

22.2.1: i. Review Exercises

Q1

Draw qualitative shapes of the (1) s, (3) p and (5) d "tangent sphere" atomic orbitals (note that these orbitals represent only the angular portion and **do not** contain the radial portion of the hydrogen like atomic wavefunctions) Indicate with \pm the relative signs of the wavefunctions and the position(s) (if any) of any nodes.

Q2

Define the symmetry adapted "core" and "valence" orbitals of the following systems:

- i. NH_3 in the C_{3v} point group,
- ii. H_2O in the C_{2v} point group,
- iii. H_2O_2 (cis) in the C_2 point group,
- iv. N in $D_{\infty h}$, D_{2h} , C_{2v} , and C_s point groups,
- v. N_2 in $D_{\infty h}$, D_{2h} , C_{2v} , and C_s point groups.

Q3

Plot the radial portions of the 4s, 4p, 4d, and 4f hydrogen like atomic wavefunctions.

Q4

Plot the radial portions of the 1s, 2s, 2p, 3s, and 3p hydrogen like atomic wavefunctions for the Si atom using screening concepts for any inner electrons.

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