

# Quiz

1. Show that only four types of rotational symmetry are possible.
2. Why it is not possible to have 5, 7 or higher order symmetry in crystallography?
3. What is point group? How many point-groups are possible?
4. Find out the Hermann-Mauguin symbol for a cube.
5. For a point at xyz write a translation, a reflection and an inversion operation.
5. What is unit cell? What is lattice parameter?
6. What is Bravais lattice? How are the Bravais lattices obtained from the primitive cell?  
How many types of Bravais lattices are there?
7. What is the effective number of atoms in a simple cubic unit cell?
8. What is coordination number (CN)? Show that CN for FCC and HCP structure is 12 while it is 8 for BCC.
9. Show that packing efficiency of FCC is 74% and that of BCC is 68%.
10. Show that the ideal c/a ratio in a hexagonal unit cell is 1.633 and calculate the packing efficiency.
11. What are the coordinates of the center atom in the BCC unit cell.
12. What is miller index? How is it obtained?
13. Draw the planes ( $\bar{1} \bar{1} 0$ ), ( $1 \bar{2} 1$ ), ( $2 \bar{3} 4$ ), ( $\bar{1} 1 2$ ) and directions  $[1 1 \bar{1}]$ ,  $[123]$ ,  $[120]$ ,  $[1 \bar{2} 1]$  in a cubic unit cell.
14. Why it is necessary to include a fourth miller index in the hexagonal system?
15. Convert the directions  $[112]$ ,  $[1 \bar{2} 3]$ ,  $[110]$ ,  $[111]$ ,  $[130]$  to four indices in a hexagonal lattice.
16. What is family of planes? Draw the  $\{111\}$  family of planes in cubic system?
17. What is linear density? What is planar density?
18. Find the planar of density  $\{111\}$  planes and linear density of  $\langle 110 \rangle$  directions in FCC system.
19. What is the linear density of  $\langle 111 \rangle$  directions in the BCC crystal.
20. What is interplanar spacing? Find the interplanar spacing of the vertical planes in the HCP system?

21. What is the stacking sequence of FCC and HCP crystals?
22. What is slip system?
23. Why FCC metals are ductile while BCC and HCP metals are not?
24. Calculate the theoretical density of Cu from its crystal structure.
25. Lattice constant of Al is 4.05 Å. What is the atomic radius of Al?
26. Calculate the theoretical density of Mg, Cu and Fe and compare them to the standard values.
27. 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?
28. Calculate the volume of the unit cell of Zn crystal.  $a$  and  $c$  of Zn are 266.5 pm and 494.7 pm respectively.
29. Calculate the planar density of {110} planes in  $\alpha$ -Fe (BCC) crystal.  $a = 0.287$  nm.
30. Calculate the linear density of [110] direction in a Cu crystal.  $a = 0.361$  nm.