

Very Short Answer Questions: (3 points each)

1. A _____ defect occurs when an ion is displaced from its normal site.
2. The _____ is highest filled molecular orbital in a band.
3. The filled collection of orbitals in a semiconductor is called the _____.
4. _____ solvent molecules are solvent molecules that appear in gaps in the lattice.
5. What is the proportionality that corresponds to a dipole-dipole interaction? _____
Include all non-constants.
6. A _____ is a molecule, atom, or ion covalently bound to a metal center.
7. The _____ is the average energy of a collection of orbitals. (e.g. the *d* orbitals in a complex)
8. Δ _____ down a group.
9. $B_5H_9^-$ has a _____ structure.
10. The bridging hydrogens in diborane(6) are attached to the boron via a _____ bond.

Discussion Questions: (You must show work to receive credit!)

1. Write a short description of band theory. (5 points)

2. Would GaAs or InSb a better conductor? Provide a physical justification for your answer. (10 points)
3. List the following in order of increasing melting point H_2O , N_2 , LiCl , LiF , H_2 , He , BaO , SiBr_4 , and SiO_2 . Justify your ordering. (16 points)
4. Consider the linear complex: ML_2 . Draw the ligand field splitting diagram for this molecule. Label the orbitals. Which *d*-electron configurations would undergo Jahn-Teller distortions? Neglect high/low spin considerations. (Hint: Assume the ligands are on the z-axis.) (10 points)

5. Write clear structural formulas for: (6 points)
mer, trans-diamminetriaquahydroxochromium(III) nitrate

cis-dibromotetracarbonyliron(II)

6. For 5 of the following 6 reactions: What are the products? Balance the equation. Clearly indicate the reaction you don't want graded. (15 points)



7. What is a catalyst precursor and why is it that in homogeneous catalysis catalyst precursors are added to reactions instead of the actual catalytically active species. (8 points) nts)