

系所組別： 電機工程學系甲組

考試科目： 電子材料概論

考試日期：0220，節次：2

※ 考生請注意：本試題 可 不可 使用計算機

1. A hydrogen atom exists with its electron in the $n=3$. The electron undergoes a transition to the $n=2$ state. Calculate (a) the energy of the photon emitted, (b) its frequency, and (c) its wavelength. ($h=6.63 \times 10^{-34}$ Js) (15%)
2. Calculate the atomic packing factor (APF) for the BCC unit, assuming the atoms to be hard spheres.(10%)
3. Draw the following direction vectors in cubic unit cells. (10%)
[100], [110], [112], [-110], [-32-1]
4. The diffusivity of silver atoms in solid silver metal is 1.0×10^{-17} m²/s at 500°C and 7.0×10^{-13} m²/s at 1000°C. Calculate the activation energy (joules per mole) for the diffusion of Ag in Ag in the temperature range 500 to 1000°C(10%)
5. A copper-nickel alloy contains 47wt% Cu and 53 wt% Ni and is at 1300°C. Using Fig.1 and answer the following: (a) What is the weight percent of copper in the liquid and solid phases at this temperature? (b) What weight percent of this alloy is liquid and what weight percent is solid?(10%)
6. Calculate the number of silicon atoms per cubic meter. The density of silicon is 2.33 g/cm³, and its atomic mass is 28.08 g/mol.(10%)
7. Calculate the electrical resistivity of intrinsic silicon at 300K. For Si at 300K, $n_i=1.5 \times 10^{16}$ carriers/m³, $q=1.6 \times 10^{-19}$ C, $\mu_n=0.135$ m²/Vs, and $\mu_p=0.048$ m²/Vs(10%)
8. A silicon wafer is doped with 10^{21} phosphorus atoms/m³. Calculate(a) the majority carrier concentration, (b) the minority carrier concentration, and (c) the electrical resistivity of the doped silicon at 300K. Assume complete ionization of the dopant atoms.(15%)
9. Calculate the reflectivity of ordinary incident light from the polished flat surface of a silicate glass with a refractive index of 1.46. (10%)

(背面仍有題目,請繼續作答)

系所組別： 電機工程學系甲組

考試科目： 電子材料概論

考試日期： 0220，節次： 2

※ 考生請注意：本試題 可 不可 使用計算機

