

※ 注意：請於答案卷內之「非選擇題作答區」作答，並應註明作答之題號。

1. Draw crystal structures of diamond, graphite, and graphene. Moreover, specify the bond type in the crystal structure. (10%)
2. If iron oxide (Fe_2O_3) is specially treated at elevated temperatures, some of Fe^{3+} ions will become Fe^{2+} .
 - (1) Under these conditions, what is the crystal defects that you would expect to form in order to maintain charge neutrality. (5%)
 - (2) How many Fe^{2+} ions are required for the creation of each defect? (5%)
3. (1) What are required physical properties for thermoelectric materials? (5%)
(2) Is doped silicon a good thermoelectric material? Why? (5%)
4. Take one example of thermoplastic polymer and draw its repeat unit. Take one example of thermosetting polymer and draw its repeat unit. (10%)
5. (1) What is vulcanization? (4%)
(2) Why vulcanized rubber is usually stronger? (3%)
(3) What is the effect of vulcanization on glass-transition temperature? (3%)
6. Fe-C alloy system is the most important engineering material.
 - (1) What is maximum solubility of carbon in α iron? (2%)
 - (2) What are the conditions for eutectoid point? (3%)
 - (3) What are the conditions for eutectic point? Why is it important in steel manufacturing? (5%)
7. Derive the Considère criteria for ductile metals. (10%)
8. (1) Use one equation to explain that stronger alloys are more sensitive to fracture. (5%)
(2) Why do metals of face-centered cubic structure has no significant ductile-to-brittle transition temperature? (5%)

見背面

9. (1) Why cannot edge dislocation do cross-slip in crystals? (5%)
(2) Briefly describe the mechanism of work hardening. (5%)
10. (1) Why is iron ferromagnetic? (4%)
(2) Why is nickel ferromagnetic? (3%)
(3) Why is austenitic stainless steel (Fe-18Cr-10Ni in wt. %) non-magnetic? (3%)

試題隨卷繳回