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Properties and Types of solids

- (a) Both gases and liquids possess fluidity and hence viscosity molecules in the solid state do not have translational motion.
- 2. (b) It is a characteristic of liquid crystal.
- **3.** (a) $BaTiO_3$ is a ferroelectric compound.
- **5.** (b) The value of heat of fusion of *NaCl* is very high due to *fcc* arrangement of its ions.
- 6. (c) Piezoelectric crystals are used in record player.
- **8.** (b) *NaCl* is a ionic solid in which constituent particles are positive (Na^+) and negative (Cl^-) ions.
- 9. (d) Amorphous solids have short range order but no sharp in melting point.
- 10. (d) Solids have definite shape, size and rigidity.
- 12. (a) In crystalline solid there is perfect arrangement of the constituent particles only at 0*K*. As the temperature increases the chance that a lattice site may be unoccupied by an ion increases. As the number of defects increases with temperature solid change in liquid.
- (c) Diamond is a covalent solid in which constituent particles are atoms.
- 14. (c) Solid NaCl is a bad conductor of electricity because ions are not free to move.
- **15.** (a) The existence of a substance in more than one crystalline form is known as polymorphism.
- 16. (a) Solids are also non-crystalline in nature.
- 17. (a) Ice has the lowest melting point out of the given solids, hence it has the weakest intermolecular forces.
- **19.** (c) All metals and some alloys are metallic crystal.
- 20. (c) Iodine crystals are molecular crystals, in which constituent particles are molecules having interparticle forces are Vander Waal's forces.
- **21.** (b) Ionic solids have highest melting point due to strong electrostatic forces of attraction.
- (d) For *n*-type, impurity added to silicon should have more than 4 valence electrons.
- 23. (d) Glass is an amorphous solid.
- **25.** (a) Crystalline solids have regular arrangement of constituent particles, sharp melting points and are anisotropic.
- 26. (d) Sugar is a crystalline solid while glass, rubber and plastic are amorphous solids.
- **28.** (a) MnO_2 is antiferromagnetic.
- **29.** (d) Graphite is sp^2 hybridised and a covalent crystal.
- 30. (d) Ionic crystals exhibit non-directional properties of the bond.
- **31.** (d) Ice is a molecular crystal in which the constituent units are molecules and the interparticle forces are hydrogen bonds.
- **32.** (a) Quartz is a covalent crystal having a framework of silicates or silica, *i.e.* a three dimensional network when all the four oxygen atoms of each of SiO_4 tetrahedron are shared.
- **33.** (c) Metallic crystals are good conductor of heat and current due to free electrons in them.
- **34.** (a) Silicon is a covalent crystal in which constituent particles are atoms.

- **35.** (b) *LiF* is an example of ionic crystal solid, in which constituent particles are positive (Li^+) and negative (F^-) ions.
- 36. (a) Amorphous solids neither have ordered arrangement (*i.e.* no definite shape) nor have sharp melting point like crystals, but when heated, they become pliable until they assume the properties usually related to liquids. It is therefore they are regarded as super-cooled liquids.
- **37.** (a) Silicon is a semiconductor because it is a thermal active and its conductivity increased with increasing temperature.
- 38. (b) Amorphous solids are isotropic, because of these substances show same properties in all directions.
- **39.** (c) Polymorphism is a ability of a substances which show two or more crystalline structure
- 40. (ac) Amorphous solids neither have ordered arrangement (*i.e.* no definite shape) nor have sharp melting point like crystals, but when heated, they become pliable until they assume the properties usually related to liquids. It is therefore they are regarded as super-cooled liquids.

Crystallography and Lattice

- 1. (b) A crystal system is hexagonal if its unit cell having $a = b \neq c$ axial ratio and $\alpha = \beta = 90^{\circ}$, $\gamma = 120^{\circ}$ axial angles.
 - (c) Rhombohedral crystal system

$$a = b = c$$
, $\alpha = \beta = \gamma \neq 90^{\circ}$

$$ex - NaNO_3$$
, $CaSO_4$, calcite $CaCO_3$, HgS

- (b) Tetragonal system has the unit cell dimension $a = b \neq c, \alpha = \beta = \gamma = 90^{\circ}.$
- (a) Space lattice of CaF_2 is face centred cubic.
- (a) For body centred cubic arrangement co-ordination number is 8 and radius ratio (r_+ / r_-) is 0.732 1.000.
- (b) There are 14 Bravais lattices (space lattices).
- (d) Monoclinic sulphur is an example of Monoclinic crystal system.
- (b) r = 0.414 r.

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- **11.** (c) Each unit cell of *NaCl* contains 4 *NaCl* units.
- 12. (c) For tetrahedral arrangement co-ordination number is 4 and radius ratio (r_{+}/r_{-}) is 0.225 0.414.
 - (a) Face-centred cubic lattice found in KCl and NaCl.
- 14. (c) Definition of unit cell.
- 16. (b) In *NaCl* (rock salt) : Number of Na^+ ions = 12 (at edge centers) $\times \frac{1}{4} + 1$ (at body centre) $\times 1 = 4$. Number of

$$Cl^{-}$$
 ions = 8 (at corners) $\times \frac{1}{8} + 6$ (at face centre) $\times \frac{1}{2} = 4$

Thus 4 formula units per unit cell.

- (b) Lowest potential energy level provides stable arrangement.
- 18. (b) The seven basic crystal lattice arrangements are :- Cubic, Tetragonal, Orthorhombic, Monoclinic, Hexagonal, Rhombohedral and Triclinic.
 - (a) The conditions for monoclinic crystal system.
- 20. (a) High lattice energy of $BaSO_4$ causes low solubility of $BaSO_4$ in water.
- **21.** (c) 14 kinds of Bravais lattices (space lattices) are possible in a crystal.
- (d) Radius ratio in *TlCl* is 0.732 1.000 and co-ordination number is 8 and arrangement is body centred cubic.
- **23.** (c) Zinc blende (ZnS) has *fcc* structure and is an ionic crystal having 4:4 co-ordination number.

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- Na_2O has antifluorite (A_2B) type structure. 24. (d)
- Zinc blende (ZnS) has fcc structure and is an ionic crystal 25 (b) having 4 : 4 co-ordination number.

28. (d)
$$\frac{1}{8} \times 8$$
 (at corners) = 1

 $\frac{1}{2} \times 6$ (at face centre) = 3

Z = 1 + 3 = 4 (total no. of atoms)

Crystal packing

(b) Number of tetrahedral voids in the unit cell 1.

= $2 \times \text{number of atoms} = 2Z$.

- 2. (b) The system ABC ABC is also referred to as face-centred cubic or fcc.
- (d) It represents ccp arrangement. 3
- BCC has a coordination number of 8. (a) 4
- 5 (b) In rock salt structure the co-ordination number of Na^+ : $Cl^$ is 6:6
- The bcc cell consists of 8 atoms at the corners and one atom at 6. (d) centre.

$$\therefore n = \left(8 \times \frac{1}{8}\right) + 1 = 2$$

The fcc cell consists of 8 atoms at the eight corners and one atom at each of the six faces. This atom at the face is shared by two unit cells.

$$\therefore n = 8 \times \frac{1}{8} + \left(6 \times \frac{1}{2}\right) = 4.$$

7. AB_2 type of structure is present in CaF_2 (c)

$$\therefore AB_2 \rightleftharpoons A^{2+} + 2B^-; \quad CaF_2 \rightleftharpoons Ca^{2+} + 2F^-$$

8. (b) Potassium (K) has bcc lattice.

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- Number of atoms per unit cell in *bcc* system = 2. (b)
- In body centred cubic, each atom/ion has a coordination 10. (b) number of 8.
- 11. (d)Number of octahedral sites = Number of sphere in the packing. \therefore Number of octahedral sites per sphere = 1.
- 12 (c) ABAB is hexagonal close packing.
- Sodium $(N\alpha)$ is a body cube. 13. (a)
- SrF_2 has fluorite (CaF_2) type structure. (b) 14
- In ZnS structure, sulphide ions occupy all FCC lattice points 15. (b) while Zn ions are present in alternate tetrahedral voids.
- 16. (b) MgO contains rock salt (NaCl) structure.
- CaF_2 (fluorite) has fcc structure with 8 : 4 coordination 17. (c) number.
- Every constituent has two tetrahedral voids. In ccp lattice 18. (b) atoms

 $= 8 \times \frac{1}{8} + 6 \times \frac{1}{2} = 4$ \therefore Tetrahedral void $\,=4\times 2=8$, Thus ratio = 4:8::1:2.

- Tetrahedral sites one double comparable to octahedral sites 19. (c) then ratio of X and Z respectively 2 : 1 since formula of the compound X_2Z .
- A atoms are at eight corners of the cube. Therefore, the no. of 20. (c) A atoms in the unit cell = $\frac{8}{8} = 1$. B atoms are at the face centre of six faces. Therefore, its share in the unit cell = $\frac{6}{2} = 3$. The formula is *AB*,

In *bcc* structure 68% of the available volume is occupied by 21. (a) spheres. Thus vacant space is 32%. 22.

Number of atoms in the cubic close packed structure = 8. (c) 1

Number of octahedral voids
$$=\frac{1}{2} \times 8 = 4$$

Co-ordination number in HCP and CCP arrangement is 12 23. (a) while in *bcc* arrangement is 8.

4. (d) In
$$NaCl$$
 (rock salt) : Number of Na^+ ions = 12 (at edge centers) $\times \frac{1}{4} + 1$ (at body centre) $\times 1 = 4$. Number of Cl^- ions
= 8 (at corners) $\times \frac{1}{8} + 6$ (at face centre) $\times \frac{1}{2} = 4$. Thus 4

formula units per unit cell.

Co-ordination number in HCP = 12(b)

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- Co-ordination number in Mg is also = 12
- (a) All are the iso-electronic species but Na^+ has low positive 26. charge so have largest radius.

Mathematical analysis of cubic system and **Bragg's equation**

- (b) Density of unit cell = $\frac{N \times \text{mol.wt}(M)}{V(=a^3) \times \text{avogadro no.}(N_o)} g \, cm^{-3}$ (b) Distance between K^+ and $F^- = \frac{1}{2} \times \text{length of the edge}$ There are two atoms in a *bcc* unit cell. з. (a) So, number of atoms in 12.08×10^{23} unit cells $= 2 \times 12.08 \times 10^{23} = 24.16 \times 10^{23} atom.$ *bcc* structure has one atom shared by 1 unit cell. (b) 4.

 - (h) The structural arrangement of co-ordination number '6' is octahedral and its radius ratio is 0.414 - 0.732. The example of octahedral is KCl and NaCl.
 - The number of spheres in one body centred cubic and in one (a) face centred cubic unit cell is 2 and 4 respectively.
 - (b) Closest approach in *bcc* lattice

$$= \frac{1}{2} \text{ of body diagonal} = \frac{1}{2} \times \sqrt{3}a \qquad = \frac{\sqrt{3}}{2} \times 4.3 = 3.72 \text{ Å}.$$
(a) $M = \frac{\rho \times a^3 \times N_0 \times 10^{-30}}{\rho \times a^3 \times N_0 \times 10^{-30}}$

$$= \frac{10 \times (100)^3 \times (6.02 \times 10^{23}) \times 10^{-30}}{4} = 15.05$$

No. of atoms in 100 g = $\frac{6.02 \times 10^{23}}{15.05} \times 100 = 4 \times 10^{25}$

(c) Cs^+ and I^- have largest sizes. 11.

12. (c)
$$58.5 g NaCl = 1 mole = 6.02 \times 10^{23} Na^+ Cl^- units.$$

One unit cell contains $4 Na^+Cl^-$ units. Hence number of unit cell present

15.05

$$=\frac{6.02\times10^{23}}{4}=1.5\times10^{23}.$$

(a)
$$\frac{1}{58.5} \times 6.023 \times 10^{23} = 1.029 \times 10^{22}$$

A unit cell contains $4 Na^+$ ion and $4 Cl^-$ ions

.Unit cell =
$$\frac{1.029 \times 10^{22}}{4} = 2.57 \times 10^{21}$$
 unit cell.

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- 14. (b) Bragg's equation is nλ = 2d sinθ where n is an integer *i.e.* 1, 2, 3, 4 etc.
 15. (d) Face centred cubic structure contribute of 1/8 by each atom
- present on the corner and 1/2 by each atom present on the face.

16. (c) As
$$CsCl$$
 is body-centred, $d = \sqrt{3a/2}$

17. (a) Radius of Na (if bcc lattice)
$$=\frac{\sqrt{3}a}{4}=\frac{\sqrt{3}\times 4}{4}$$

 $= 1.8574 \text{\AA} = 1.8574 \times 10^{-8} \text{ cm}$

18. (b) The crystals in which radius ratio value is found between 0.225-0.414 shows tetrahedral crystal structure.

19. (d) For
$$bcc; d = \frac{\sqrt{3}}{2} a$$
 or $a = \frac{2d}{\sqrt{3}} = \frac{2 \times 4.52}{1.732} = 5.219 \text{ Å} = 522 \, pm$

$$\rho = \frac{Z \times M}{a^3 \times N_0 \times 10^{-30}} = \frac{2 \times 39}{(522)^3 \times (6.023 \times 10^{23}) \times 10^{-30}}$$

$$= 0.91 \, g \, / \, cm^3 = 910 \, kg \, m^{-3}$$

- 20. (c) The value of ionic radius ratio is 0.52 which is between 0.414 0.732, then the geometrical arrangement of ions in crystal is octahedral.
- **21.** (c) The number of atoms present in *sc, fcc* and *bcc* unit cell are 1, 4, 2 respectively.
- (b) The number of atoms present in *sc, fcc* and *bcc* unit cell are 1, 4, 2 respectively.

23. (d)
$$Cl^- Na^+ Cl^-$$

 x^-
 $a = 2x$
24. (a) $r = \frac{a}{2\sqrt{2}}; r = \frac{620}{2\sqrt{2}} = 219.25 Pm$

$$25. (c) Z = \frac{V \times N_0 \times d}{M}$$

$$=\frac{4.2\times8.6\times8.3\times10^{-24}\times6.023\times10^{23}\times3.3}{155}=3.84=4$$

26. (b) Volume of unit cell
$$= a^3$$

= $(3.04 \times 10^{-8} cm)^3 = 2.81 \times 10^{-23} cm^3$

27. (b) In *FCC*
$$4r = \sqrt{2}a$$

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

Crystal structure and Coordination number

- (b) In a unit cell, W atoms at the corner = 1/8 × 8 = 1
 O atoms at the centre of edges = 1/4 × 12 = 3
 Na atoms at the centre of the cube = 1
 W: O: Na = 1:3:1, hence formula = NaWO₃
 (d) For bcc lattice, co-ordination number is 8.
- 3. (b) Body centered cubic lattice has a co-ordination number 8.

- 4. (a) A atoms are at eight corners of the cube. Therefore, the number of A atoms in the unit cell $=\frac{8}{8}=1$, atoms B per unit cell = 1. Hence the formula is AB.
 - (d) Co-ordination number for *Cu* is 12.

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- 6. (b) Each Cs^+ in CsCl is surrounded by eight Cl^- and each Cl^- in CsCl is surrounded by eight Cs^+ .
 - (d) X atoms are at eight corners of the cube. Therefore, the number of X atoms in the unit cell $=\frac{8}{8}=1$.

Y atoms are at the face centre of six faces. Therefore, its share in the unit cell $= \frac{6}{2}$. The formula is *XY*

in the unit cell $=\frac{6}{2}=3$. The formula is XY_3 .

8. (a) Let the units of ferrous oxide in a unit cell = n, molecular weight of ferrous oxide (*FeO*) = 56 + 16 = 72 g mol⁻¹,

weight of *n* units =
$$\frac{72 \times n}{6.023 \times 10^{23}}$$

Volume of one unit = (lengthof corner)³

$$= (5 \text{\AA})^3 = 125 \times 10^{-24} \text{ cm}^3$$

Density = $\frac{\text{wt.ofcell}}{\text{volume}}$, $4.09 = \frac{72 \times n}{6.023 \times 10^{23} \times 125 \times 10^{-24}}$
 $n = \frac{3079.2 \times 10^{-1}}{72} = 42.7 \times 10^{-1} = 4.27 \approx 4$

(b) In NaCl crystal Na^+ ions has coordination number 6.

- 10. (b) Cl^{-} ions in CsCl adopt *BCC* type of packing.
 - (d) There were 6 A atoms on the face-centres removing face-centred atoms along one of the axes means removal of 2 A atoms.
 Now, number of A atoms per unit cell

$$= 8 \times \frac{1}{8} + 4 \times \frac{1}{2} = 3$$
(corners) (face-centred)

Number of *B* atoms per unit cell

$$= \frac{12 \times \frac{1}{4}}{(\text{edge centred})} + \frac{1}{(\text{body centred})}$$

Hence the resultant stoichiometry is A_3B_4

- (a) In Cs^+Cl^- crystal co-ordination number of each ion is 8.
- (b) $r_{+}/r_{-} = \frac{180}{187} = 0.962$ which lies in the range of 0.732 1.000, hence co-ordination number = 8 *i.e.* the structure is *CsCl* type.
- (a) In diamond, C-atoms are arranged in a regular tetrahedral structure.
- 15. (b) In *hcp*, co-ordination no. is 12.
- **16.** (c) Mg has 6 co-ordination number (*fcc* structure).
- 17. (d) In NaCl crystal every Na^+ ion is surrounded by $6Cl^-$ ion and every chloride ion is surrounded by $6Na^+$ ion.
- 18. (d) Crystals show good cleavage because their constituent particles are arranged in planes.
- **19.** (b) Fe_3O_4 is a non-stoichiometric compound because in it the ratio of the cations to the anions becomes different from that indicated by the chemical formula.
- 20. (d) The radius ratio for co-ordination number 4, 6 and 8 lies in between the ranges [0.225-0.414], [0.414-0.732] and [0.732-1] respectively.

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- (c) The radius ratio for co-ordination number 4, 6 and 8 lies in between the ranges [0.225-0.414], [0.414-0.732] and [0.732-1] respectively.
- **22.** (b) In Na_2O , each oxide ions (O^{2^-}) is co-ordinated to $8Na^+$ ions and each Na^+ ion to 4 oxide ions. Hence it has 4 : 8 co-ordination.
- 23. (b) When radius ratio between 0.732-1, then co-ordination number is 8 and structural arrangement is body-centred cubic.
- **24.** (c) Each Cs^+ is surrounded by eight Cl^- ions in CsCl crystal lattice because its co-ordination number is 8 : 8.
- 25. (a) NaCl has fcc arrangement of ions.
- **26.** (c) Each Na^+ is surrounded by six Cl^- ions in NaCl crystal lattice because its co-ordination number is 6:6.
- **27.** (b) Zinc blende (ZnS) has *fcc* structure and is an ionic crystal having 4:4 co-ordination number.
- **30.** (d) In a simple cubic structure

 $z = \frac{1}{8} \times 8$ (atoms one at a corners)

- **31.** (a) Co-ordination number in hcp structure is 12.
- **32.** (acd) A metal that crystallizes in *bcc* structure has a co-ordination number of 8.
- **33.** (a) In sodium chloride, each Na^+ ion is surrounded by six Cl^- ions and each Cl^- ion is surrounded by six Na^+ ions. Thus, both the ions have coordination number six.
- 34. (b) The Ca²⁺ ions are arranged in (ccp) arrangement, i.e. Ca²⁺ ions are present at all corners and tat the centre of each face of the cube. the fluoride ions occupy all the tetrahedral sites. This is 8 : 4 arrangement i.e., each Ca²⁺ ion is surrounded by 8F⁻ ions and each F⁻ ion by four Ca²⁺ ions.

Defects in crystal

- (c) When polar crystal is subjected to a mechanical stress, electricity is produced – a case of piezoelectricity. Reversely, if electric field is applied, mechanical stress is developed. Piezoelectric crystal acts as a mechanical electrical transductor.
- (b) More is the Schottky defect in crystal more is the decrease in density.
- **3.** (d) All the given statements are correct about *F*-centres.
- **5.** (a) As each Sr^{2+} ion introduces one cation vacancy, therefore concentration of cation vacancies = mol % of $SrCl_2$ added.
- **6.** (c) Yellow colour on heating *NaCl* in presence of *Na* is due to presence of electrons in anion vacancies (*F*-centres).
- (d) Frenkel's defect is due to shift of an ion from the normal lattice site (Creating a vacancy) and occupy interstitial spaces.
- 8. (c) AgBr exhibits Frenkel defect due to large difference in the size of Ag^+ and Br^- ions.
- **9.** (d) Schottky defects occurs in highly ionic compounds which have high co-ordination number ex. *NaCl*, *KCl*, *CsCl*.
- (d) Schottky defect is due to missing of equal number of cations and anions.
- (a) Schottky defect is due to missing of equal number of cations and anions.
- (a) Impurity present in a crystal does not establish thermal equilibrium.
- 13. (c) Since no ions are missing from the crystal as a whole, there is no effect on density.
- 15. (b) On adding non-metal in metal the metal becomes less tensile.

- **16.** (c) AgBr exhibits Frenkel defect due to large difference in the size of Ag^+ and Br^- ions.
- **17.** (c) Both are stoichiometric crystalline defects.
- **18.** (c) Brass, Cu = 80%, Zn = 20% substitutional alloy.
 - Steel is an interstitial alloy because it is an alloy of *Fe* with *C*, *C* atoms occupy the interstitial voids of *Fe* crystal.
- 19. (d) In metal excess defect when holes created by missing of anions are occupied by electrons, there sites are called *F*-centres and are responsible for colour in the crystal.
- 20. (c) KBr exhibits Schottky defect and not Frenkel defect.
- 21. (c) When cation shifts from lattice to interstitial site, the defect is called Frenkel defect.
- 22. (d) F-centres are the sites where anions are missing and instead electrons are present, they are responsible for colour.

Critical Thinking Questions

- (c) Amorphous solids neither have ordered arrangement (*i.e.* no definite shape) nor have sharp melting point like crystals, but when heated, they become pliable until they assume the properties usually related to liquids. It is therefore they are regarded as super-cooled liquids.
- 2. (c) Silicon due to its catenation property form network solid.
 - (c) Orthorhombic geometry has $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^{\circ}$. The shape of match box obey this geometry.

(d) In a triclinic crystal has no notation of symmetry.

- (a) In NH_3 molecule, the original appearance is repeated as a result of rotation through 120^o . Such as axis is said to be an axis of three-fold symmetry or a triad axis.
- (a) Na_2O has antifluorite (A_2B) type structure.
- 7. (b) Cationic radius increases down the group and decreases along the period.
- 8. (c) Distance between centres of cation and anion $= \frac{d}{2} = \frac{508}{2} = 254 \, pm$

$$r_c + r_a = 254 \ pm$$
 or $110 + r_a = 254$ or $r_a = 144 \ pm$

9. (b)
$$\rho = \frac{n \times M}{a^3 \times N_0 \times 10^{-30}}$$

= $\frac{2 \times 100}{a^3 \times N_0 \times 10^{-30}}$

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$$=\frac{2\times100}{(400)^3\times(6.02\times10^{23})\times10^{-30}}=5.188\,g/cm^3$$

(a) NaCl structure
$$\xrightarrow{\text{High pressure}}$$
 CsCl structure (6:6 co.-ord.)

(a) Difference =
$$2.178 \times 10^3 - 2.165 \times 10^3 = 0.013 \times 10^3$$

Fraction unoccupied =
$$\frac{5.013 \times 10^{3}}{2.178 \times 10^{3}} = 5.96 \times 10^{-3}$$

- 12. (c) $CsBr_3$ consist of Cs^+ and Br_3^- ions.
- **13.** (a) Each Cs^+ is surrounded by eight Cl^- ions in CsCl crystal lattice because its co-ordination number is 8 : 8.
- 14. (b) In each CaF_2 each calcium cation is surrounded by eight fluoride anions in a body centred cubic arrangement. Each fluoride ion is in contact with four calcium ions. Thus CaF_2 has 8 : 4 co-ordination number.
 - (c) The radius ratio for co-ordination number 4, 6 and 8 lies in between the ranges [0.225-0.414], [0.414-0.732] and [0.732-1] respectively.



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- 17. (b) In this diagram, equal number of cations (Na^+) and anions (Cl^-) are missing, so it, shows schottky defect.
- 18. (c) Zeolite is a three dimensional silicate because of in the silicates all the four oxygen atoms at $(SiO_4)^{-4}$ tetrahedra are shared with other tetrahedra, vesulting in a three dimensional network.

Assertion & Reason

- 1. (b) It is true that in the dimond structure, carbon atoms are arranged in tetrahedrally (sp^3 hybridized) but it is not the correct explanation of assertion.
- 2. (d) Tetrahedral holes are smaller in size than octahedral holes. Cations usually occupy less space than anions.
- (d) Crystalline solids have regular arrangement of constituent particles and are anisotropic whereas amorphous solids have no regular arrangement and are isotropic.
- (a) Schottky defect is due to missing of equal number of cations and anions.
- (b) Space or crystal lattice is a regular repeating arrangement of points in space and forms the basis of classification of all structures.
- 6. (c) Tetrahedral void is so called because it is surrounded by four spheres tetrahedrally while octahedral void is so called because it is surrounded by six spheres octahedrally.
- 7. (c) Two corners per tetrahedron one shared in both the cases.
- 8. (b) When an atom or an ion is missing from its normal lattice site, a lattice vacancy or defect is created, which is called schottky defect. Due to missing density of crystal will be lowered.
- 9. (b) On heating, the metal atoms deposit on the surface and finally they deffuse into the crystal and after ionisation the alkali metal ion occupies cationic vacancy where as electron occupies anionic vacancy.
- 10. (a) In case of semiconductors, the gap between valence band and the conduction band is small and there fore some of the electrons may jump from valence band to conduction band and thus on increasing temperature conductivity is also increased.
- (a) All magnetically ordered solids (ferromagnetic and antiferromagnetic solids) transform to the paramagnetic state at high temperature due to the randomisation of spins.
- 12. (c) In piezoelectric crystals, the dipoles may align them selves in an ordered manner such that there is a net dipole moment in the crystal.