1. When heated above 916ºC, iron changes its bcc crystalline form to fcc without the change in the radius of atom. The ratio of density of the crystal before heating and after heating is [At . wt. Fe = 56]
(a) 1.069 (b) 0.918 (c) 0.725 (d) 1.231

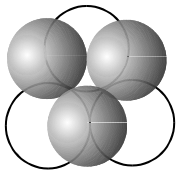
2. In a face centred cubic lattice, atom A occupies the corner positions and atom B occupies the face centre positions. If one atom of B is missing from one of the face centred points, the formula of the compound is:
(a) A_2B (b) AB_2 (c) A_2B_3 (d) A_2B_5

3. Which of the following is/are pseudo solids ?
I. KCI II. Barium chloride dehydrate
III. Rubber IV. Solid cake left after distillation of coal tar
(a) I,III (b) II, III (c) III, IV (d) Only III

4. Which of the following are the correct axial distance and axial angles for rhombohedral system?
(a) $a = b = c, \alpha = \beta = \gamma \neq 90^0$ (b) $a = b \neq c, \alpha = \beta = \gamma = 90^0$
(c) $a \neq b \neq c, \alpha = \beta = \gamma = 90^0$ (d) $a \neq b \neq c, \alpha \neq \beta \neq \gamma \neq 90^0$

5. Body centred cubic lattice has co–ordination number of :
(a) 8 (b) 12 (c) 6 (d) 4

6. The empty space between the shaded balls and hollow balls as shown in the diagram is called

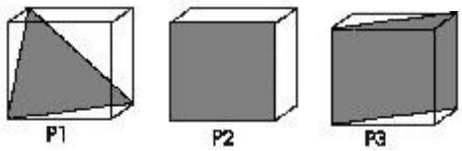


Figure

(a) Hexagonal void (b) Octahedral void
(c) Tetrahedral void (d) Double triangular void

7. Which one of the following schemes of ordering closed packed sheets of equal sized spheres does not generate close packed lattice.
(a) ABCABC (b) ABACABAC
(c) ABBAABBA (d) ABCBCABCBC

8. Following three planes(P_1, P_2, P_3) in an FCC unit cell are shown:



Consider the following statements and choose the correct option that follow:
(i) P_1 contains no voids of three dimensions.
(ii) P_2 contains only Octahedral voids.
(iii) P_3 contains both Octahedral and Tetrahedral voids.
(a) All are true (b) Only (i) & (ii) are true
(c) (i) & (iii) are true (d) Only (iii) is true.

9. Strontium chloride has a fluorite structure, which of the following statement is true for the structure of strontium chloride ?
(a) The strontium ions are in a body–centered cubic arrangement
(b) The strontium ions are in a face–centered cubic arrangement
(c) Each chloride ion is at the center of a cube of 8 strontium ions
(d) Each strontium ion is at the center of a tetrahedron of 4 chloride ions

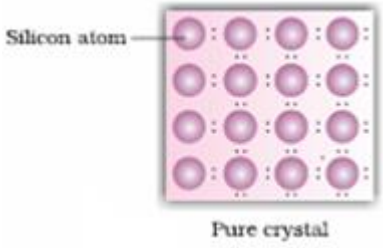
10. Cesium chloride on heating to 760 K changes into
(a) CsCI(g) (b) NaCI structure
(c) Antifluorite structure (d) ZnS structure

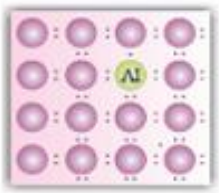
11. F–centers are
(a) The electrons trapped in anionic vacancies

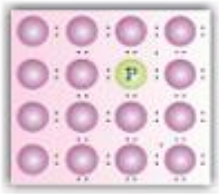
(b) The electrons trapped in cation vacancies
(c) Non-equivalent sites of stoichiometric compound
(d) All of the above

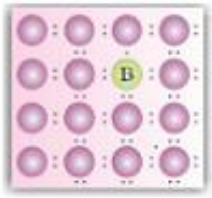
12. Which statements is/are true about HCP and CCP lattice
(a) Number of tetrahedral voids are twice of octahedral holes
(b) 12 tetrahedral and 6 octahedral voids are present in one HCP unit cell
(c) C.N. of HCP unit cell is 12
(d) If atom of tetrahedral voids displace into octahedral voids then it is Schootky defect.

13. A perfect crystal of silicon (Fig). is doped with some elements as given in the options. Which of these options show n-type semiconductors?



(a) 

(b) 

(c) 

(d) 

14. You are given 6 identical balls.What is the maximum number of square voids and triangular voids(in separate arrangements) that can be created?
(a) 2 , 4 (b) 4 , 2 (c) 4 , 3 (d) 3 , 4

15. Consider a cube 1 of Body Centered Cubic unit cell of edge length a now atom at the body center can be viewed to be lying on the corner of another cube 2.Find the volume common to cube 1 and cube 2.
(a) $\frac{a^3}{27}$ (b) $\frac{a^3}{64}$ (c) $\frac{a^3}{2\sqrt{2}}$ (d) $\frac{a^3}{8}$

16. An element (atomic mass = 100 g/mole) having bcc structure has unit cell edge 400 pm. The density of the element is (no. of atoms in bcc(Z) = 2).
(a) 2.144 g/cm^3 (b) 5.2 g/cm^3
(c) 7.289 g/cm^3 (d) 10.376 g/cm^3

17. In a compound, oxide ions are arranged in cubic close packing arrangement. Cations A occupy one-sixth of the tetrahedral voids and cations B occupy one-third of the octahedral voids. The formula of the compound is
(a) A_2BO_3 (b) AB_2O_3 (c) $A_2B_2O_2$ (d) ABO_3

18. Platinum crystallizes in a face-centered cubic crystal with a unit cell length 'a'. The distance between nearest neighbors is :
(a) a (b) a $\frac{\sqrt{3}}{2}$ (c) a $\frac{\sqrt{2}}{2}$ (d) a $\frac{\sqrt{2}}{4}$

19. Platinum crystallises in a face centered cube crystal with a unit cell length of 3.9231 Å. The density and atomic radius of platinum are respectively. [Atomic mass of Pt = 195]

(a) 45.25 g. cm^{-3}, 2.516 Å (b) 21.86 g. cm^{-3}, 1.387 Å
(c) 29.46 g. cm^{-3}, 1.48 Å (d) None of these

20. Given an alloy of Cu, Ag and Au in which Cu atoms constitute the CCP arrangement.If the hypothetical formula of the alloy is Cu_4Ag_3Au. What are the probable locations of Ag and Au atoms.
(a) Ag - all Tetrahedral voids; Au - all Octahedral voids
(b) Ag - 3/8th Tetrahedral voids; Au - 1/4th Octahedral voids
(c) Ag - 1/2 Octahedral voids; Au - 1/2 Tetrahedral voids
(d) Ag - all Octahedral voids; Au - all tetrahedral voids

21. The coordination number of cation and anion in Fluorite CaF_2 and Rutile TiO_2 are respectively :
(a) 8 : 4 and 6 : 3 (b) 6 : 3 and 4 : 4
(c) 6 : 6 and 8 : 8 (d) 4 : 2 and 2 : 4

22. The compound AB crystallizes in a cubic lattice in which both A and B atoms have coordination numbers of 8. To what crystal class does the unit cell belong ?
(a) CsCI structure (b) NaCI structure
(c) ZnS structure (d) AI_2O_3 structure

23. Zinc sulphide exists in two different forms-zinc blende and wurtzite. Both occur as 4:4 co-ordination compounds. Choose the correct option from among the following :
(a) Zinc blende has a bcc structure and wurtzite an fcc structure
(b) Zinc blende has an fcc structure and wurtzite an hcp structure
(c) Zinc blende as well as wurtzite have a hcp structure
(d) Zinc blende as well as wurtzite have a cpp structure

24. BaO has a rock-salt type structure. When subjected to high pressure, the ratio of the coordination number of Ba^{+2} ion to O^{-2} changes to
(a) 4 : 8 (b) 8 : 4 (c) 8 : 8 (d) 4 : 4

25. In the Schoottky defect :
(a) Cations are missing from the lattice sites and occupy the interstitial sites
(b) Equal number of cations and anions are missing
(c) Anion are missing and electrons are present in their place
(d) Equal number of extra cations and electrons are present in the interstitial sites

26. The number of atoms per unit cell in a simple cubic, face-centered cubic and body-centered cubic are ……. respectively -
(a) 1 , 4, 2 (b) 4, 1, 2 (c) 2, 4, 1 (d) 4, 8, 2

27. An element 'A' has face-centred cubic structure with edge length equal to 361 pm. The apparent radius of atom 'A' is -
(a) 127.6 pm (b) 180.5 pm (c) 160.5 pm (d) 64 pm

28. In a CCP lattice of X and Y, X atoms are present at the corners while Y atoms are at face centres. Then the formula of the compound would be if one of the X atoms from a corner is replaced by Z atoms (also monovalent) ?
(a) $X_7Y_{24}Z_2$ (b) $X_7Y_{24}Z$ (c) $X_{24}Y_7Z$ (d) $XY_{24}Z$

29. The number of nearest neighbours to each sphere in hexagonal close packing pattern in its own layer will be:
(a) 4 (b) 6 (c) 12 (d) 8

30. Which of the following statements is correct in the rock-salt structure of ionic compounds?
(a) Co-ordination number of cation is four whereas that of anion is six.
(b) Co-ordination number of cation is six whereas that of anion is four.
(c) Co-ordination number of each cation and anion is four.
(d) Co-ordination number of each cation and anion is six.

1. (b)

$$\rho_1 = \frac{2\times 56}{\left(\frac{4r}{\sqrt{3}}\right)^3}$$

$$\rho_2 = \frac{4\times 56}{\left(2\sqrt{2}r\right)^3} \qquad \therefore \ \frac{\rho_1}{\rho_2} = 0.918$$

2. (d)

$A_{8\times\frac{1}{8}}\ B_{5\times\frac{1}{2}}$

Formula of compound A_2B_5

3. (c)

KCl & $BaCl_2.2H_2O$ are ionic solids and not pseudo solids (amorphous solids).

4. (a)

for rhombohedral system, axial distance and axial angles are $a = b = c$, $\alpha = \beta = \gamma \neq 90^0$

5. (a)

For bcc unit cell coordination number = 8 (In bcc crystal structure, the co-ordination no. is 8 because each atom touches four atom in the layer above it, four in the layer below it and none in its own layers).

6. (b)

It is a octahedral void.

7. (c)

In ABB AABB A, there is no close packing as there are repeated planes adjacent to each other.

8. (a)

Refer theory octahedral & tetrahedral voids about positions of P_1, P_2 and P_3

9. (b)

$SrCl_2$ is AB_2 type in which cation is of large size.

10. (b)

On increasing temp^r C.N. decreases.

$\therefore$ CsCl (8 : 8) structure changes into (6 : 6) NaCl type structure.

11. (a)

F-centers are the electrons trapped in anionic vacancies.

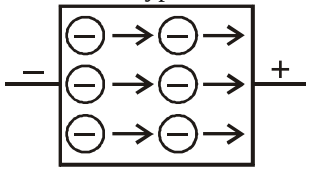
12. (a)

These are facts.

13. (a)

When silcon is doped with some group-15 element, the some of the positions in the lattice are substituted by atoms fo groups -15 elements have five valence electrons. After forming the four covalent bonds with silicon (or anyother group-14 element such as germanium). one excess electron is left on them.

Since this electron is not involed in bonding it becomes delocalized and contributre to electrical conduction. Silicon dped with group 15 element behaves as a n-type semconductor.



n-type semiconductor

14. (a)

2 Square Voids (4)

15. (d)

Common Volume = $\left(\frac{a}{2}\right)^3 = \frac{a^3}{8}$

[$\therefore$ Common vol is a cube of edge length $\frac{a}{2}$]

16. (b)

density = $\frac{Z \times M}{N_A \times a_3} = \frac{2 \times 100}{6 \times 10^{23} \times (400 \times 10^{-10})^3} = 5.2\ g/cm^3$

17. (d)

no. of oxide ions = 4

no. of A particles = $\frac{1}{6} \times 8 = \frac{4}{3}$

no. of B particles = $\frac{1}{3} \times 4 = \frac{4}{3}$

so formula is $A_{4/3}\ B_{4/3}O_4$ or ABO_3

18. (c)

Distance between nearest neighbours is along the face diagonal = $\frac{a\sqrt{2}}{2}$.

19. (b)

Density = $\frac{Z \times M}{N_A \times a^3} = \frac{4 \times 195}{6.02 \times 10^{23} \times (3.9231 \times 10^{-8})^3}$

= 21.86 g/cm^3

for fcc lattice, 4r = $a\sqrt{2}$

so, r = $\frac{a\sqrt{2}}{4} = \frac{3.9231\sqrt{2}}{4}$ Å = 1.387 Å.

20. (b)

Cu_4 Ag_3 Au

↓ ↓ ↓

Froms c.c.p. , $\frac{3}{8}$ th of tetrahedral voids , $\frac{1}{4}$ of Octahedral voids [$\therefore$ No. of O- voids = 4]

z = 4, [$\therefore$ No. of T- voids = 8].

21. (a)

It is a fact.

22. (a)

It is a fact.

23. (b)

These are isomorphous.

24. (c)

On increasing pressure, C.N. increases. $\Rightarrow$ 6 : 6

changes to 8 : 8 .

25. (b)
See Sol. E-8.

26. (a)
$sc = \frac{8}{8} = 1$

$fcc = \frac{8}{8} + \frac{6}{2} = 4$

$bcc = \frac{8}{8} + \frac{1}{1} = 2$

27. (a)
$a\sqrt{2} = 4r$

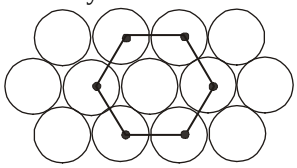
$r = \frac{\sqrt{2}a}{4}$

$= \frac{1.414 \times 361}{4}$

$= 127.6$ pm

28. (b)
$X_{\frac{7}{8}}\ Y_3\ Z_{\frac{1}{8}} \Rightarrow \therefore X_7Y_{24}Z$

29. (b)
Number of nearest neighbours in hcp pattern in its own layer = 6.



30. (d)
In NaCl structure, C.N. of each cation & anion is six.