A sheet of letter-sized paper with double-sided notes is allowed
- Material on the exam will be taken from the text book, lecture notes, homework and lab
- Bring a calculator and straight edge/triangle
- The review materials are not comprehensive, there may be questions on the exam not listed here

Bonding and atomic forces

- The periodic table
- What types of bonding are there?
- How does bonding affect materials properties?

Bonding and atomic forces (continue)

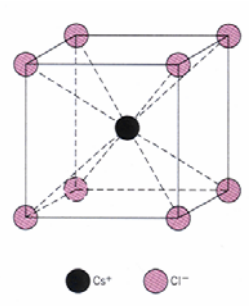
- Atomic forces & potential vs interatomic distance

Crystal structure

- Determine #atoms/unit cell, CN#, APF and density
- Draw and index crystallographic direction and planes
- Close-packed plane and stacking sequence
- Crystal systems

Crystal structure (*continue*)

- Know the types of ceramic structures and identify their unit cells
- Determine coordination number for ceramic structures based on ionic radii and charge



Defects

- Distinguish point, linear (dislocation 1D), interfacial(2D), volume(3D) defects
- Draw and describe edge and screw dislocations
- Burgers circuits and vectors
- Understand equilibrium of vacancies and effect of T

Diffusion

- Mechanisms, concentration gradients, diffusion coefficient
- Ficks first law
- Effects of T on diffusion coefficients

Mechanical properties

- Definition of stress, strain, elastic modulus
- Analysis of stress-strain curves
- Yield strength, tensile strength, Poisson's ratio, ductility, resilience, and toughness
- Hardness

Plastic deformation

- Slip plane, direction and system, resolved shear stress
- Mechanism of plastic deformation
- Strengthening mechanisms
- Recovery, recrystallization, and grain growth

Failure

- Ductile vs brittle fracture
- Stress concentrations and fracture toughness
- Creep and fatigue failure