Notes#22/Electron Configurations/AP Chemistry

I. Electron Configurations - how the electrons are distributed among the various atomic orbitals in an atom. We will be focusing on the MOST STABLE distribution of electrons or ___________________________________ electron configurations.

TOP SEVEN THINGS TO KNOW ABOUT ELECTRON CONFIGURATIONS:

1. *Always fill a* _______________________________ *energy orbital before moving on to higher energy orbitals.*

2. *A max of* _________________________ *electrons per orientation - and they have to be spinning opposite.*
   - This is **THE PAULI EXCLUSION PRINCIPLE** which states that no two electrons in an atom can have the same four quantum numbers (n, l, ml, ms).

3. *Unpaired before Paired.*
   - This is **HUND'S RULE** which states that that electrons prefer to spread out as much as possible so as to minimize ____.

4. *Paramagnetic vs Diamagnetic.*

   Paramagnetic - substances attracted to a magnet. Why? because the substance has UNPAIRED

   electrons which causes an unequal magnetic field. EX: N, ______, _______, _______, etc.

   Diamagnetic - substance that is not (or only slightly) attracted to a magnet. Why? because the substance has NO UNPAIRED electrons which causes the +1/2 and -1/2 spins to all cancel out.

   EX: _______, ________, _______, etc.

   ** Any atom with an odd # of electrons *has* to be ____.
   ** Atoms with even #'s of electrons *could* be paramagnetic or diamagnetic depending on how the electrons are distributed in the orbitals.
   EX: Be (4e-) is _____________________ ( )

   C (6e-) is ___________________________ ( )

   Zn (30 e-) is ________________________ ( )

   Fe (26 e-) is ________________________ ( )

5. *Valence Electrons.*
   - electrons in the _________________________________ principal quantum number of an atom.

   EX: N has ___________ valence electrons. _________ has _________ valance electrons.
   - Just by looking at the periodic table, you can see how many valence e- an element will have. The number of v.e.- an element has is equal to that element's group number. (refer to table)

   - Valence e- are so important because they are the ones involved in _______________ and _____________.

   - All the other electrons are called ______________ electrons.

6. *Noble Gas configurations* - short-hand way of writing electron configurations that focuses on just the VALENCE e-.

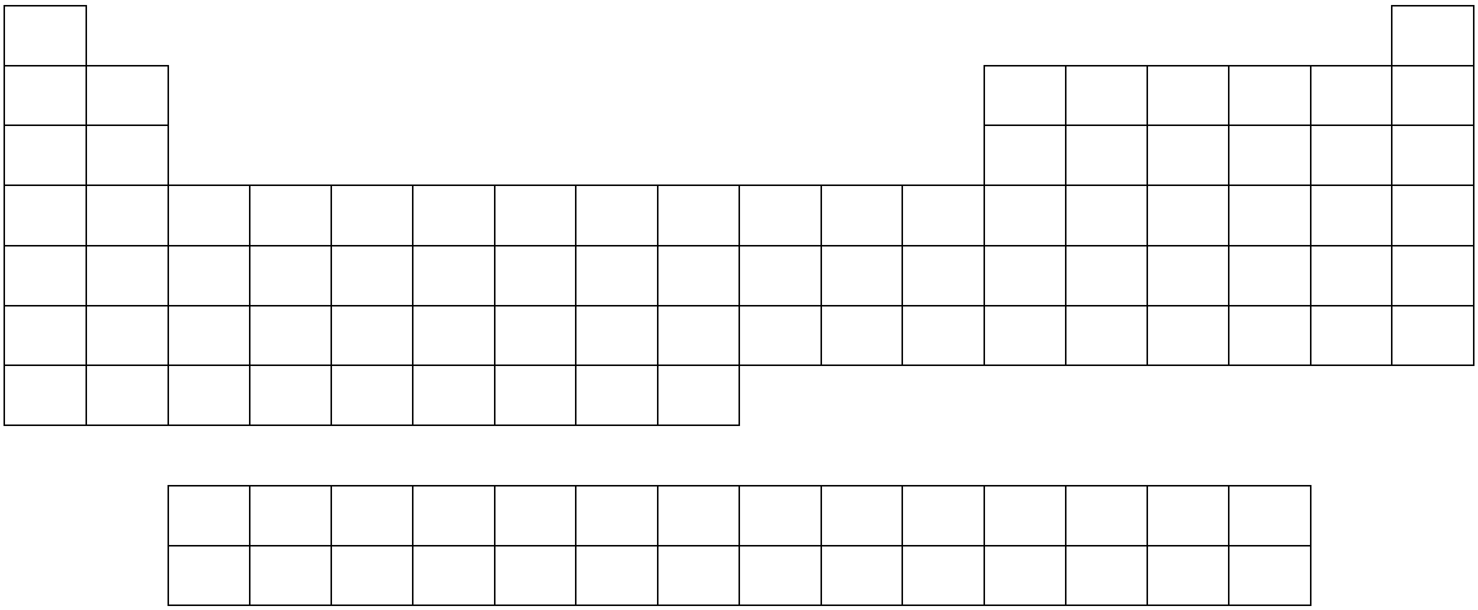
   STEP ONE: First, we have to know some about how the Periodic Table is organized. (other side)

   - The P.T. was designed so that electron configurations could be read off easily.
   - Horizontal rows are called *periods*. Each period represents a Principal Energy level, n=1, n=2, n=3,
   - The P.T. is divided into orbital blocks, s-block, p-block, d-block, f-block. Blocks represent what orbital an element's highest energy valance e- are in.

- The P.T. even takes into account the overlap among the d and f orbitals in the filling order. Because of this, the d block is always _1_ principal quantum number lower than the s and p blocks for any particular row.

Likewise, the f-block is always ___ principal quantum numbers ____________________.

EX: Na: Ca: Cr:



STEP 2: Now, we can actually write some noble gas configurations. Write, in brackets, the symbol of the closest noble gas with a lesser atomic number. Then "read" the periodic table to determine the electron configuration of the remaining electrons.

EXAMPLES

Cl: Br:

Mn: Sb:

7. *Electron Configuration EXCEPTIONS.*

A. D-block exceptions. Involve the _________________ family and the ___________________family.

- The electron configuration we would expect for Cr is _______________________________________.

  The e- configuration actually is: [Ar] $4s^1 3d^5$

** Why???____.

- The electron configuration we would *expect* for Cu is ___________________________________.

  The e- configuration actually is: [Ar]$4s^1 3d^{10}$

** Why??? ____.