

Homework #2

Due 16 September 2003

Each Problem is worth 10 Points

- 1.) **Nickel is a face-centered cubic metal with atomic density of 9.14×10^{22} atoms/cm³, atomic weight = 58.7, and density ρ of 8.91 g/cm³**
 - (a) **What is the lattice parameter a_c and the atomic volume Ω_v ?**
 - (b) **What is the number of atoms per centimeter squared on a {103} plane?**

- 2 **Calculate the energy, in eV, of a proton moving at the Bohr velocity. What is the velocity of a 35 keV As ion?**

- 3 **Given the Lennard-Jones Potential for frozen argon in the textbook, use Taylor expansion and the classical stress/strain relationship to show that the Elastic Modulus = $72\varepsilon_b/r_0^3$**

- 4 **Compute the distance that a 500keV proton can travel (in a vacuum) in 10^{-11} seconds. How many nickel lattice constants does that correspond to? Compute the distance for a nickel atom which receives the maximum possible kinetic energy, T , from an elastic collision with a 500keV proton. Assuming that it takes 25eV to displace a nickel atom from it's lattice, what is the minimum proton kinetic energy required to displace an atom from the nickel lattice?**