

### Chemistry 111 Study Group Worksheet

1. What wavelength of light is emitted when a hydrogen atom changes from the  $n = 4$  energy level to the  $n = 2$  energy level?

2. Which transition involves the:

- a. most energy
- b. least energy
- c. longest wavelength photon
- d. lowest frequency light

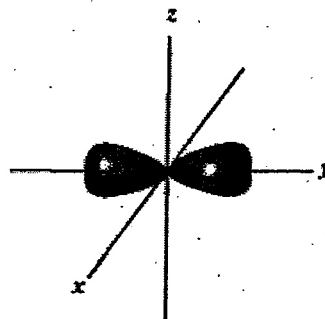
From	To
$n = 3$	$n = 4$
$n = 3$	$n = 1$
$n = 5$	$n = 4$
$n = 6$	$n = 5$
$n = 6$	$n = 1$
$n = 6$	$n = 200$

2b. Of the transitions in the table,  
which are absorptions and which are emissions?

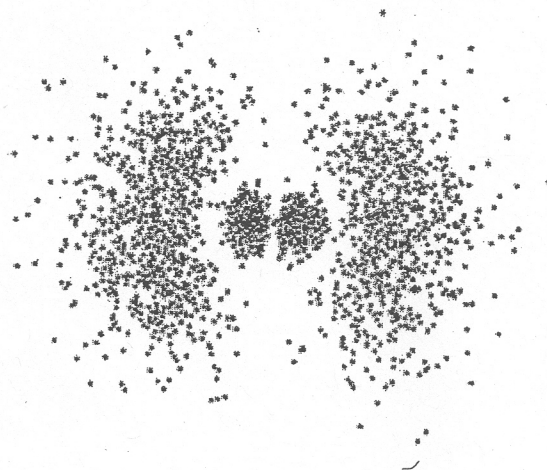
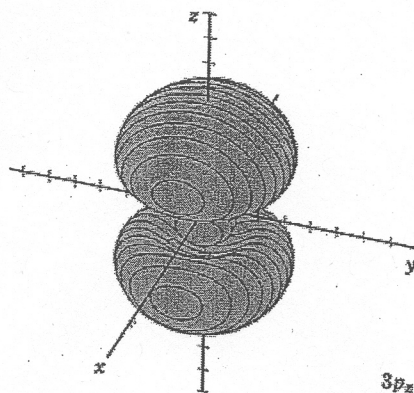
3. Explain the difference between the light emitted by a solid and by gas-phase atoms.

Chemistry 111 Study Group Assignment for the Week of October 26, 2009

1. List all orbitals in the first 5  $n$ -levels.
2. Why is the Bohr model, in which electrons process around the nucleus in planetary-like orbits, incorrect?
3. What controls the energy of an electron in an orbital?
4. How many nodes does the  $2p_y$  orbital have? Are these nodes planar or spherical? If planar, in what plane is each node?



5. How many nodes does the  $3p_z$  orbital have? Are these nodes planar or spherical? If planar, in what plane is each node?



Consider the following table to answer questions 6-8:

Orbital	$n$	$l$	Spherical nodes	Planar nodes
1s	1	0	0	0
2s	2	0	1	0
3s	3	0	2	0
2 <sub>px</sub>	2	1	0	1
3 <sub>px</sub>	3	1	1	1
3d <sub>xy</sub>	3	2	0	2

6. What is the relationship between  $n$ ,  $l$ , and the number of planar nodes?
7. What is the relationship between  $n$ ,  $l$ , and the number of spherical nodes?
8. What is the relationship between  $n$ ,  $l$  and the total number of nodes?

1. For the H-like atom, which subshell has the highest energy level?

4f      3d      2p      1s

2. For an element with atomic number 20, which is the last or highest occupied subshell of atomic orbitals?

1s      2s      2p      3s      3p      3d      4s      5s

What element is this?

3. What is the minimum number of electrons required to fill all orbitals at  $n=5$ ? Which element is would this be?

4. Which of the following two electronic configurations is more stable? Why?

a.  $[\text{Ar}]3d^4 4s^1$

b.  $[\text{Ar}]3d^3 4s^2$

5. What is the highest energy sublevel for an atom with 52 electrons?

6. What are the possible quantum numbers for an electron in a 6f orbital?

- 7. Write the electronic configuration in spectroscopic notation, orbital notation, and Noble Gas notation for the following elements**
- a. Kr**
  - b. Mg**
  - c. Si**
  - d. Ni**

Chem 111 Study Group Questions: Periodic Properties

1. Which of the following atoms is largest?

K      Rb      Ca      Sr

2. Which of the following atoms has the highest ionization energy?

F      Cl      Br      Se

3. Which of the following ions is largest?

$\text{Na}^+$     $\text{K}^+$     $\text{Cl}^-$     $\text{F}^-$

4. Which of the following has the highest ionization energy?

$\text{K}^+$     $\text{Ca}^{2+}$    Ar    $\text{S}^{2-}$     $\text{Cl}^-$

5. Which orbital is involved when a Na atom forms an ion? Does that orbital gain an electron or lose one?

1s    2s    2p    3s    3p

Draw orbital box electron configurations for the atom and its ion.

6. Which orbital is involved when a F atom forms an ion? Does that orbital gain an electron or lose one?

1s    2s    2p    3s    3p

Draw orbital box electron configurations for the atom and its ion.