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：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

填 准 考 證 號 碼

注意事項：

1. 本試題共 6 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. Snell's law(6%)
2. WLF equation(6%)
3. Poisson's ratio(6%)
4. Ultimate tensile strength(6%)
5. The mass action law(6%)
6. Schmid's law(6%)

二. 【12%】

Calculate the critical radius of a homogeneous nucleus that forms when pure liquid platinum, Pt solidifies. For Pt, melting temperature, Tm = 2045K, Heat of fision = 2160 J/cm^3, Surface energy = 240 x 10^{-7} J/cm^2, Assume undercooling = 0.2Tm.

三. 【12%】

The diffusivity of iron atom in the BCC iron lattice is 4.5 x 10^{-23} m^2/s at 400 $^\circ$C and 5.9 x 10^{-16} m^2/s at 800 $^\circ$C. Calculate the activation energy in KJ/mol in this temperature range.

R=8.314 J/(mol·K)

四. 【12%】

1. What is the definition (unit required) of stress intensity factor, K_I; and fracture toughness, K_{Ic}? (8%)
2. How to judge a material is brittle or ductile by K_{Ic}? (4%)

五. 【15%】

1. Diffraction from (2 2 1) plane of a BCC metal was obtained at 2 theta = 88.838 $^\circ$ using X-ray of wavelength = 0.1541 nm. What is the interplanar d-spacing of (2 2 1) and lattice constant, a, for this metal?(10%)

2. Draw in unit cube the crystal plane that have Miller index (2 2 1). (5%)

六. 【13%】

Describe and compare strain hardening (cold work) and solid solution strengthening of metals.