WS 4.5 ***(More electron configurations!)*** *Name:*_____ *p.*___

1. Write the complete electron configuration for Ni and Sn.

Ni

Sn

2a. Explain why the electrons in the n = 4 level generally have more energy than those in the n = 3 level.

b. Though n = 4 generally has higher energy than n = 3, there is an exception: Electrons fill the 4s orbital "before" they occupy the 3d orbitals. Why would electrons have lower potential energy by filling 4s before they fill 3d?

3. Write the electron configurations for the following elements, using the noble gas abbreviation.

Ni

Sn

Bi

Br

Xe

Mn

Al

U

Pb

Eu

Rb

Cf

4. Valence electrons are the electrons in the outermost shell (n-level) of the atom.
They are generally the electrons involved bonding: In covalent bonds, elements share valence electrons.
In ionic bonding, elements gain or lose electrons in the valence shell.
For each element in #3, underline the valence electrons, and then write the number of valence electrons it has.

5. Write the electron configurations for the following elements. OK to use the noble gas abbreviation.

V

As

I

Pt

Pu

B

Po

Am

6. For each element in #5, underline the valence electrons, and then write the number of valence electrons it has.

7. Fill this out! **Don't** use the noble gas abbreviation.

Atom symbol	**Electron Configuration of the Atom**	**Ion symbol**	**Electron Configuration of the ion:**
Na	$1s^2 2s^2 2p^6 3s^1$	Na^{+1}	_____
S	$1s^2 2s^2 2p^6 3s^2 3p^4$	S^{-2}	_____
F	$1s^2 2s^2 2p^5$	F^{-1}	_____
Al	$1s^2 2s^2 2p^6 3s^2 3p^1$	Al^{+3}	_____
P	$1s^2 2s^2 2p^6 3s^2 3p^3$	P^{-3}	_____
Mg	$1s^2 2s^2 2p^6 3s^2$	Mg^{+2}	_____
Ti	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$	Ti^{+4}	_____

8a. All of the ions in number 7 should have the same number of valence electrons. How many do they have?_____

8b. Many elements gain/lose/share electrons to acquire this number (in a) of valence electrons.
This is called the _____ rule. (circle the correct *answer* below.)

duet *trio* *quartet* *quintet* *sextet* *heptet* *octet*

9. The Heisenberg Uncertainty Principle (stated as an equation) is $\Delta p \cdot \Delta x \geq \frac{h}{4\pi}$.

a. What do the variables represent in the equation?

b. Explain what the Heisenberg Uncertainty Principle says:

c. Explain how the uncertainty principle relates to the modern quantum mechanical model and the concept of orbitals.

I A

II A

1s
2s 2p
3s 3p 3d
4s 4p 4d 4f
5s 5p 5d 5f
6s 6p 6d 6f
7s 7p 7d 7f

III A IV A V A VI A VII A VIII A

Hydrogen																	Helium
Lithium	Beryllium											Boron	Carbon	Nitrogen	Oxygen	Fluorine	Neon
Sodium	Magnesium											Aluminum	Silicon	Phosphorus	Sulfur	Chlorine	Argon
Potassium	Calcium	Scandium	Titanium	Vanadium	Chromium	Manganese	Iron	Cobalt	Nickel	Copper	Zinc	Gallium	Germanium	Arsenic	Selenium	Bromine	Krypton
Rubidium	Strontium	Yttrium	Zirconium	Niobium	Molybdenum	Technetium	Ruthenium	Rhodium	Palladium	Silver	Cadmium	Indium	Tin	Antimony	Tellurium	Iodine	Xenon
Cesium 55	Barium 56	Lutetium 71	Hafnium 72	Tantalum	Tungsten	Rhenium	Osmium	Iridium	Platinum	Gold	Mercury	Thallium	Lead	Bismuth	Polonium	Astatine	Radon
Francium 87	Radium 88	Lawrencium 103	Rutherfordium 104	Dubnium	Seaborgium	Bohrium	Hassium	Meitnerium	Ununnilium	Unununium	Ununbium	113	114	115	116	117	118

Darmstadtium (Ds)
Roentgenium (Rg)
Copernicium (Cn)

Lanthanum 57	Cerium 58	Praseodymium	Neodymium	Promethium	Samarium	Europium	Gadolinium	Terbium	Dysprosium	Holmium	Erbium	Thulium	Ytterbium 70
Actinium 89	Thorium 90	Protactinium	Uranium	Neptunium	Plutonium	Americum	Curium	Berkelium	Californium	Einsteinium	Fermium	Mendelevium	Nobelium 102