



1. Describe a twin and a twin boundary. (5%).
2. Calculate the force of attraction between a K^+ and an O^{2-} ion the centers of which are separated by a distance of 1.5 nm. (15%)
3. Titanium has an HCP crystal structure ad a density of 4.51 g/cm^3 . The atomic mass of Ti is 47.9 g/mol . (30%)
 - (1) What is the volume of its unit cell in cubic meters?
 - (2) If the c/a ratio is 1.58, compute the values of c and a.



4. Please explain the following nouns(10%, 2 points per question)
- point defect
 - quenching
 - phase law
 - eutectic point
 - ductile failure
5. Please describe the main types of metal phase changes and draw a diagram to illustrate the changes(20%)
6. What are the main methods of strain hardening in metals?
Please explain the reason for strain hardening(20%)