Chemistry

Name:
Date:
Period:

Electron Configuration Worksheet (and Lots More!!)

Brief Instructions

An electron configuration is a method of indicating the arrangement of electrons about a nucleus. A typical electron configuration consists of numbers, letters, and superscripts with the following format:

1. A number indicates the energy level (The number is called the principal quantum number.).
2. A letter indicates the type of orbital; s, p, d, f.
3. A superscript indicates the number of electrons in the orbital. Example: ls^2 means that there are two electrons in the 's' orbital of the first energy level. The element is helium.

To write an electron configuration:

1. Determine the total number of electrons to be represented.
2. Use the Aufbau process to fill the orbitals with electrons. The Aufbau process requires that electrons fill the lowest energy orbitals first. In another words, atoms are built from the ground upwards. The sum of the superscripts should equal the total number of electrons.
3. Example: 12Mg ls^2 $2s^2$ $2p^6$ $3s^2$

Configuration Writing Practice

1. Write a ground state electron configuration for each neutral atom. Ground state means that all of the lowest possible energy levels (up to the proper number of electrons for the element) are filled.

a) Na
b) Pb
c) Sr
d) U
e) N
f) Ag
g) Ti
h) Ce
i) Cl
j) Hg

2. If each orbital can hold a maximum of two electrons, how many electrons can each of the following hold?

a) 2s
b) 5p
c) 4f
d) 3d
e) 4d

3. What is the shape of an s orbital?
4. How many s orbitals can there be in an energy level?
5. How many electrons can occupy an s orbital?
6. What is the shape of a p orbital?
7. How many p orbitals can there be in an energy level?
8. Which is the lowest energy level that can have a s orbital?
9. Which is the lowest energy level that can have a p orbital?
10. Is it possible for two electrons in the same atom to have exactly the same set of quantum numbers?
11. Distinguish between an atom in its ground state and an excited atom.
12. How many d orbitals can there be in an energy level?

13. How many d electrons can there be in an energy level?
14. Which is the lowest energy level having d orbitals?
15. How many f electrons can there be in an energy level?
16. Which is the lowest energy level having f orbitals?
17. How many f orbitals can there be in an energy level?
18. How many energy levels are partially or fully ocupied in a neutral atom of calcium?
19. Which sublevels of the 3rd energy level are filled
    (a) in the element argon
    (b) in the element krypton?
20. For the following elements list the electron configuration.

a) oxygen	d) titanium	g) chlorine
b) cesium	e) scandium	h) arsenic
c) krypton	f) nitrogen	i) francium

21. For the following elements list the shorthand electron configuration

a) boron	e) radon	i) iron
b) cadmium	f) iodine	j) astanine
c) phosphorus	g) strontium	
d) neon	h) nickel	

Writing Electron Configurations

1. Electrons occupy the lowest energy orbital first, then move to the next one and so on. (The "Aufbau" Princple)
2. Orbitals are considered to be in the same shell if they have the same first number (no matter in what order filling is done).
3. An atom will gain or lose electrons in order to have eight electrons in its outer shell. (The "Octet" Rule)
4. The outer shell is the highest numbered shell which has electrons in it. Only s and p orbitals are part of the outer shell.

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1. Write a ground state electron configuration for each neutral atom. Ground state means that all of the lowest possible energy levels (up to the proper number of electrons for the element) are filled.

a) Na (11) $1s^2 2s^2 2p^6 3s^1$
b) Pb (82) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^2$
c) Sr (38) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2$
d) U (92) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^4$
e) N (7) $1s^2 2s^2 2p^3$
f) Ag (47) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^9$
g) Ti (22) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$
h) Ce (58) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^2$
i) Cl (17) $1s^2 2s^2 2p^6 3s^2 3p^5$
j) Hg (80) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10}$