Atomic Structure-Quantum Numbers -Lesson 2-Practice Questions

1. An electron has the following set of quantum numbers; n = 4 , l = 1 , m = 0 and s = +1/2.
   In which of the following orbitals would this electron be found?

   a) 4s b) $4p_x$ c) $4d_3$ d) $4f_5$ e) none of these

2. Which of the following sets of quantum numbers is **not** possible?

   a) n = 3, l = 0, m = 0, s = +1/2
   b) n = 5, l = 3, m = 0, s = +1/2
   c) n = 5, l = 3, m = -1 s = -1/2
   d) n = 4, l = 3, m = -3, s = -1/2
   e) n = 4, l = 4, m = +2, s = -1/2

3. Which of the following subshells has room for a maximum of 10 electrons?

   a) 4p b) 6p c) 3s d) 4f e) 5d

4. The maximum number of electrons at n = 2 is

   a) 2 b) 4 c) 8 d) 18 e) 32

5. The number of orbitals available at n = 4 is

a) 4 b) 8 c) 16 d) 32 e) none of these

6. The number of 'p' orbitals in each energy level above the first is

   a) 1 b) 3 c) 4 d) 5 e) 6

7. Which is **not** true of the 'p' orbitals?

   a) they are dumbbell shaped
   b) they are oriented about 3 axes
   c) they are found in all energy levels
   d) they may contain a total of 6 electrons
   e) they represent a region of probability of finding an electron

8. A '1s' orbital has a shape that

   a) concentrates electron density around the nucleus with points of equal electron density at equal distances from the nucleus
   b) places all the electron density in one 'lobe' that is located on one side of the nucleus
   c) spreads the electron density uniformly over the entire volume of the atom
   d) places electron density in six 'lobes' that lie along an imaginary set of x, y, z coordinate axes
   e) cannot be described with pictures

9. What is the total number of electrons in the 2p sublevel of a chlorine atom in the ground state?

   a) 6 b) 2 c) 3 d) 5 e) 8

10. In modern chemical theory, an occupied orbital is pictured to be

    a) a spherical or dumbell-shaped route traced by the electron in its rapid movement
    b) a region in space having a precise shape, which is completely filled by a dense electron cloud
    c) a region in space in which the probability of finding an electron is high
    d) an elliptical pathway, outside the nucleus, followed by an electron
    e) an electron at a specific distance from the nucleus

Multiple Choice Answers

1	2	3	4	5	6	7	8	9	10
B	**E**	**E**	**C**	**C**	**B**	**C**	**A**	**A**	**C**

Problems

1. What are the quantum numbers n, l and m for each of the orbitals of:
   a) the 5p sublevel
   b) the 6d sublevel

2. Explain what is meant by 'spin pairing'.

4. Explain the meaning of each of the following sets of quantum numbers:

   a) n = 2, l = 1, m = 0 $s = +\frac{1}{2}$

   b) n = 6, l = 3, m = - 1 $s = -\frac{1}{2}$

   c) n = 7, l = 1, m = + 1, $s = -\frac{1}{2}$

5. Indicate the quantum numbers for each of the orbitals of the sublevels indicated in the following chart:

	n	l	m
a) 3 p sublevel			
b) 5 d sublevel			

6. If one electron has the quantum numbers n = 4, l = 3, m = +2, $s = -\frac{1}{2}$ and another electron has the quantum numbers n = 4, l = 3, m = -2, $s = +\frac{1}{2}$, what are the similarities and differences between the orbitals in which the electrons are found?