

國立臺北科技大學九十六學年度碩士班招生考試

系所組別：3722 有機高分子研究所乙組

第二節 材料科學與工程 (選考) 試題

第一頁 共一頁

注意事項：

1. 本試題共 7 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。

一. Explain following term (use graph if possible): **【36%】**

1. Schmid's law (6%)
2. Critical radius of nuclei (6%)
3. Bragg's law (6%)
4. Extrinsic semiconductor (6%)
5. Fick's first and second law of diffusion (6%)
6. The mass action law (6%)

二. **【12%】**

1. What is the definition of engineering strain, true strain and Poisson's ratio? (4%)
2. What is the typical Poisson's ratio value of elastomers and plastics? (4%)
3. What is the definition of ultimate tensile strength (use graph)? (4%)

三. **【12%】**

1. Using graph of Young's modulus vs. temperature to explain 5 regions of visco-elastic behavior of polymers: linear amorphous, semi-crystalline and cross-linked. Specify  $T_g$  (glass transition temperature),  $T_m$  (melting temperature) and  $T_d$  (degrade temperature) in graph. (8%)
2. What happens during  $T_g$ ? (4%)

四. **【10%】**

1. What is the definition of refractive index,  $n$ ? (4%)
2. What is the critical angle for light to be totally reflected when leaving a flat plate of glass ( $n=1.51$ ) and entering air? (6%)

五. **【10%】**

1. What is the definition of stress intensity factor,  $K_{Ic}$ ; and fracture toughness,  $K_{Ic}$ ? (6%)
2. How to judge a material is brittle or ductile by  $K_{Ic}$ ? (4%)

六. **【10%】**

1. Draw in unit cube the crystal plane that have Miller index (2 2 1). (5%)
2. What is the relation of its interplanar spacing with lattice constant,  $a$ ? (5%)

七. **【10%】**

Calculate the equilibrium concentration of vacancies per cubic meter in pure copper, Cu, at  $850^\circ\text{C}$ . Assume that the energy of formation of a vacancy in Cu is 1eV. Density of Cu =  $8.96 \times 10^6 \text{ g/cm}^3$ , at. Mass of Cu = 63.54g,  $k = 8.62 \times 10^{-5} \text{ eV/K}$ .