

CH301 Fall 2010 Worksheet 3: Electron Configurations and Periodic Trends

1. Match the following elements with their corresponding electron configurations

Te	[Kr] 5s ² 4d ²
Ir	[Kr] 5s ²
Zr	[Ne] 3s ² 3p ²
Si	[Kr] 4d ¹⁰ 5s ² 5p ⁴
Sr	[Xe] 4f ¹⁴ 5d ⁷ 6s ²

2. Write the electron configuration of arsenic (As) in long notation and in short (noble gas) notation.

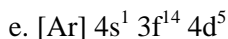
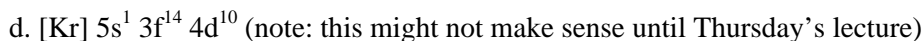
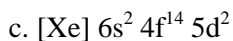
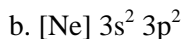
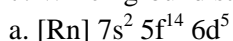
3. Write the electron configuration of a divalent cobalt cation (Co²⁺) in long and in short notation.

4. Write the electron configuration of a monovalent astatine anion (At⁻) in long and in short notation.

5. Write the electron configuration of ununoctium (Uuo), atomic number 118, in long and in short notation.

6. Although it can't be found on any periodic table, what would element 120's electron configuration be, in long and short notation?

7. Which ground state element corresponds to the following electron configurations?



8. Consider the element calcium (Ca). What is the effective nuclear charge experienced by electrons in the following of Ca's subshells?

a. 4s

b. 3p

c. 3s

d. 1s

9. If a helium atom had an electron had one of its electrons excited from its 1s subshell to a 2s subshell, what would be the ENC experienced by that electron?

10. Consider an electron in the orbitals given and rank them from most attracted to the nucleus to least attracted to the nucleus by comparing their effective nuclear charges that they each experience.

(i) 3p in Mg (ii) 2p in O (iii) 4s in Ca (iv) 2s in K

11. Do what you did in 10, but rank them from least attracted to most attracted.

(i) 2s in N (ii) 3p in Sc (iii) 3s in S (iv) 2p in Fe

12. Consider the trends below. As effective nuclear charge increases, do these trends increase or decrease?

a. electron affinity

b. atomic radius

c. ionization energy

d. metallic character

13. For the trends above (electron affinity, atomic radius, ionization energy, metallic character) we are comparing elements to other elements. How is the ionic radius trend different?

14. For each species below, write its set of isoelectronic species

a. S^{2-}

b. He

15. Write the set of isoelectronic species for Mg^{2+} and arrange them from smallest to largest

16. Arrange the elements Cs, P, K, O, He, F by:

a. increasing electron affinity

b. decreasing atomic radius

c. decreasing ionization energy

17. Why do noble gases have exceptionally low electron affinities and exceptionally high ionization energies?

18. What effects do filled and half-filled subshell considerations have on electron configurations?

19. Arrange the following sets of elements as described.

a. Si, P, S, Cl - increasing electron affinity

b. C, N, O, F - decreasing ionization energy

20. Explain the “hiccups” in the periodic trends below in terms of filled and half-filled subshells.

a. electron affinity

b. ionization energy