

SOLID STATE

- Q.1** The most efficient packing of similar spheres is obtained in-
- (A) The simple cubic system and the body centered cubic system
 - (B) The simple cubic system and the hexagonal close packed system.
 - (C) The face centered cubic system and the hexagonal close packed system.
 - (D) The body centered cubic system and the face centered cubic system.
- Q.2** If the ratio of co-ordination no. P to that of Q be Y : Z, then the formula of the solid is-
- (A) P_yQ_z
 - (B) P_zQ_y
 - (C) $P_{1/y}Q_{1/z}$
 - (D) None
- Q.3** Xenon crystalizes in face centre cubic lattice and the edge of the unit cell is 620 pm, then radius of xenon atom is-
- (A) 438.5 pm
 - (B) 219.20 pm
 - (C) 536.94 pm
 - (D) 265.5 pm
- Q.4** The arrangement of Cl^- ions in CsCl structure is-
- (A) hcp
 - (B) fcc
 - (C) bcc
 - (D) Simple cubic
- Q.5** In closest packing of A type of atoms (radius, r_A), the radius of atom B that can be fitted into Octahedral void is-
- (A) $0.155 r_A$
 - (B) $0.125 r_A$
 - (C) $0.414 r_A$
 - (D) $0.732 r_A$
- Q.6** In $\alpha-WCl_6$
- (i) All Cl^- ions are present in cubic close packing
 - (ii) W occupies, $1/6^{th}$ of the octahedral holes
 - (iii) W occupies $1/3^{rd}$ of the tetrahedral holes.
 - (iv) All Cl^- ions are present in all octahedral
- (A) i, ii
 - (B) i, iii
 - (C) ii, iii
 - (D) iv, i

- Q.7** The edge length of a cube is 400 pm. Its body diagonal would be-
- (A) 600 pm (B) 566 pm (C) 693 pm (D) 500 pm
- Q.8** The mass of unit cell of CaF_2 (fluorite structure) corresponds to-
- (A) Mass of 8Ca^{++} ions & 4F^- ions (B) Mass of 4Ca^{++} ions & 8F^- ions
 (C) Mass of 4Ca^{++} ions & 4F^- ions (D) Mass of 1Ca^{++} ions & 2F^- ions
- Q.9** Close packing is maximum in the Crystal which is-
- (A) Simple cube (B) bcc (C) fcc (D) None
- Q.10** An ionic compound AB has ZnS type of structure, if the radius A^+ is 22.5 pm, then the ideal radius of B^- is-
- (A) 54.35 pm (B) 100 pm (C) 145.16 pm (D) None

ANSWER KEY

Solid State										
Q.No.	1	2	3	4	5	6	7	8	9	10
Ans.	C	B	B	D	C	A	C	B	C	B

SOLUTIONS (SOLID STATE)

Sol.1 The hexagonal close packing and the face-centred cubic system have the closest packing as their packing efficiency is 74% and thus (C) represent the correct solution.

Sol.2 Since the ratio of the co-ordination no. P to that of Q is Y : Z.
i.e. P is surrounded by Y atoms of Q and Q is surrounded by Z atoms of P
i.e. no. of atoms of P is Z
& no. of atoms of Q is Y
So, the formula is $P_Z Q_Y$
∴ (B)

Sol.3 For fcc lattice

$$4r = \sqrt{2}a \quad \text{where } a = 620 \text{ pm} \quad \text{or, } r = \frac{1}{2\sqrt{2}} \times a$$

$$\frac{1}{2\sqrt{2}} \times 620 \text{ pm} = 219.20 \text{ pm}$$

∴ (B)

Sol.4 Arrangement of atoms or, ions in the corner of the unit cell is simple cubic. So in body centered cubic arrangement, Cl^- ions are arranged in the corner of the cube. So, it is a simple cubic.

∴ (D)

Sol.5 For octahedral void

$$\frac{r_B}{r_A} = 0.414$$

$$\text{or } r_B = 0.414 r_A$$

∴ (C)

Sol.6 In $\alpha\text{-WCl}_6$, Cl^- ions are arranged in cubic close packing, so, there is only one Cl^- ion in 1-unit cell. So, the formula can be written $\text{W}_{1/6}\text{Cl}$, i.e. $\frac{1}{6}$ of the octahedral hole is filled by W.

∴ (A), (B)

Sol.7 Since in body center cubic, the body diagonal = $\sqrt{3}a$.
= $\sqrt{3} \times 400 \text{ pm} = 692.82 \text{ pm}$
= 693 pm
 \therefore (C)

Sol.8 In CaF_2 (Calcium fluorite) structure 1-unit cell contains 4- Ca^{2+} ions and 8 F^- ions.
So, mass of unit cell of CaF_2
= mass of 4 Ca^{2+} ions + mass of 8F ions
 \therefore (B)

Sol.9 The close packing in the crystal is 0.52, 0.68 and 0.74 for simple cubic, body centered cubic, and face-centered cubic respectively.
i.e. the close packing is maximum in fcc.
 \therefore (C)

Sol.10 Since ionic compound AB has ZnS type of structure, therefore it has tetrahedral holes, for which,

$$\frac{\text{radius of cation}}{\text{radius of anion}} = 0.225$$

$$\frac{r_+}{r_-} = 0.225$$

$$\frac{r_+}{r_-} = 0.225$$

Hence, $r_- = 100 \text{ pm}$

\therefore (B)