

Electron Configurations Worksheet

Chemistry

- 1) What does each letter and number mean in the following notation?  $3p^6$
- 2) Determine the following for the 4<sup>th</sup> electron shell ( $n=4$ ) of an atom:
  - a) Number of subshells it contains
  - b) The designation used to describe each of the first three subshells
  - c) The number of orbitals in each of the first three subshells.
  - d) The maximum number of electrons that can occupy the 4<sup>th</sup> shell.
  - e) The maximum number of electrons that can occupy each of the first three subshells.
- 3) Fill in the numerical value(s) that correctly complete(s) each of the following statements.
  - a) A 5f subshell holds a maximum of \_\_\_\_\_ electrons.
  - b) A 4s orbital holds a maximum of \_\_\_\_\_ electrons.
  - c) The maximum number of electrons in the third electron shell is \_\_\_\_\_.
  - d) The fourth shell contains \_\_\_\_\_ subshells, \_\_\_\_\_ orbitals, and a maximum of \_\_\_\_\_ electrons.
- 4) Give the maximum number of electrons that can occupy each of the following units.
  - a) 2p subshell
  - b) 5d orbital
  - c) 3s orbital
  - d) 5d subshell
  - e) fifth shell
- 5) Write an orbital-filling diagram for the outer energy level of the following elements by drawing an arrow for each electron:
  - a) Argon \_\_\_\_\_  
           s      p<sub>x</sub> p<sub>y</sub> p<sub>z</sub>
  - b) Sulfur \_\_\_\_\_  
           s      p<sub>x</sub> p<sub>y</sub> p<sub>z</sub>
  - c) Calcium \_\_\_\_\_  
           s      p<sub>x</sub> p<sub>y</sub> p<sub>z</sub>
  - d) Oxygen \_\_\_\_\_  
           s      p<sub>x</sub> p<sub>y</sub> p<sub>z</sub>
- 6) Write the electronic configuration for germanium.
- 7) Write the electronic configuration for iron.
- 8) The electron configuration for a neutral atom ends in  $4s^23d^8$ .
  - a) What is its atomic number?

- b) How many orbitals are NOT completely filled?
- c) Name the atom.
- 9) The electron configuration for a neutral atom ends in  $3s^2$ .
  - a) What is its atomic number?
  - b) How many orbitals are NOT completely filled?
  - c) Name the atom.
- 10) Name the elements whose electron configuration is:
  - a)  $1s^22s^22p^63s^23p^64s^23d^3$
  - b)  $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^9$
  - c)  $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^2$
  - d)  $[\text{Xe}] 6s^24f^{14}5d^6$
  - e)  $[\text{Rn}] 7s^25f^{11}$
- 11) Determine which of the following electron configurations are not valid, and tell what is wrong with them:
  - a)  $1s^22s^22p^63s^23p^64s^24d^{10}4p^5$
  - b)  $1s^22s^22p^63s^23d^{10}$
  - c)  $[\text{Ra}] 7s^25f^8$
  - d)  $[\text{Kr}] 4s^23d^{10}4p^5$

An **ion** is an element that has a positive or negative charge because it has lost or gained one or more electrons. Positively-charged ions are also called **cations**; negatively charged ions are **anions**. A **polyatomic ion** is a bound group of elements that has a positive or negative charge.

Based on this information, answer the following:

- 12) Name the  $-1$  ion that has an electron configuration of  $[\text{Kr}]$ .
- 13) Name the  $-2$  ion that has an electron configuration of  $[\text{Ar}]$ .
- 14) Name the  $+1$  ion that has an electron configuration of  $[\text{Ar}]$ .
- 15) Name the  $+1$  ion that has an electron configuration of  $[\text{Ne}]$ .
- 16) Name the  $+3$  ion that has an electron configuration of  $[\text{Ne}]$ .
- 17) Determine the electron configuration for each of the following ions:
  - a)  $\text{S}^{2-}$
  - b)  $\text{Se}^{2-}$
  - c)  $\text{Mg}^{2+}$
  - d)  $\text{Ca}^{2+}$