DEPARTMENT OF CHEMICAL ENGINEERING, N.I.T SRINAGAR

T-SHEET No.1

Subject: Material Science and Technology **Semester: 5th Sem.**

1. What is unit cell? What is lattice parameter?
2. What is Bravais lattice? How are the Bravais lattices obtained from the primitive cell? How many types of Bravais lattices are there?
3. What is the effective number of atoms in a simple cubic unit cell?
4. What is coordination number (CN)? Show that CN for FCC and HCP structure is 12 while it is 8 for BCC.
5. Show that packing efficiency of FCC is 74% and that of BCC is 68%.
6. Show that the ideal c/a ratio in a hexagonal unit cell is 1.633 and calculate the packing efficiency.
7. What are the coordinates of the centre atom in the BCC unit cell.
8. What is miller index? How is it obtained?
9. Draw the planes ($\bar{1}\bar{1}$ 0), (1$\bar{2}$1), (2$\bar{3}$4), ($\bar{1}$12) and directions[11$\bar{1}$], [123], $\bar{}$[120], [1$\bar{2}$1] in a cubic unit cell.
10. Why it is necessary to include a fourth miller index in the hexagonal system?
11. What is family of planes? Draw the {111} family of planes in cubic system?
12. What is linear density? What is planar density?
13. Find the planar of density {111} planes and linear density of <110> directions in FCC system.
14. What is the linear density of <111> directions in the BCC crystal.
15. What is interplanar spacing? Find the interplanar spacing of the vertical planes in the HCP system?
16. What is the stacking sequence of FCC and HCP crystals?
17. What is slip system?
18. Why FCC metals are ductile while BCC and HCP metals are not?
19. Calculate the theoretical density of Cu from its crystal structure.
20. Lattice constant of Al is 4.05 Å. What is the atomic radius of Al?
21. Calculate the theoretical density of Mg, Cu and Fe and compare them to the standard values.
22. A metal has a density of 10.22 g/cc, atomic weight of 95.94 and atomic radius of 0.136 nm. Is it BCC or FCC?
23. Calculate the planar density of {110} planes in α-Fe (BCC) crystal. a = 0.287 nm.
24. Calculate the linear density of [110] direction in a Cu crystal. a = 0.361 nm.
25. Define Anisotropy.
27. "An array of lattice points that fit in an FCT unit cell should be represented by a BCT cell". Explain.
28. What are interstitial voids? Differentiate tetrahedral voids from Octahedral voids?
29. Copper has FCC structure and atomic radius of 1.278 A. Calculate its theoretical density.
30. Niobium has anatomic radius of 0.1430 nm and a density of 8.57 g/cm^3. Determine whether it has an FCC or BCC crystal structure?

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