Chapter 6 – Problems 32, 50, 52, 54, 75

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32. Write the ground state electron configuration for:

(a) Mg

$$[\mathrm{Ne}]\,3\,\mathrm{s}^2$$

(b) Os

$$[\mathrm{Xe}]\,6\,\mathrm{s}^2\,4\,\mathrm{f}^{14}\,5\,\mathrm{d}^6$$

(c) Ge

$$[\mathrm{Ar}]\,4\,\mathrm{s}^2\,3\,\mathrm{d}^{10}\,4\,\mathrm{p}^2$$

(d) V

$$[\mathrm{Ar}]\,4\,\mathrm{s}^2\,3\,\mathrm{d}^3$$

(e) At

$$[\mathrm{Xe}]\,6\,\mathrm{s}^2\,5\,\mathrm{d}^{10}\,4\,\mathrm{f}^{14}\,6\,\mathrm{p}^5$$

50. Write the ground state electron configuration for:

(a) F, F^-

$$\mathrm{F}\text{: } 1\,\mathrm{s}^2\,2\,\mathrm{s}^2\,2\,\mathrm{p}^5$$
$$\mathrm{F}^-\text{: } 1\,\mathrm{s}^2\,2\,\mathrm{s}^2\,2\,\mathrm{p}^6$$

(b) Sc, Sc^{3+}

$$\mathrm{Sc}\text{: } 1\,\mathrm{s}^2\,2\,\mathrm{s}^2\,2\,\mathrm{p}^6\,3\,\mathrm{s}^2\,3\,\mathrm{p}^6\,4\,\mathrm{s}^2\,3\,\mathrm{d}^1$$
$$\mathrm{Sc}^{3+}\text{: } 1\,\mathrm{s}^2\,2\,\mathrm{s}^2\,2\,\mathrm{p}^6\,3\,\mathrm{s}^2\,3\,\mathrm{p}^6$$

(c) Mn^{2+}, Mn^{5+}

$$Mn^{2+}:\ 1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,4s^2\,3d^5$$
$$Mn^{5+}:\ 1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,4s^2\,3d^2$$

(d) O^-. O^{2-}

$$O^-:\ 1s^2\,2s^2\,2p^5$$
$$O^{2-}:\ 1s^2\,2s^2\,2p^6$$

52. How many unpaired electrons are in the following ions:

(a) Al^{3+}

0

(b) Cl^-

0

(c) Sr^{2+}

0

(d) Zr^{4+}

0

54. Arrange the elements Mg, S, and Cl in order of:

(a) Increasing atom radius

Least | Cl S Mg | Greatest

(b) Increasing first ionization energy

Least | Mg S Cl | Greatest

(c) Decreasing Electronegativity

Least | Mg S Cl | Greatest

75. Explain why:

(a) Negative ions are larger than their corresponding atoms.

A negative ion means greater electrons. As such, this means that the repulsion force between the nucleus of the atom and the proton is greater, thereby increasing the distance from nucleus to orbitals.

(b) Scandium, a transition metal, forms an ion with a noble-gas structure.

This is because atoms try to take the most stable electron configuration. The noble gases have the most stable electron configurations, which means that Scandium will try to take a similar structure.

(c) Electronegativity decreases down a group in the periodic table

This is because, although it should theoretically remain the same, the repulsion forces between the nucleus and the orbitals is greater, meaning that the elements moving down are slightly less stable, and, therefore, are less able to hold an electron.