

1. Give brief explanations about the point, line, and planar defects exist in crystalline solids? Provide schematic sketch for each type as possible.
2. Briefly explain the difference between substitutional and interstitial solution solutions?
3. Calculate the activation energy for vacancy formation in aluminum, given that the equilibrium number of vacancies at 500°C (773 K) is  $7.55 \times 10^{23} \text{ m}^{-3}$ . The atomic weight and density (at 500°C) for aluminum are, respectively, 26.98 g/mol and  $2.62 \text{ g/cm}^3$ . Boltzman constant  $k = 8.62 \times 10^{-5} \text{ (eV/atom K)}$
4. What is the composition, in weight percent and atom percent, of an alloy that contains 35.7 kg copper, 41.9 kg zinc, and 4.95 kg lead?
5. (Bonus) Copper forms a solid solution with zinc. If the concentration of copper in a copper-zinc alloy is 41.9 at% and the mass of zinc is 47 g, compute the number of atoms of copper in this alloy? The atomic weight of zinc is 65.39 g/mole.  
 $N_{av} = 6.023 \times 10^{23}$