Chemistry 101 – Unit 11
Answers to Practice Problems

1. Fill in the following Tables:

Energy Level	Number of Sublevels	Name(s) of Sublevel(s)	Maximum # of Electrons Per Level = ($2n^2$)
1	1	**s**	**2**
2	**2**	s, p	**8**
3	3	**s, p, d**	18
4	**4**	s, p, d, f	**32**

Sublevel Name	Number of Degenerate Orbitals*	Orbital Shape	Number of Electrons per Orbital	Number of Electrons Sublevel
s	1	spherical	2	**2**
p	3	**Lobed, dumbbell**	**2**	6
d	**5**	----------	2	**10**
f	**7**	----------	**2**	14

(*Degenerate orbitals: Orbitals of the same energy)

2. Write the electron configurations of:

   a. Bromine **(35e^-)** **$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4\ s^2\ 3d^{10}\ 4p^5$**

   b. Calcium **(20e^-)** **$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4\ s^2$**

   c. Aluminum **(13e^-)** **$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$**

   d. Fluorine **(9e^-)** **$1s^2\ 2s^2\ 2p^5$**

   e. Argon **(18e^-)** **$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$**

3. Write the valence level electron configuration for:

a. Nitrogen **$2s^2\ 2p^3$** **(Group 5A)**
b. Barium **$6s^2$** **(Group 2A)**
c. Selenium **$4s^2\ 4p^4$** **(Group 6A)**

4. Write the Lewis symbol for:

a. Phosphorus 

b. Potassium 

c. Chlorine 

5. Write the electron configuration for each of the following ions. State which noble gas is isoelectronic with each ion.

a. **S^{-2}** **$= 1s^2\ 2S^2\ 2p^6\ 3s^2\ 3p^6$** **isoelectronic with Ar ($18e^-$)**

b. **Mg^{+2}** **$= 1s^2\ 2S^2\ 2p^6$** **isoelectronic with Ne ($10e^-$)**

c. **Br^-** **$= 1s^2\ 2S^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6$**

(<u>or</u> $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^6$) **isoelectronic with Kr ($36e^-$)**

6 Using the electronegativity values in your textbook, identify each of the following bonds as ionic, polar covalent or nonpolar covalent. If the bond is polar or ionic, identify the positive and negative ends.

a. Ca – Cl bond **Ca= 1.0** **Cl= 3.0** **Δ= 2.0** **ionic**

b. H – C bond **H= 2.1** **C= 2.5** **Δ= 0.4** **non-polar covalent**

c. N – F bond **N= 3.0** **F= 4.0** **Δ= 1.0** **polar covalent**

d. Cl – Cl bond **Cl= 3.0** **Cl= 3.0** **Δ= 0.0** **non-polar covalent**

e. Li – F bond **Li= 1.0** **F= 4.0** **Δ= 3.0** **ionic**

f. O – P bond **O= 3.5** **P= 2.1** **Δ= 1.4** **polar covalent**

Rank the above bonds in order of increasing polarity.

	Cl–Cl	**<**	**H–C**	**<**	**N–F**	**<**	**O–P**	**<**	**Ca-Cl**	**<**	**Li-F**
Δ =	**0**		**0.4**		**1.0**		**1.4**		**2.0**		**3.0**

Least polar ⟶ **Most polar**

(Ca-Cl and Li-F are so polar they are actually ionic.)