

1. For the hexagonal close-packed crystal structure, show the ideal  $c/a$  ratio is 1.633. ( $a$  and  $c$  represent the short and long edge lengths, respectively) (10%)
2. If you have found the stone in mountain, please describe how to identify the composition and phase of the stone. (10%)
3. Briefly explain (a) solid solution (b) screw dislocation (c) Poisson's ration (d) Bragg Law (e) eutectoid reaction. (10%)
4. If you are an engineer to design the dental implant (人工牙根). What kinds of factors would be considered by the concepts of materials? (10%)
5. Please explain why the ceramic show better corrosion resistance than metal. (10%)
6. (a) Draw the schematic tensile engineering stress-strain diagram for an alumina alloy and show (b) the modulus of elasticity (d) the proportional limit (d) the yield strength at a strain offset of 0.002 (e) the tensile strength. (10%)
7. Please explain and compare (a) intrinsic semiconductor and (b) extrinsic semiconductor. (10%)
8. Please describe and explain the strengthening mechanisms for metals. (10%)
9. Please explain (a) graphite is conductive (b) diamond is not conductive. (10%)
10. How to calculate the diffusion coefficient for materials? Please explain. (10%)