

Ae/AM/CE/ME 102c
Mechanics of Structures and Solids – Spring 2007-08
Assignment 5, Due May 15, 9:00AM, in class

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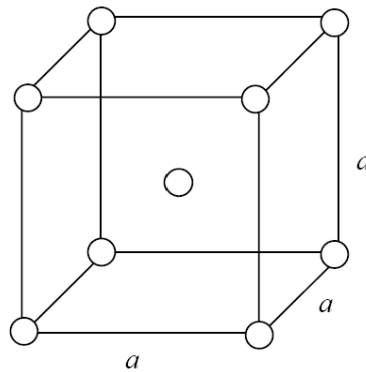
Grading TA: Mike Silva

*****Please indicate the number of hours spent on this assignment*****

Problem 1 (10 points)

For a body-centered-cubic lattice with its atoms interact through a Lennard-Jones potential (as shown below), find the lattice parameter and energy per atom, if $V_0 = 0.09$ eV/atom and $\sigma = 3.9\text{\AA}$. Consider the first, second and third nearest neighbor interaction.

$$\Psi(r) = V_0 \left[\left(\frac{\sigma}{r} \right)^{12} - \left(\frac{\sigma}{r} \right)^6 \right]$$



Problem 2 (10 points)

Consider an atomic chain made of the same atoms as shown below. Suppose the atoms interact through a Lennard-Jones potential,

$$\Psi(r) = V_0 \left[\left(\frac{\sigma}{r} \right)^{12} - \left(\frac{\sigma}{r} \right)^6 \right]$$

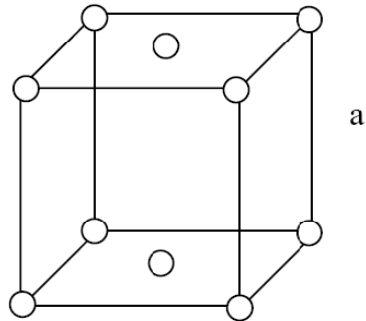
- (a) Calculate the energy per atom, assuming only first and second nearest neighbor interaction.
- (b) Find the lattice parameter “ a_0 ” that minimizes the energy per atom.



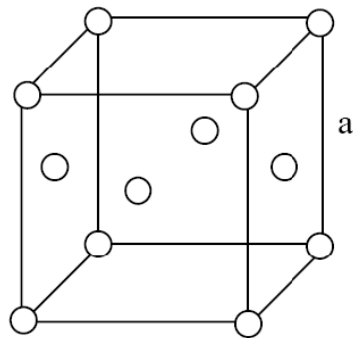
Problem 3 (10 points)

Which of the following are Bravais lattices, and what are the lattice vectors?

- (a) Base centered cubic - atoms at the corners of a cube and the center of the base and the top



- (b) Side centered cubic - atoms at the corners of a cube and at the center of each vertical face.



- (c) Triangular lattice (in 2D)

