Department of Chemistry
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The Hydrogen Atom– Supplemental Worksheet

1. State the significance of the line spectrum of hydrogen.

2. Calculate the energy in each of the following spectral transitions in the hydrogen atom.
   a. $n = 4 \rightarrow n = 1$
   b. $n = 3 \rightarrow n = 2$

3. What is the minimum uncertainty in the position of an electron (mass = 9.11×10^{-31} kg) traveling at a velocity with an uncertainty of 4.1×10^{7} $m \cdot s^{-1}$?

4. An electron is excited from the ground state to the $n = 2$ state in a hydrogen atom. Which of the following statements are true? And correct the false statements.
   a. It takes less energy to ionize the electron from $n = 2$ than from the ground state.
   b. The electron is closer to the nucleus on average in the $n = 2$ than from the ground state.
   c. The first excited state corresponds to $n = 2$.
   d. The wavelength of light emitted when the electron returns to the ground state from $n = 2$ is different from the wavelength of light absorbed to go from $n = 1$ to $n = 2$.

5. Fill the following chart

n	*l*	Orbital Designation	m_l	Number of Orbitals
1				
				1
		2p		
	0			
			-1, 0, 1	
				5
		4s		
4			-2, -1, 0, 1, 2	

6. Which of the following sets of quantum numbers are allowed?

a. $n = 3$, $l = 2$, $m_l = -2$
b. $n = 1$, $l = 1$, $m_l = 0$
c. $n = 4$, $l = -2$, $m_l = 0$
d. $n = 2$, $l = 1$, $m_l = 1$

7. What is the maximum number of electrons in the *s, p, d*, and *f* shells?

8. Draw the representations of the s, p, and d orbitals.