Q1 - 24 June - Shift 1

Atoms of element X form hcp lattice and those of element Y occupy $\frac{2}{3}$ of its tetrahedral voids. The percentage of element X in the lattice is_____ (Nearest integer)

Space for your notes:

Q2 - 25 June - Shift 1

The distance between Na^+ and Cl^- ions in solid NaCl of density 43.1 g cm^{-3} is _____ $\times 10^{-10}$m. (Nearest Integer)
(Given : $N_A = 6.02 \times 10^{23}$ mol^{-1})

Space for your notes:

Q3 - 26 June - Shift 2

In a solid AB. A atoms are in ccp arrangement and B atoms occupy all the octahedral sites. If two atoms from the opposite faces are removed, then the resultant stoichiometry of the compound is A_xB_y. The value of x is_____. [nearest integer]

Space for your notes:

Q4 - 27 June - Shift 1

Metal deficiency defect is shown by $Fe_{0.93}O$. In the crystal, some Fe^{2+} cations are missing and loss of positive charge is compensated by the presence of Fe^{3+} ions. The percentage of Fe^{2+} ions in the $Fe_{0.93}O$ crystals is _____ . (Nearest integer)

Space for your notes:

Q5 - 27 June - Shift 1

Two elements A and B which form 0.15 moles of A_2B and AB_3 type compounds. If both A_2B and AB_3 weigh equally, then the atomic weight of A is _____ times of atomic weight of B.

Space for your notes:

Q6 - 28 June - Shift 1

The incorrect statement about the imperfections in solids is :

(A) Schottky defect decreases the density of the substance.

(B) Interstitial defect increases the density of the substance.

(C) Frenkel defect does not alter the density of the substance.

(D) Vacancy defect increases the density of the substance.

Space for your notes:

Answer Key

Q1 (43) **Q2** (1) **Q3** (3) **Q4** (85)

Q5 (2) **Q6** (D)

Q1 (43)

$$X \rightarrow 6 \qquad Y \rightarrow \frac{2}{3} \times 2 \times 6 = 8$$

$$\% X = \frac{6}{14} \times 100 = 42.8 \simeq 43\%$$

Q2 (1)

$$\text{Unit cell formula} - Na_4Cl_4$$

$$\text{Mass per unit cell} = \frac{Z \times M.M.}{N_A} g$$

$$= \frac{4 \times 58.5}{N_A} g$$

$$d_{\text{unit cell}} = \frac{m}{V} = \frac{m}{a^3}$$

$$\Rightarrow \frac{4 \times 58.5}{N_A \cdot a^3} = 43.1$$

$$\Rightarrow a^3 = 9.02 \times 10^{-24} cm^3$$

$$\Rightarrow a = 2.08 \times 10^{-8} cm$$

$$\Rightarrow a = 2.08 \times 10^{-10} m$$

$$\text{Also } a = 2\left(r_{Na^+} + r_{Cl^-}\right)$$

$$\Rightarrow r_{Na^+} + r_{Cl^-} = 1.04 \times 10^{-10} m$$

$$\therefore \text{ The answer is 1}$$

Q3 (3)

$$A \rightarrow 4 - \left(2 \times \frac{1}{2}\right) = 3$$

$$B \rightarrow 12 \times \frac{1}{4} + 1 \times 1 = 4$$

So, Compound is A_3B_4

The value of x is 3.

Q4 (85)

In $Fe_{0.93}O$ for every 93 Fe ions 14 are Fe^{+3} and (93 – 14) = 79 are Fe^{+2} ions

$\therefore$ % $Fe^{+2} = \frac{79}{93} \times 100 = 84.9\%$

$\therefore$ nearest integer = 85%

Q5 (2)

Given : Molar mass of $A_2B = AB_3$

$\therefore (2A + B) = (A + 3B)$ $\begin{bmatrix} A \rightarrow \text{Atomic wt. of A} \\ B \rightarrow \text{Atomic wt. of B} \end{bmatrix}$

$\Rightarrow A = 2B$

$\therefore$ atomic wt. of A is 2 times of atomic wt. of B

Integer answer is 2

Q6 (D)

Due to vacancy defect density of the substance will decrease.