

國立聯合大學 108 學年度碩士班考試招生

__材料科學工程學系碩士班__ 入學考試試題

科目： 材料科學導論 第 1 頁共 2 頁

注意!!!本試卷共有三類題，請於答題卷書寫類題題號、小題題號及答案，於本試題紙作答者不予計分。

一、是非題(10題，每題4分，共40分，請於答題卷書寫題號及答案[O或X]，於本試題紙作答者不予計分)

1. Electrically symmetric molecules can be induced to form dipole bonds.
2. "Chain-fold model" is a way that polymer molecular chains fold back and forth on themselves to form a crystalline structure.
3. In ionic solids, a Schottky defect contains a pair of missing anion and cation.
4. A screw dislocation has a Burgers vector perpendicular to its dislocation line.
5. Engineering stress is always larger than true stress.
6. Recovery is the first step when a deformed metallic material undergoes annealing.
7. A eutectoid reaction concerns one liquid phase and two solid phases.
8. Transgranular and intergranular crack propagation paths are possible for polycrystalline brittle metals.
9. A continuous-cooling transformation diagram is to describe the percentage of transformation without the consideration of time.
10. The bondings between carbon atoms in both diamond and graphite are covalent bondings.

二、單一選擇題(8題，每題5分，共40分，請於答題卷書寫題號及答案，於本試題紙作答者不予計分)

1. What strengthening mechanism is related to phase transformation?
(a) Solid-solutioning, (b) precipitation hardening, (c) work hardening, (d) fine grain.
2. Which is correct for an FCC structure?
(a) APF=56%, (b) max. LD direction=[100], (c) APF= 82%, (d), max. LD direction=[110].
3. Which is **not** a permanent bonding?
(a) induced dipole, (b) hydrogen bond, (c) van der Waals bond, (d) ionic bond.
4. Which one is **not** a fast path for diffusion?
(a) surface, (b) dislocation, (c) twin, (d) grain boundary.
5. Which one is **not** the A-X type crystal structure?
(a) Fluorite (b) Cesium Chloride, (c) Rock Salt, (d) Zinc Blende.
6. Which one is **not** related to dislocation?
(a) Solid-solutioning strengthening, (b) grain growth, (c) work hardening, (d) recrystallization.
7. Which is correct for a binary eutectoid reaction?
(a) Two liquid phases are involved, (b) only one solid phase is involved, (c) phase transformation is involved, (d) three elements are involved.
8. Which concerns carbon?
(a) fullerenes, (b) graphene, (c) methane, (d) all of the above.

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科目： 材料科學導論 第 2 頁共 2 頁

三、問答題(8題，每題15分，共120分，請於答題卷書寫題號及答案，於本試題紙作答者不予計分)

1. Show schematically the phase diagram of a Pb-Sn alloy with given eutectic point at 183°C and 61.9%Sn. Also show how a laminated structure is formed.
2. Draw stress-strain curves for typical metal, ceramic and polymer under tension test. Describe the differences between those curves.
3. What is "ductile-to-brittle transition"? What tests are used for the determination of the transition?
4. Describe the solid-solution strengthening in metals.
5. After 1.5 hrs diffusion process, surface chromizing is completed for a $5\ \mu\text{m}$ hard layer. If one needs an $8\ \mu\text{m}$ hard layer, how long would it take under the same chromizing atmosphere?
6. Draw a BCC arrangement, indicate the possible interstitial sites. What is the ratio of the radius of the interstitial atom, r , just fit to the octahedral site against the radius BCC atoms, R , i.e. $r/R=?$
7. Draw a hexagon of an HCP arrangement. Determine the Miller-Bravais indices of the unit cell walls, i.e. the 4-digit indices of the planes perpendicular to basal plane.
8. How does a carbon atom rearrange the electrons to form bonding with 4 H atoms in CH_4 ?