

國立臺北科技大學九十七學年度碩士班招生考試

系所組別：3301 材料科學與工程研究所不分組

第二節 工程材料 (選考) 試題

填准考證號碼

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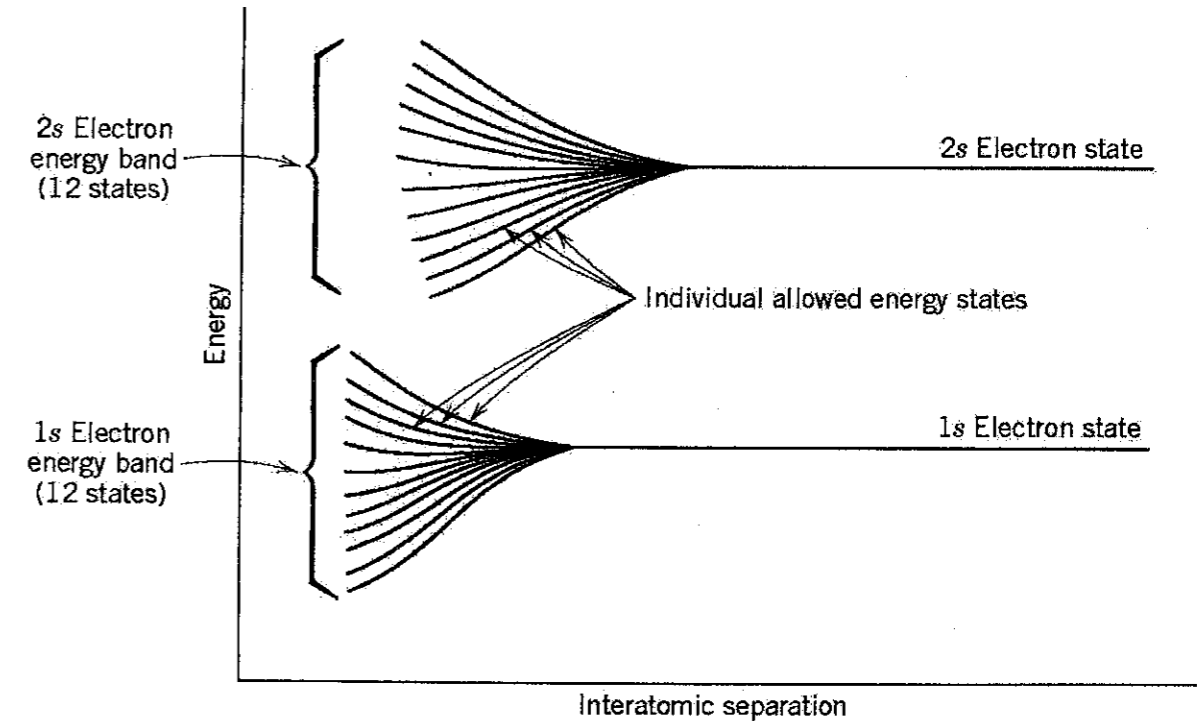
第一頁 共一頁

注意事項：

1. 本試題共八題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Please explain the "cradle-to-grave" concept and give an example demonstrating such concept in engineering materials. (10%)
2. Please explain the following terms and their differences:
resilience, ductility, and toughness. (15%)
3. Given that the surface energy is proportional to the numbers of broken atomic bonds on unit area of surfaces (a^2), please compare the surface energies of the following three atomic surfaces: $(100)_{fcc}$, $(110)_{fcc}$, and $(111)_{fcc}$. (15%)
4. Please rank the electrical resistivity of the following materials from low to high: (all materials were annealed and tested at ambient temperature except specifically noted.) (15%)
 - (a) 50 nm Cu-3%Ni thin films.
 - (b) Bulk Cu-3%Ni.
 - (c) Bulk oxygen free pure Cu.
 - (d) Bulk oxygen free pure Cu at -100°C .
 - (e) Bulk CuO.
 - (f) Bulk pure Cu containing 100ppm O.
 - (g) 20% cold worked pure Cu containing 100ppm O.

5. Based on the following plot of electron energy states for an aggregate of 12 atoms, please explain what it might imply for nanomaterials? (10%)



6. Derive the volume changes during elastic tensile deformation of an isotropic material by considering the elastic strains in three major axes. And does the volume change during elastic deformation? (hint: use concept of poisson's ratio) (15%)
7. Please compare the mechanical properties of gray irons and nodular irons by their microstructures and explain why. (10%)
8. Do you expect more or less point defects in metals than in ceramics? Why? (10%)