Name: _____ **Date: _____**

Quantum Number Practice Worksheet

1. Summarize:
   The principal quantum number, ***n***, can have the values of: ___ ___ ___ ___ ___, etc.
   The angular momentum quantum number, **l**, can have integer values from _____ to _____.
   The magnetic quantum number, m_l, can have integer values from _____ to _____.

2. When n = 3, **l** can have values of _____.
   For the 3d sublevel, **l** has a value of ___.

   When n = 4, **l** can have values of _____.
   For the 4p sublevel, **l** has a value of ___.

   When n = 2, **l** can have values of _____.
   For the 2s sublevel, **l** has a value of ___

3. Summarize:

orbital	s	p	d	f
value of **l**				

4. There are five 4d orbitals. List the quantum numbers for each orbital.

n	**l**	m_l

5. Rank the following orbitals in order of increasing energy: 3s, 2s, 2p, 4s, 3p, 1s, and 3d.

6. How many orbitals in an atom can have the following quantum number or designation?
   a) 3p
   b) 4p
   c) $4p_x$
   d) 6d
   e) 5d
   f) 5f
   g) ***n*** = 5
   h) 7s

7. Answer the following questions:
   a) The quantum number ***n*** describes the _____ of an atomic orbital.
   b) The shape of an atomic orbital is given by the quantum number ____.
   d) The maximum number of orbitals that may be associated with the set of quantum numbers n=4 and **l** =3 is ____.
   e) The maximum number of orbitals that may be associated with the quantum number set n=3, **l** =2, and m_l = -2 is ___.
   f) When n=5, the possible values of **l** are _____.
   g) The maximum number of orbitals that can be assigned to the n=4 shell is ____.

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8. (a) For n = 4, what are the possible values of l ?
   (b) For l = 3, what are the possible values of m_l ?

9. Give the values of n, l , m_l (a) for each orbital in the 4f sublevel, (b) for each orbital in the n = 2 shell.

10. Which of the following sets of quantum numbers are allowed for an electron in an orbital of a hydrogen atom:

    (a) n = 1, l = 1, m_l = 0
    (b) n = 3, l = 0, m_l = 0
    (c) n = 4, l = 1, m_l = -1
    (d) n = 2, l = 1, m_l = 2

    Write the designation for the sublevel to which the orbital belongs.

11. What is the maximum number of electrons that can occupy each of the following subshells:
    (a) 3d
    (b) 4s
    (c) 2p
    (d) 5f

12. What is the maximum number of electrons in an atom that can have the following quantum numbers:
    (a) n = 3
    (b) n = 4, l = 2
    (c) n = 4, l = 3, m_l = 2
    (d) n = 2, l = 1, m_l = 0, m_s = - ½

13. The quantum numbers listed below are for four different electrons in the same atom. Arrange them in order of increasing energy. Indicate whether any two have the same energy.
    (a) n = 4, l = 0, m_l = 0, m_s = ½
    (b) n = 3, l = 2, m_l = 1, m_s = ½
    (c) n = 3, l = 2, m_l = -2, m_s = -½
    (d) n = 3, l = 1, m_l = 1, m_s = -½