

CLASS 12

CHEMISTRY

EXTRA QUESTIONS

Extra Questions: Class 12 Chemistry The Solid State (JEE/NEET Bonus)

Genuinely harder, HOTS-level practice for Class 12 Chemistry: The Solid State (JEE/NEET Bonus), going beyond the standard exercise. These Class 12 Chemistry (The Solid State) important questions are handy for last-minute exam practice.

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Class 12 Chemistry: The Solid State – Solutions and Notes

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Q1 (Multi-step density problem). A metal crystallises in a bcc lattice with a unit cell edge of 300 pm. If the density of the metal is 5.96 g/cm^3 , calculate its atomic mass, and identify the coordination number and packing efficiency of this structure.

Solution: $Z=2$ for bcc. $M = d \cdot a^3 \cdot N_A / Z = 5.96 \times (300 \times 10^{-10})^3 \times 6.022 \times 10^{23} / 2 \approx \mathbf{48.4 \text{ g/mol}}$ (close to titanium, 47.9 g/mol). Coordination number for bcc = **8**; packing efficiency = **68%**.

Q2 (Assertion-Reason). Assertion (A): Frenkel defects do not change the density of an ionic solid.

Reason (R): In a Frenkel defect, no ion actually leaves the crystal — it only shifts to an interstitial site.

Solution: Both A and R are true, and R correctly explains A — since the displaced ion stays within the same crystal (just at a different site), the total mass and volume of the crystal are unchanged, so density is unaffected. **Answer: Both true, R is the correct explanation of A.**

Q3 (Conceptual synthesis). Explain why ZnS shows Frenkel defects but NaCl shows Schottky defects, connecting your answer to the radius ratio of the two ions in each compound.

Solution: Frenkel defects occur when there is a large size difference between the cation and anion, allowing the smaller ion to fit into an interstitial space; Schottky defects occur when the two ions are of comparable size and high coordination number, so no ion is small enough to occupy an interstitial gap without severe strain. In ZnS, Zn^{2+} (74 pm) is much smaller than S^{2-} (184 pm) — a large radius-ratio mismatch that favours Frenkel defects. In NaCl, Na^+ (102 pm) and Cl^- (181 pm) are closer in size with a stable 6:6 coordination, favouring Schottky defects instead.

Q4 (Application). A compound forms hcp packing of anions with cations occupying all the tetrahedral voids. What is the simplest formula of the compound, and give one real example.

Solution: In close packing, the number of tetrahedral voids is twice the number of packing spheres. If all tetrahedral voids are filled and there are n anions, there are $2n$ cations, giving the ratio cation:anion = 2:1, formula **M_2X** . A real example following this pattern is Na_2O (antifluorite structure).

Class 12 Chemistry: The Solid State – Solutions and Notes

For complete step-by-step answers and a quick summary, check the [The Solid State Solutions](#) and [The Solid State Revision Notes](#).

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