

October 2025

1. Explain the following points about ionic radius
 - (a) use same set of ionic radii throughout
 - (b) adjust radius for coordination number
 - (c) adjust radius for spin state of electrons
 - (d) trends and patterns will be much more accurate than absolute data
 - (e) calibrate any property to predicted by utilizing other measurements, then trends can be used with much more precision and ease
2. There are three strong bonding forces in solids, ionic, covalent, and metallic bonds; as well as two weaker bonds, hydrogen bonds and van der Waals forces. Explain how each of these five bonding forces can influence crystal structure of solids.
3. All non-crystalline solids show
 - (1) no Bragg diffraction and
 - (2) metastability.Explain.
4. The five steps to relate composition to structure for ionic solids are:
 - a. Determine the total composition
 - b. Put into atom fractions or percent, and come up with simple formula
 - c. Decide what compositional family the phase belongs to
 - d. For the compositional family, lists the major structures
 - e. Based on ionic sizes, charges, and polarizabilities, match up (b) with (d).The chemical analysis of a compound shows K 52.4 wt% and Cl 47.6 wt%. Describe how you systematically (step by step) relate this composition to a structure. (atomic weight: K 39.1 and Cl 35.5 g/mole; ionic size: K 1.52 and Cl 1.67 Å)
5. Explain the formation of crystalline solution (solid solution) is affected by
 - (a) solute vs. solvent ions,
 - (b) environment, and
 - (c) solvent structure.However, the formation of crystalline solution does not depend on
 - (d) structure of end members,
 - (e) same formula ratios or stoichiometry, and
 - (f) valence or perfection of lattice.