

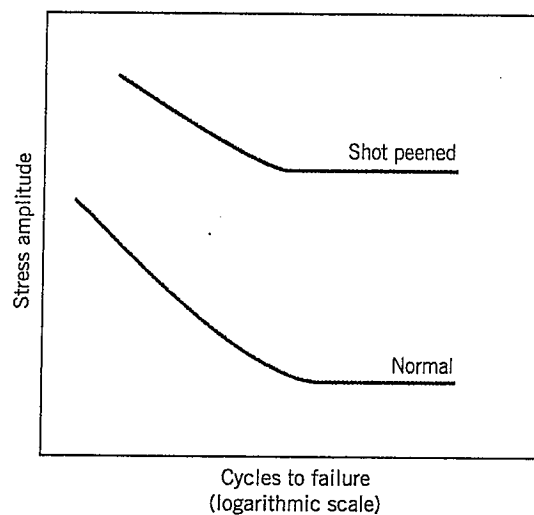
國立中山大學 107 學年度碩士暨碩士專班招生考試試題

科目名稱：材料科學【材光系碩士班丙組】

題號：439004

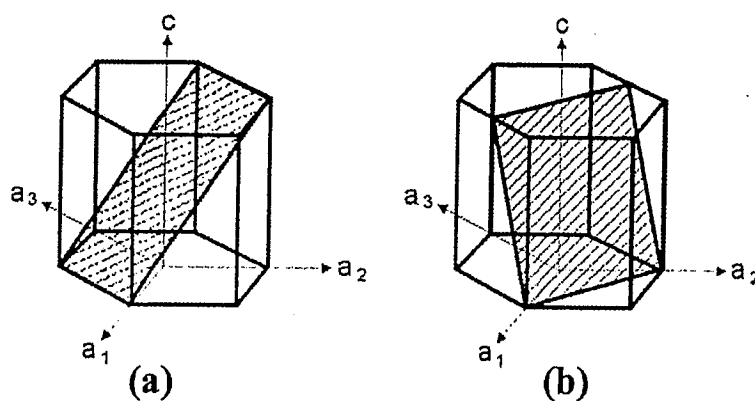
※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）（問答申論題） 共 2 頁第 1 頁

- (1) Grain boundary strengthening is a very common strengthening method of materials. Discuss how the misorientation of a grain boundary affects the strengthening effect of this grain boundary? 8 points
- (2) Elongation and area reduction of a tensile test specimen can both be used to measure the ductility of a material. Which one is the better way to measure the ductility of a material? Justify your answer. 8 points
- (3) Shot peening is a process using small steel balls bombard the surface of a metal part. The steel balls act like a hammer, bombard the surface and causing deformation and compression stresses. The figure given below shows the effect of shot peening on the fatigue property of a metal. Explain this figure. 8 points



- (4) What are the Miller-Bravais indices of the planes shown in (a) and (b)? 3 points each.

6 points



- (5) Explain the following terms: (a) phase, 3 points, (b) peritectic reaction, 3 points, (c) metastable phase, 3 points, (d) bainite, 3 points, (e) glass-ceramic, 3 points, (f) intrinsic semiconductor, 3 points, and (g) luminescence, 2 points. 20 points
- (6) The parameter,  $K_{Ic}$ , is used to know the fracture toughness of a material. Explain what is  $K_{Ic}$ , and how do you measure it? 8 points
- (7) What can we know about diffusion from Fick's first and second laws? 12 points

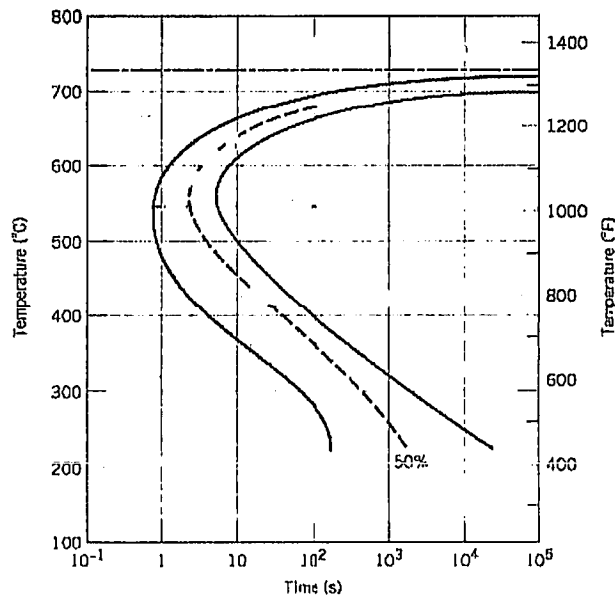
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- (8) The figure shown below is a T-T-T diagram. The shape of this T-T-T diagram is a typical one. Explain why it has this kind of shape. 10 points



- (9) Give five phase transformation names in materials, e.g. solidification. 10 points

- (10) Give the unit of (a) shear stress, (b) diffusion coefficient, (c) Young's modulus, (d) strain rate and (e) electrical conductivity. 2 points each, 10 points