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Problem Set 12

Due date: January, 14, 2008

Problem 40)
Give the ground-state electron configurations of (a) ClF, (b) CS, and (c) O_2^-. Hint: It might help to find isoelectric homonuclear molecules.

(3 points)

Problem 41)
Arrange the species O_2^+, O_2, O_2^-, O_2^{2-} in order of increasing bond length.

(3 points)

Problem 42)
What is the most probable point (not radius) at which a $2p$ electron will be found in the hydrogen atom? Note: There are six possible equivalent points!

(5 points)

Problem 43)
An sp^2 hybrid orbital that lies in the xy-plane and makes an angle of 120° to the x-axis has the form

$$\psi = \frac{1}{\sqrt{3}}\left(s - \frac{1}{\sqrt{2}}p_x + \sqrt{\frac{3}{2}}p_y\right).$$

Use hydrogenic atomic orbitals to write the explicit form of the hybrid orbital. Show that it has its maximum amplitude in the direction specified.

(6 points)