Name KEY!

Chemistry 11 - Atomic Theory, Periodic Table, and Bonding Theory Review

1. Give the number of protons, neutrons and electrons in the following:

Isotope	*Protons*	*Neutrons*	*Electrons*
$^{177}Hf^{3+}$	72	105	69
$^{209}Po^{2+}$	84	125	82
$^{212}At^{-}$	85	127	86

2. Give the nuclear notation of the following:

Isotope	*Protons*	*Neutrons*	*Electrons*
$^{96}_{42}Mo^{3+}$	42	54	39
$^{74}_{32}Ge$	32	42	32
$^{265}_{108}Hs^{3+}$	108	157	105

3. What is the name of the element, **X**, which has the following mixture of isotopes:
^{192}X = 35.5%, ^{194}X = 34.9%, ^{198}X = 20.3%, ^{209}X = 9.3%

At. Mass = (0.355)(192) + (0.349)(194) + (0.203)(198) + (0.093)(209)
= 195.50 g/mol – Pt

4. Each single orbital can hold a maximum of __2__ electrons.

5. An "s" subshell (1 orbital) can hold a maximum of __2__ electrons

A "p" subshell (3 orbitals) can hold a maximum of __6__ electrons

A "d" subshell (5 orbitals) can hold a maximum of __10__ electrons

An "f" subshell (7 orbitals) can hold a maximum of __14__ electrons

When electrons in an atom are filling energy levels, they fill the __lowest__ possible energy levels first.

6. Give the electron configuration for each of the following atoms and ions: (You may use core notation)

Si	[Ne] $3s^2 3p^2$	Cr	[Ar] $4s^1 3d^5$
Br	[Ar] $4s^2 3d^{10} 4p^5$	Sr	[Kr] $5s^2$
K	[Ar] $4s^1$	Fe	[Ar] $4s^2 3d^6$
Ge	[Ar] $4s^2 3d^{10} 4p^2$	P	[Ne] $3s^2 3p^3$
Na^+	[He] $2s^2 2p^6$	Mg^{+2}	[He] $2s^2 2p^6$
Br^-	[Ar] $4s^2 3d^{10} 4p^6$	As^{-2}	[Ar] $4s^2 3d^{10} p^6$
O^{-2}	[He] $2s^2 2p^6$	Te^{-2}	[Kr] $5s^2 4d^{10} 5p^6$

7. Write the configuration and then find the number of valence electrons for the following atoms:

N (configuration) ___[He] $2s^2 2p^3$___ (# of valence e^-'s) ___5___

Si (configuration) ___[Ne] $3s^2 3p^2$___ (# of valence e^-'s) ___4___

Ca (configuration) ___[Ar] $4s^2$___ (# of valence e^-'s) ___2___

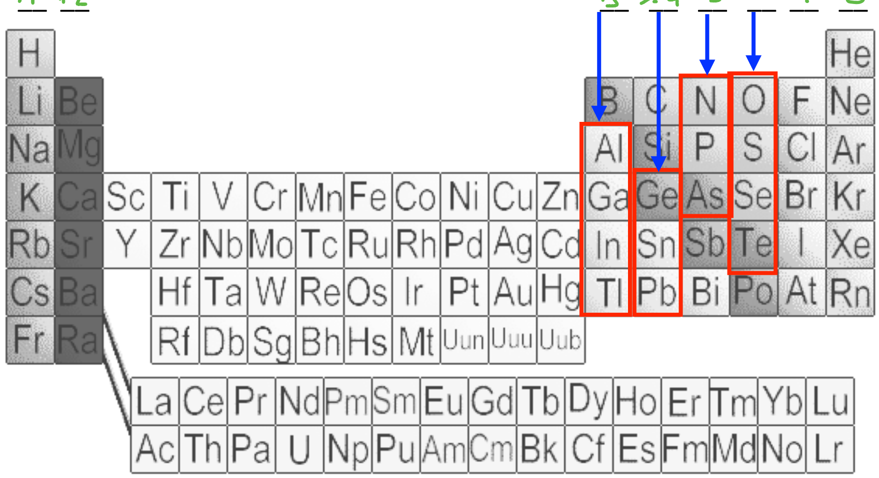
P (configuration) ___[Ne] $3s^2 3p^3$___ (# of valence e^-'s) ___5___

Al (configuration) ___[Ne] $3s^2 3p^1$___ (# of valence e^-'s) ___3___

On the following diagram of the Periodic Table, list the number of valence electrons and the most common ion charge in Groups 1,2 & 13-18

# of Valence e^-s: 1, 2, 3, 4, 5, 6, 7, 0

Ion Charge: +1, +2, +3, ±4, -3, -2, -1, 0



8. In order to become stable,

an atom of Ca will _donate__ _2_ electrons and become the ion __Ca^{2+}___

an atom of Se will _gain__ _2_ electrons and become the ion _Se^{2-}_

an atom of K will _donate_ _1_ electrons and become the ion _K^+_

an atom of Br will _gain_ _1_ electrons and become the ion _Br^-_

an atom of N will _gain_ _3_ electrons and become the ion _N^{3-}_

an atom of As will _gain_ _3_ electrons and become the ion _As^{3-}_

an atom of Al will _donate_ _3_ electrons and become the ion _Al^{3+}_

an atom of Te will _gain_ _2_ electrons and become the ion _Te^{2+}_

9. What is the general trend in atomic radius (size of atoms) as you move from left to right across any Period? (*increase/decrease*) ___decrease___

10. As you move from Li to Ne, electrons are filling (*the same/different*) ___Same___ energy levels(s).

This may help explain why atoms *don't* get bigger as you move to the right within a period.

↑ protons while NO increase in shielding (no more core electrons)

11. As you move across from Li to Ne, what is happening to the number of *protons* in the nucleus? ___increases___. What do the protons do to the electrons? ___attraked___. Suggest a reason why the atoms in a period actually get *smaller* as you move from left to right.

12. What is the general trend in atomic radius (size of atoms) as you move *down* a vertical column (group)? (*increase/decrease*) ___Increase___

13. Suggest a reason for this trend. (*Hint: are electrons filling up the same energy level (orbitals) as you move down a column?*) No! Every new row means +1 energy level!

14. What is meant by **ionization energy**?
The amount of E required to remove an e^- from the outter most shell

15. What is the general trend in first ionization energy as you move from left to right across any Period? (eg. from Li→Ne or from Na→Ar) (*increase/decrease*) ___increase___

16. Keeping in mind the trend in atomic radius as you move from left to right across a period, suggest a reason for this trend in ionization energies. (Hint: *What happens to the distance and the force of attraction between the nucleus and the outer electron as atoms get smaller?*)
↑ protons increase attraktive force ∴ harder to remove e^-

17. What is the trend in ionization energy as you move down a vertical column, like from Li→Na→K or from He→Ne→Ar→Kr? (*increase/decrease*) ___decrease___

Suggest a reason for this trend based on atomic radius (size) and the distance and force of attraction between the nucleus and the outer electron.
while attrack increases so does shielding + distance overall attraktive force goes ↓

18. Compare the following particles:

sodium ion	oxide	neon	Magnesium atom	Fluorine atom

a. Arrange the particles using **chemical formulas** from **smallest atomic radii** to **largest atomic radii**:

Na^+ → Ne → F → O^{2-} → Mg

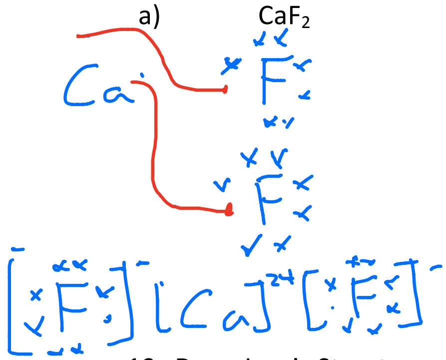
← EN

b. On your answer above, using **arrows** show the trend of **electronegativity, ionization energy** and **electron affinity**.

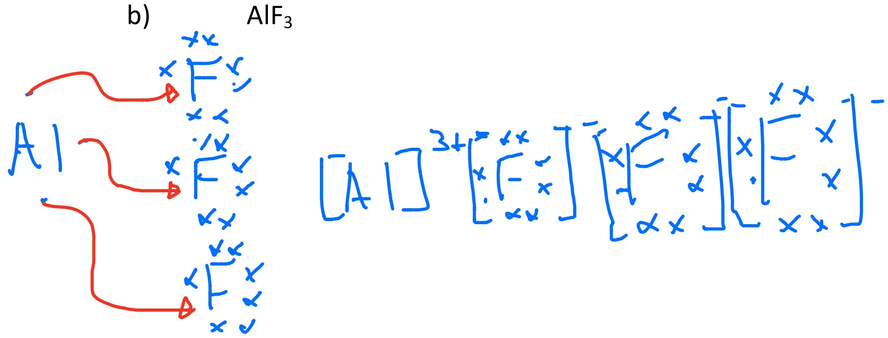
← IE

Draw Lewis Structures (Electron-dot diagrams) for the following ionic compounds:

a) CaF_2

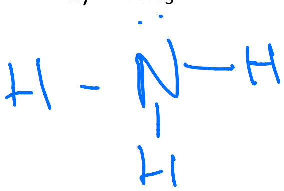


b) AlF_3

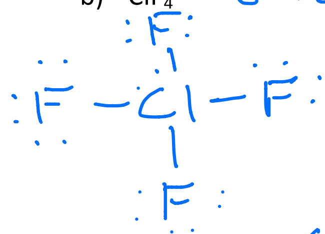


19. Draw Lewis Structures (Electron-dot diagrams) for the following covalent compounds.

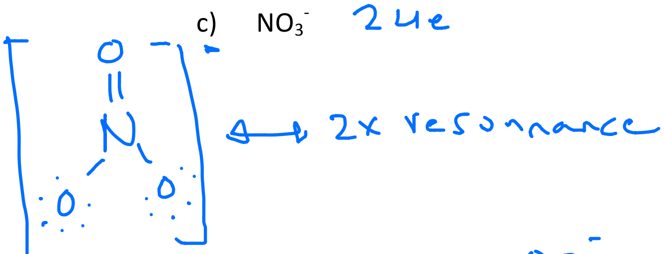
a) NH_3 8e⁻



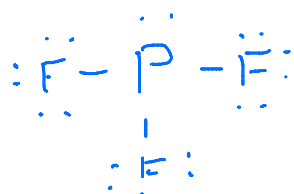
b) ClF_4^+ 34e⁻



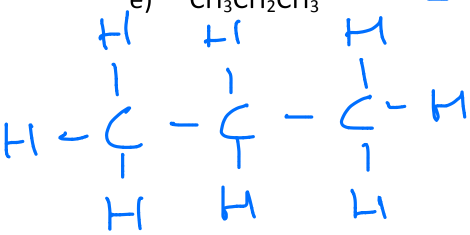
c) NO_3^- 24e⁻



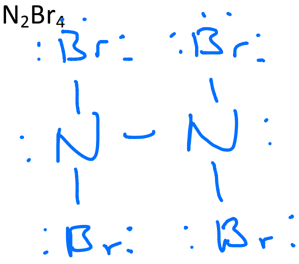
d) PF_3 26e⁻



e) $CH_3CH_2CH_3$ 20e⁻

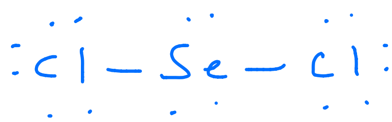


f) N_2Br_4 38e⁻

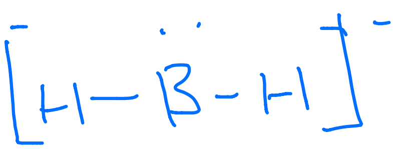


g) H_2S 8e⁻

h) $SeCl_2$ 20e⁻



i) BH_2^- 8e⁻



j) SF_5^- 42e⁻