※ 考生請注意：本試題不可使用計算機

1. Foe the BCC unit cell, determine for the relationship between the cube side length a and the atomic radius R. Calculate the packing factor (20%)

2. Consider a simple cubic unit cell, side length a, with eight identical atoms, radius R, at the corner of a cube. There is one interstitial site at the center of cube. Calculate the radius of the interstitial site. (10%)

3. Look at the following section of the periodic table (10%)

II	III	IV	V	VI
Cd	In	Sn	Sb	Te

a). Consider the compound semiconductor CdTe. If Sn impurities are inducted into CdTe and sit on Cd sites, wheat semiconductor type would result? Explain

b).Consider the compound semiconductor InSb. In growing this semiconductor, excess indium atoms are introduced. The excess indium atoms sit on Sb sites. Explain which semiconductor type would result.

4. Please address the effect of temperature and impurity on the conductivity for metal, insulator and semiconductor, respectively.(20%)

5. Consider a piece of silicon doped with donor and acceptor impurities, with concentration N_D and N_A, respectively. Recall that, at a given temperature, the relationship np=constant always holds. In addition, not all donors and acceptors are ionized. Based on the principle of electrical neutrality, write down a relationship among the following four quantities: n, p, N_D^+ (ionized donors) , and N_A^- (ionized acceptors) (20%)

6. Refer to the Pb-Sn phase diagram as shown in Fig. (1)(20%)

a). State the composition of the eutectic alloy and the eutectic temperature.

b). What will happen to the eutectic alloy when the temperature is raised above the eutectic temperature?

c). Cool 100g of the eutectic alloy to slightly below the eutectic temperature. Calculate the amount of α - and β - phase at thermal equilibrium ?

d). Take a Pb-Sn alloy with 25 wt% Sn. As we heat the alloy from room temperature, what is the temperature when melting starts ?

(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

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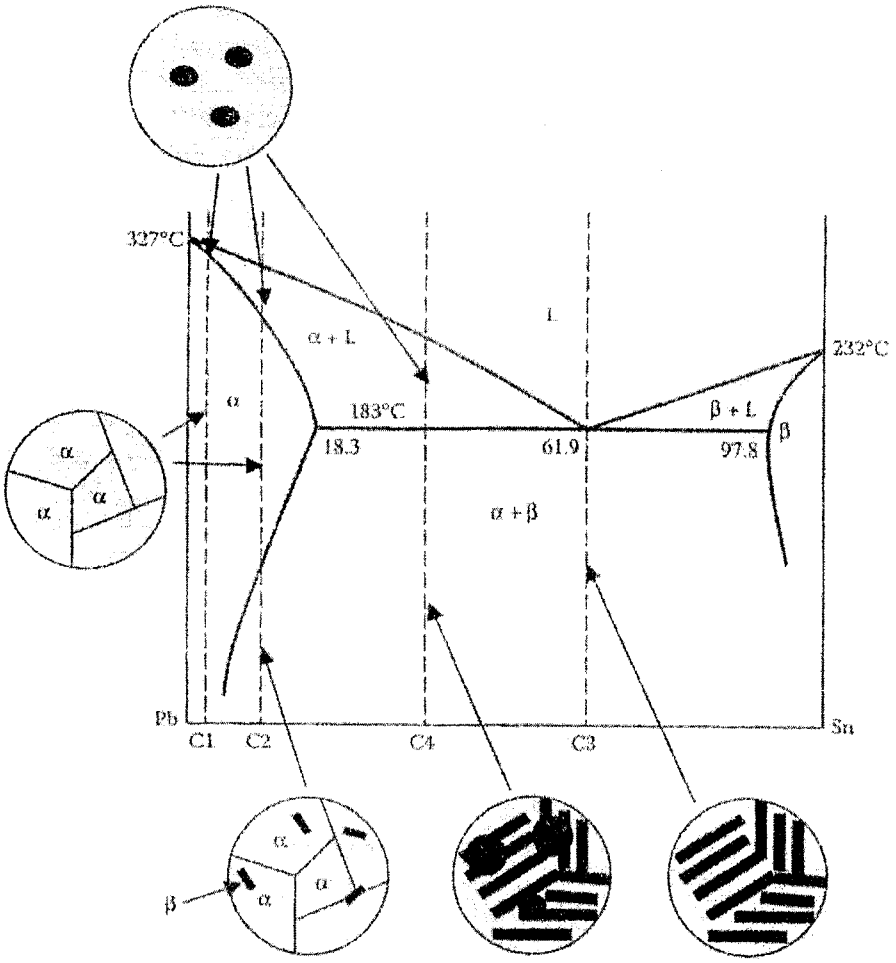
Fig.(1)



Pb-Sn phase diagram