**QUANTUM NUMBERS WORKSHEET Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. State the four quantum numbers and the possible values they may have.

2. Name the orbitals described by the following quantum number

a. n = 3, l = 0  
    b. n = 3, l = 1  
    c. n = 3, l = 2  
    d. n = 5,  = 0

3. Give the n and l values for the following orbitals

    a. 1s  
    b. 3s  
    c. 2p  
    d. 4d  
    e. 5f

1. Circle all of the following orbital destinations that are theoretically possible.

a. 7s b. 1p c. 5d d. 2d e. 4f f. 5g g. 6i

1. Without referring to a text, periodic table or handout, deduce the maximum number of electrons that can occupy an:

a. s orbital \_\_\_\_\_ b. the subshell of p orbitals \_\_\_\_\_\_\_ c. the subshell of d orbitals \_\_\_\_

d. the subshell of f orbitals\_\_\_\_\_\_\_ e. the subshell of g orbitals\_\_\_\_\_\_\_

1. Circle all of the following electron configurations that are ruled out by the Pauli exclusion principle.

a. 1s22s22p7 b. 1s22s22p63s3 c. 1s22s22p63s23p64s23d12 d. 1s22s22p63s23p6

1. Explain why the following ground-state electron configurations are not possible:

a. 1s22s32p3 b. 1s22s22p33s6 c. 1s22s22p73s23p8 d. 1s22s22p63s23p14s23d14

1. Give two examples (i.e. list 2 elements that are examples) of:
   1. an atom with a half-filled subshell
   2. an atom with a completely filled outer shell
   3. an atom with its outer electrons occupying a half-filled subshell and a filled subshell.
2. Place the following orbitals in order of increasing energy:

    1s, 3s, 4s, 6s, 3d, 4f, 3p, 7s, 5d, 5p

10. What are the possible ml values for the each of the following types of orbitals?

    a. s  
    b. p  
    c. d  
    d. f

11. How many possible orbitals are there for n =

    a. 4  
    b. 10

12. How many electrons can inhabit all of the n=4 orbitals?

13. Fill in the blanks with the correct response:

1. The number of orbitals with the quantum numbers *n*=3, *l*=2 and *ml* = 0 is \_\_\_\_\_\_\_\_\_.
2. The subshell with the quantum numbers *n*=4, *l*=2 is \_\_\_\_\_\_\_\_\_.
3. The ml values for a d orbital are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. The allowed values of *l* for the shell with *n*=2 are \_\_\_\_\_\_\_\_\_.
5. The allowed values of *l* for the shell with *n*=4 are \_\_\_\_\_\_\_\_\_.
6. The number of orbitals in a shell with *n*=3 is \_\_\_\_\_\_\_\_\_.
7. The number of orbitals with *n*=3 and *l*=1 is \_\_\_\_\_\_\_\_\_.
8. The maximum number of electrons with quantum numbers with *n*=3 and *l*=2 is \_\_\_\_\_\_\_\_\_.
9. When *n*=2, *l* can be \_\_\_\_\_\_\_\_\_.
10. When *n*=2, the possible values for ml are \_\_\_\_\_\_\_\_\_.
11. The number of electrons with *n*=4, *l*=1 is \_\_\_\_\_\_\_\_\_.
12. The subshell with *n*=3 and *l*=1 is designated as the \_\_\_\_\_\_\_\_\_\_ subshell.
13. The lowest value of n for which a d subshell can occur is n=\_\_\_\_\_\_\_\_\_.

14. Which sets of quantum numbers are unacceptable? (Select a, b, c, or any combination)

1. *n*=3, *l*= -2, ml= 0, ms= +½
2. *n*=2, *l*= 2, ml= -1, ms= -½
3. *n*=6, *l*= 2, ml= -2, ms= +½

15. Write the values for the quantum numbers for the **bold** electron in the following diagrams:

a. 3p orbitals c. 4d orbitals

b. 5s

d. 3d orbitals