Name: _____ Date: ____ / ____ / _____

Leandros's Chemistry Challenge

Electron Configurations

1. (1 point) Write the 4 sets of quantum numbers for each orbital in the valence shell of the Ag^{+} ion

2. (2 points) Is element ${}_{70}Yb$ paramagnetic or diamagnetic? Explain.

3. (2 points) Suppose the electron in a Hydrogen atom is excited such that it moves from the ground state to the next lowest energy subshell. What might the shape of the electon's new orbital be? Explain.

4. (1 point) Select the group of particles which do **NOT** share the same range of azimuthal values across their valence shell orbitals.
   A. Oxide ion, Neon, Carbide ion, Fluoride ion
   B. Cerium, Francium, Copernicium, Rutherfordium
   C. Hydrogen, Lithium, Sodium, Potassium
   D. Helium, Neon, Argon, Krypton

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5. (2 points) Which of the following statements is false?
   A. All particles of an isoelectronic species have identical electron configurations
   B. For atoms with an even number of electrons, subshells within same energy level follow: $E_s < E_p < E_d < E_f$
   C. There is only one orbital per s subshell because there is only one way to orient a sphere
   D. None of the above

6. (1 point) Predict the shape of orbitals located at energy level $n = \infty$

7. (2 points) Draw the orbital box diagram for the $4s$ and $3d$ orbitals of Cr. Could the spin of the of $3d$ electrons be different than the spin of the $4s$ electron? Explain why or why not.

8. (1 point) Which of the following is an invalid set of quantum numbers?
   A. $n = 3$, $\ell = 1$, $m_\ell = -1$, $m_s = \frac{1}{2}$
   B. $n = 3$, $\ell = 1$, $m_\ell = -1$, $m_s = -\frac{1}{2}$
   C. $n = 1$, $\ell = 1$, $m_\ell = 0$, $m_s = \pm\frac{1}{2}$
   D. $n = 1$, $\ell = 0$, $m_\ell = 0$, $m_s = 0$

9. (2 points) Suppose a hydrogen atom is maintained in such a way that even when more electrons are added to the atom, the energy levels still remain degenerate. Suppose this atom were to repeatedly receieve electrons until it had a total of 10 electrons, describe how the quantum numbers of each orbital in the atom would change with the addition of each new electron.