

Chemistry Review – ANSWER KEY
Electronic Nature of the Atom and Periodic Trends

Answer the following:

1. Consider $n = 4$ principal energy level
 - a. What is the # of subshells in this energy level? **16**
 - b. What is the total # of orbitals in $n = 4$ E.L.? **4 orbitals (s, p, d, f)**

2. Quantum numbers – give the set of four QN for each electron in the 3s orbital in a sodium atom.

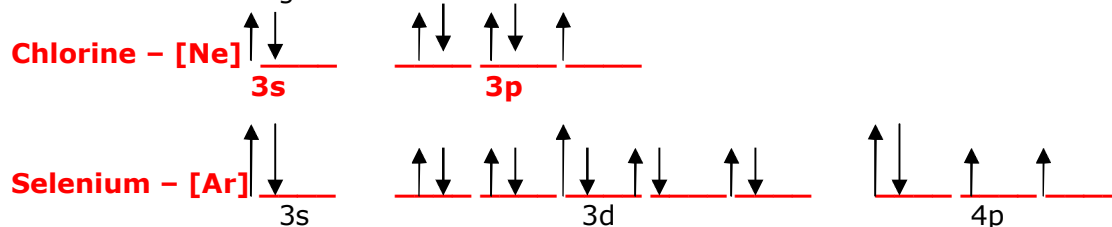
There is one electron in the 3s orbital in a sodium atom. For the one electron, the QN would be 3, 0, 0, +1/2

3. Give the electron configuration for a chlorine atom. Do the same for selenium atom. (Use the noble gas shortcut).

Chlorine – [Ne] $3s^2 3p^5$

Selenium – [Ar] $4s^2 3d^{10} 4p^4$

4. Draw the orbital diagrams for each atom in # 3.



5. For each pair choose the smaller atom or ion:

- a. Cu atom or Cu^{2+} ion **Cu^{2+} ion**
- b. Se atom or Se^{2-} ion **Se atom**
- c. Cu^+ ion or Cu^{2+} ion **Cu^{2+} ion**

6. Use only the periodic table, arrange these atoms in order of increasing first ionization energy: Al, Ar, Cl, Na, K, Si

K Na Al Si Cl Ar

7. The blue line of strontium atom emission has a wavelength of 461 nm. What is the frequency of this light? What is the energy of a photon of this light?

ν (frequency) = $6.508 \times 10^{14} \text{ sec}^{-1}$

Energy = 4.315×10^{-21} Joules

8. The energy of a photon of light is 4.34×10^{-19} J. What is the wavelength and frequency of this light?

λ (wavelength) = $4.583 \times 10^{-7} \text{ m}$ (or 458 nm)

ν (frequency) = $6.546 \times 10^{14} \text{ sec}^{-1}$

9. What is the number of different orbitals in each of the subshells? How many maximum electrons can each subshell hold?

- | | | |
|-------|-----------------------------|---------------------|
| a. 3d | 5 different orbitals | 10 electrons |
| b. 4f | 7 different orbitals | 14 electrons |
| c. 4p | 3 different orbitals | 6 electrons |
| d. 5s | 1 orbital | 2 electrons |