

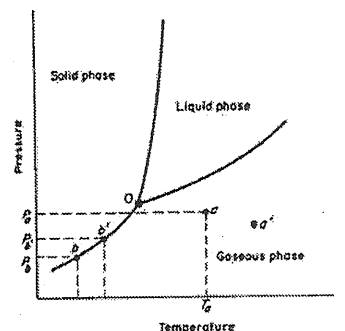
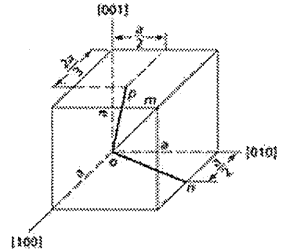
國立聯合大學 104 學年度

寒假轉學生招生考試試題紙

科目： 材料科學導論 第 1 頁共 2 頁

一、單選題 (每題 4%，共 100%)

- What is the direction of line \overline{op} in the right figure? (a) $[436]$ (b) $[\overline{4}\overline{3}\overline{6}]$ (c) $[\overline{4}\overline{3}6]$ (d) $[346]$ (e) $[643]$
- Which of the following is not a Bravais lattice? (a) simple cubic (b) bcc (c) fcc (d) hcp (e) triclinic
- What is the closest packed direction in the simple cubic structure? (a) $[100]$ (b) $[110]$ (c) $[111]$ (d) $[121]$ (e) $[321]$
- Angle between $[121]$ and $[30\overline{1}]$ directions in a cubic structure is (a) 34° (b) 45° (c) 56° (d) 67° (e) 75°
- Which has the lowest atomic packing density? (a) fcc (b) bcc (c) hcp (d) diamond (e) simple cubic
- The c/a ratio in an ideal hexagonal close-packed (HCP) structure is? (a) $2\sqrt{\frac{5}{6}}$ (b) $2\sqrt{\frac{4}{5}}$ (c) $2\sqrt{\frac{3}{4}}$ (d) $2\sqrt{\frac{2}{3}}$ (e) $2\sqrt{\frac{1}{2}}$
- The first reflection plane for an FCC crystal is (a) $\{100\}$ (b) $\{110\}$ (c) $\{111\}$ (d) $\{200\}$ (e) $\{220\}$
- Graphite has only 2-D sp^2 structure and therefore is not hard like diamond. The sheets of graphite are held together by only (a) covalent bonding (b) metallic bonding (c) London forces (d) Keesom forces (e) Debye forces
- The bonding of SiC crystal is (a) metallic (b) ionic (c) van der Waals (d) covalent (e) none of the above
- Metal usually deforms plastically at stress $\sim 1/10,000$ of its theoretical strength. This is due to the presence of (a) vacancy (b) interstitial atom (c) dislocation (d) grain boundary (e) precipitates
- The Poisson ratio of a typical metal is (a) $1/2$ (b) $1/3$ (c) $1/4$ (d) $1/5$ (e) $1/6$
- A single crystal of zinc is oriented for a tensile test such that its slip plane normal makes an angle of 65° with the tensile axis. Three possible slip directions make angles of 30° , 48° , 53° , 60° and 78° with the same tensile axis. Which of these slip directions is most favored? (a) 30° (b) 48° (c) 53° (d) 60° (e) 78°
- The number of slip systems in HCP crystals with $c/a > 1.632$ is (a) 3 (b) 6 (c) 12 (d) 24 (e) 48
- The Hall-Petch equation states the flow stress proportional to n^{th} power of the grain size. $n =$ (a) $1/2$ (b) $1/3$ (c) $-1/2$ (d) $-1/3$ (e) $-1/4$
- Which of the following is not a point defect? (a) Vacancy (b) Frenkel defect (c) Schottky defect (d) Interstitial (e) Grain boundary
- Pure iron has (a) 1 (b) 2 (c) 3 (d) 4 (e) 5 allotropes in the solid state
- For a single-component phase diagram as show on the right figure, the degree of freedom at a' is (a) 0 (b) 1 (c) 2 (d) 3 (e) 4



18. Same to question 17, the degree of freedom at O is (a) 0 (b) 1 (c) 2 (d) 3 (e) 4
19. Which of the following is not considered an interstitial solute atom? (a) H (b) C (c) O (d) N (e) none of the above
20. Calculate the weight percentage of solid at point y (70%Cu-30%Ni) in the right figure. (a) 0% (b) 25% (c) 50% (d) 75% (e) 100%
21. Which of the following has the smallest activation energy for diffusion? (a) Fe atom in BCC iron (b) Fe atom in FCC iron (c) carbon atom in BCC iron (d) carbon atom in FCC iron (e) Zn atom in FCC copper
22. The solubility of carbon in ferrite and austenite at eutectoid temperature is 0.02 wt% and 0.8 wt%, respectively. What is the equilibrium ferrite content just below eutectoid temperature for a steel containing 0.54 wt% of carbon? (a) 10% (b) 25% (c) 33.3% (d) 50% (e) 66.7%
23. For an alloy of 70wt%Ag-30wt%Cu, what is the alloy composition in wt%, given that the atomic weight of Ag is 108 and that of Cu is 64? (a) 58at%Ag-42at%Cu (b) 80at%Ag-20at%Cu (c) 42at%Ag-58at%Cu (d) 20at%Ag-80at%Cu (e) 70at%Ag-30at%Cu
24. Carburization treatment of a low carbon steel for 4 hours gives rise to 0.4 wt% carbon in the depth region of 0.2 mm below surface. What is the time needed for the depth region of 0.5 mm to reach the same carbon concentration? (a) 30 hours (b) 25 hours (c) 20 hours (d) 15 hours (e) 10 hours.
25. Diffusion coefficient is not a function of (a) diffusion species (b) concentration gradient (c) composition of diffusion medium (d) structure of diffusion medium (e) temperature

