

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (a) Please describe the phenomena of superheating and supercoiling. (b) Why do these phenomena occur? (10%)
2. Please describe the difference between pearlite, bainite, and spheroidite relative to microstructure and mechanical properties. (10%)
3. Please cite advantage and disadvantages of hot working and cold working. (10%)
4. Please explain the difference between hardness and hardenability. (5%)
5. Please explain (a) why there may be significant scatter in the fracture strength for some given ceramic materials, and (b) why fracture strength increases with decreasing specimen size. (10%)
6. Niobium has an atomic radius of 0.143 nm and density of 8.57 g/cm<sup>3</sup>. Determine whether it has an FCC or BCC crystal structure. (10%)
7. Please explain why cold-worked metals are susceptible to corrosion than noncold-worked metals. (10%)
8. What is the distinction between electronic and ionic conduction? (5%)
9. For some ceramic materials, why does the thermal conductivity first decrease and then increase with rising temperature. (10%)
10. Please describe the differences between hard and soft magnetic materials in terms of both hysteresis behavior and typical application. (10%)
11. Please describe the significant differences between the stress intensity factor, the plane stress fracture toughness, and the plane strain fracture toughness. (10%)