Problem Set: Quantum Numbers

1. Fill in the following table:

Orbital	s	p	d	f
Value of ℓ				

2. Provide the quantum numbers for each 4d orbital:

n	ℓ	m_ℓ

3. Which orbital has the most orientations in space? And how many orientations does this orbital have?

4. How many d orbitals are filled with electrons in a ground state silver atom?

5. Provide the maximum number of orbitals for:

   a. $n = 4, \ell = 1$
   b. $n = 2, \ell = 1$
   c. $n = 3, \ell = 2$
   d. $n = 5, \ell = 1, m_\ell = -1$

6. Which orbitals cannot exist, a 2p, 3p, 4d, 3f, 6s, or 2d?

7. Draw the shape of the orbital for an electron defined by the following quantum numbers.

   a. $n = 3, \ell = 0, m_\ell = 0$
   b. $n = 2, \ell = 1, m_\ell = 1$
   c. $n = 4, \ell = 2, m_\ell = -1$
   d. $n = 3, \ell = 3, m_\ell = 2$
   e. $n = 3, \ell = 1, m_\ell = 2$

8. What is the total number of electrons allowed in a $\ell = 1$ sublevel?

9. What are the possible magnetic quantum numbers (m_ℓ) for a 3p electron?

10. What are the possible orbitals for n = 3?

11. How many electrons can be contained in the third principal level of a given atom?

12. In which orbital would an electron (on average) be farthest from the nucleus, a 1s, 4f, 3s, 3d, or 2p orbital?

13. In which orbital would an electron (on average) be closest to the nucleus, a 2p, 4s, 2s, 5d, 3p orbital?