SOLUTION

EXERXISE (O-I)

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1. Covalent network solids are → [SiO_2, Diamond, Si, AlN & SiC]

2. (C)

7. Factual

8. Factual

9. For triclinic system

$a \neq b \neq c$ & $\alpha \neq \beta \neq \gamma = 90°$,

Hence most unsymmetrical.

10. In match box

$a \neq b \neq c$ & $\alpha = \beta = \gamma = 90°$,

Hence orthorhombic geometry

11. For hexagonal crystal system

$a = b \neq c$ & $\alpha = \beta = 90°$ & $\gamma = 120°$

14. The distance between 2 nearest neighbor in B.C.C. is $\frac{\sqrt{3}a}{2}$

i.e. $\frac{\sqrt{3}\times 5.2}{2}$

i.e. 4.5Å

15. In BCC

$\sqrt{3}a = 4r$

Fraction of edge occupied by atoms = $\frac{2r}{a}$

$= \frac{2r}{\frac{4}{\sqrt{3}}r} = \frac{\sqrt{3}}{2}$

16. For B.C.C.

$r = \frac{\sqrt{3}a}{4} = \frac{\sqrt{3}\times 286}{4}$ i.e. r = 124 pm

20. Factual

22. The shortest distance between 1st & Vth layer of HCP arrangement is 2C

i.e. $2\times\left(\sqrt{\frac{2}{3}}\times 4r\right)$

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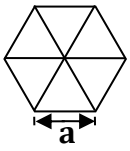
i.e. $8\sqrt{\frac{2}{3}}\,r$

23. Volume of HCP unit CsCl = (Area of Base × height)



i.e. $\left(6\times\frac{\sqrt{3}}{4}\times a^2\right)\times 2\sqrt{\frac{2}{3}}\,a$

i.e. $\frac{6\sqrt{3}}{4}\times(2r)^2+2\sqrt{\frac{2}{3}}\times(2r)$ (As a = 2r)

= $24\sqrt{2}\,r^3$.

24. $\frac{\rho_{fcc,Fe}}{\rho_{bcc,Fe}}=\frac{\pi/3\sqrt{2}}{\sqrt{3}\pi/8}$

25. Volume occupied by atoms in an bcc unit cell is -

$$\mathbf{2\times\frac{4}{3}\pi r^3=\left[\frac{2\times\frac{M}{N_A}}{\rho}\right]\times\frac{\sqrt{3}\pi}{8}}$$

26. It is formed by 4 spheres the centres of which form a regular tetrahedron

27. For tetrahedral voids

r = 0.225 R

& for octahedral voids

r = 0.414 R

⇒ Size of an octahedral void formed in a closed packed lattice is larger as compared to tetrahedral void.

28. Number of atom X = $7\times\frac{1}{8}$

Number of atom y = 1

Formula of compound will be (X_7Y_8)

29. For -----ABCABC----- closed packing sequence, it forms, it forms C.C.P / F.C.C.

Number of tetrahedral voids is twice the number of atoms in the unit cell.

Number of tetrahedral void = 2 × Z

Number of octahedral void = Z

30. Number of atom A = 6

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Number of atom C = $\frac{2}{3}\times 6$ i.e. 4

Formula of compounds is (A_3C_2)

31. For NaCl

$2(r_{Na^+} + r_{Cl^-}) = a$

$\Rightarrow 2x + 2y = a$

32. For F.C.C. of M^+X^- $2\left(r_{M^+} + r_{X^-}\right) = 7.2$

$\Rightarrow 2 \times 1.6 + 2r_{X^-} = 7.2 \qquad \Rightarrow r_{X^-} = 2\text{Å}$

33. 1 mole i.e. 58.5 g NaCl contains $\frac{N_A}{4}$ unit cells

$\Rightarrow$ 1 gm cubic crystal of NaCl contains $\left(\frac{N_A}{58.5\times 4}\right)$ unit cells

34. For compounds (XY) for which crystallizes in 8 : 8 lattice.

$\Rightarrow \quad r_{X^+} + r_{Y^-} \frac{\sqrt{3}}{2}a$

$\Rightarrow \quad r_{X^+}\left(\frac{\sqrt{3}}{2}\times 480 - 225\right)$

$\Rightarrow \quad r_{X^+} = 190.68$ pm

35. Number of $Cs^+ \rightarrow 8\times\frac{1}{8}$ i.e 1

Number of $Cl^- \rightarrow 1$

36. Factual

37. For ZnS type structure $\left(\frac{r_{Zn^{+2}}}{r_{S^{-2}}} \square .402\right)$ it is a 4 : 4 coordination number compound.

$\Rightarrow \quad \frac{r_{A^+}}{r_{B^-}} = 0.225$

$\Rightarrow \quad \frac{22.5}{r_{B^-}} = 0.225$

$\Rightarrow \quad r_{B^-} = 100$ pm

38. For $CaF_2 \rightarrow$ Coordination number of cation & Anion is 8 : 4

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& For CsCl → coordination number of cation & Anion is 8 : 8

39. Schottky defect is shown by ionic substances in which the cation & Anion are of almost similar sizes.

40. Schottky defect is basically a vacancy defect in ionic solids. In order to maintain electrical neutrality, the number of missing cation & anions are equal.

41. Factual

42. $ZnO \xrightarrow{\text{heating}} Zn^{+2} + \frac{1}{2}O_2 + 2l^-$

So, strongly heated ZnO crystal can conduct electricity, this is due to movement of electrons in the anion vacancies.