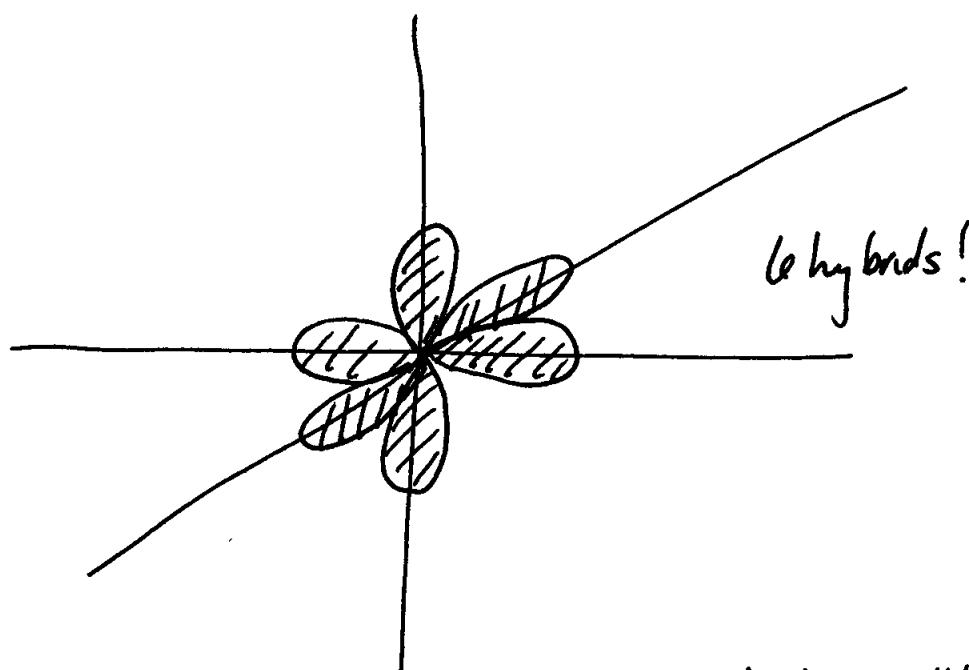


CH301H – Principles of Chemistry I: Honors  
Fall 2013, Unique 52195

Quiz 5, November 14, 2013

The d orbitals make hybrids by mixing with the s orbital of higher n. For example, the five 3d orbitals ( $d_{xy}$ ,  $d_{xz}$ ,  $d_{yz}$ ,  $d_{x^2-y^2}$ , and  $d_{z^2}$ ) mix with the 4s orbital to form a set of hybrid orbitals that then engage in bonding interactions for metals in the 3d row. The rules for combining s and d orbitals are identical for the rules combining s and p orbitals. With all of that information, draw the structure of the hybrid orbitals formed from the 4s orbital and five 3d orbitals (called  $sd^5$  hybrids) and estimate the structure of the molecule that is formed from these hybrids.

We start w/ 6 AOs (5 3d + 1 4s), so we need 6 hybrids. These will be symmetrically organized around the nucleus and will point as far away from each other as possible.



- a molecule that is formed from this collection of hybrids will be octahedral.