1. Explain the following noun. (20%)
   a). Ionic Polarization
   b). Dipolar Polarization
   c). Atomic packing factor
   d). Schottky Defect
   e). Frenkel Defect
   f). Gibbs Phase Rule
   g). Seebeck Effect
   h). Fermi-Dirac Statistics
   i). Schottky Barrier Height
   j). Ohmic contact

2. Copper(ion radius=0.125nm) and nickel (ion radius= 0.128nm) form a solid solution in all properties. Predict this result using the Hume-Rothery rules (15%)

3. Iron at 20℃ is BCC with atoms of atomic radius 0.124nm. Calculate the lattice constant a for the cube edge of the iron unit cell (15%)

4. Draw the following crystallographic planes in cubic unit cell.(15%)
   (a). (101) (b) ($1\bar{1}0$) (c) (221)
   (d) Draw a (110) plane in a BCC atomic-site unit cell, and list the position coordinates of the atoms whose centers are intersected by this plane.

5. Fig.(1) shows a hypothetical binary eutectic phase diagram on which we indicate an alloy of composition 0.27B. Calculate the following quantities (20%)
   甲、The fraction of primary solid that forms under equilibrium cooling at the eutectic temperature .
   乙、The fraction of liquid with the eutectic composition that will transform to two solid phases below the eutectic isotherm
   丙、The amount of α and β that will form from the liquid just below the eutectic isotherm.
   丁、The total amount of phase in the alloy at a temperature just below the eutectic temperature.

6. For intrinsic gallium arsenide, the room temperature electrical conductivity is 10^{-6} $(\Omega\text{-m})^{-1}$; the electron and hole mobilities are, respectively, 0.85 and 0.04 $m^2/V\text{-s}$. Calculate the intrinsic carrier concentration n_i at room temperature. (15%)

(背面仍有題目，請繼續作答)

Fig.(1)