Electron Configuration Practice
Chemistry

Name: _____
Due Date: _____

How to write an electron configuration:

A. Determine the total number of electrons to be represented.
B. Use the Aufbau principle to fill the orbitals with electrons for elements 1-23. Refer to electron configuration periodic table for elements after 23
C. The sum of the superscripts should equal the total number of electrons. Example:
12Mg $1s^2\ 2s^2\ 2p^6\ 3s^2$

I. Configuration Writing Practice

A. 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.

1. Na: $1s^2 2s^2 2p^6 3s^1$
2. Pb: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^2$
3. Sr: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2$
4. U: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^3 6d^1$
5. N: $1s^2 2s^2 2p^3$
6. * Ag: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^{10}$
7. Ti: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$
8. Ce: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^1 5d^1$
9. Cl: $1s^2 2s^2 2p^6 3s^2 3p^5$
10. Hg: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10}$

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B. Write a ground state electron configuration for these ions. Remember that ions have a change in the total number of electrons (positive have lost electrons and negative have gained). Example: N^{3-} is $1s^2\ 2s^2\ 2p^6$. It has three extra electrons

11. O^{2-}: [Ne]

12. Fe^{2+}: [Ar] $4s^1 3d^5$

13. B^{3+}: [He]

14. Ni^{2+}: [Ar] $3d^8$

15. K^{+}: [Ar]

16. Co^{3+}: [Ar] $4s^1 3d^5$

C. For the following electron configurations determine the possible elements (or ions) they may represent

17. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6\ 4s^2\ 3d^{10}\ 4p^4$: Se

18. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6\ 4s^2\ 3d^{10}\ 4p^6$: Kr

19. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^2\ 4f^{10}$: Ho

20. $1s^2\ 2s^2 2p^6\ 3s^2 3p^6\ 4s^2\ 3d^5$: Mn

21. [Kr] $5s^2\ 4d^{10}\ 5p^3$: Sb

22. [Ar] $4s^1$: K

23. [Xe] $6s^2\ 4f^{10}$: Ho

24. [Ne] $3s^2\ 3p^1$: Al

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D. Complete the following chart:

Element	Atomic Number	Number of e^- in each E Level	Electron Configuration	Number of e- probably lost or gained	Number of e^- left after loss or gain	Charge on Ion
O	8	2,6	$[He]2s^2 2p^4$	2 gain	10	2^-
Na	11	2,6,1	$[Ne]3s^1$	1 lost	10	1^+
S	16	2,8,6	$[Ne]3s^2 3p^4$	2 gain	18	2^-
K	19	2,8,8,1	$[Ar]4s^1$	1 lost	18	1^+
Al	13	2,8,3	$[Ne]3s^2 3p^1$	3 lost	10	3^+
Cl	17	2,8,7	$[Ne]3s^2 3p^5$	1 gain	18	1^-
Sr	38	2,8,18,8,2	$[Kr]5s^2$	2 lost	36	2^+
Ca	20	2,8,8,2	$[Ar]4s^2$	2 lost	18	2^+
F	9	2,7	$[He]2s^2 2p^5$	1 gain	10	1^-
Br	35	2,8,18,7	$[Ar]4s^2 4p^5$	1 gain	36	1^-
N	7	2,5	$[He]2s^2 2p^3$	3 gain	10	3^-
I	53	2,8,18,18,7	$[Kr]5s^2 4d^{10} 5p^5$	1 gain	54	1^-

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E. In the space below, write the full (unabbreviated) electron configurations of the following elements:

1) sodium $1s^2 2s^2 2p^6 3s^1$

2) iron $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$

3) bromine $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

4) barium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$

5) neptunium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 6d^1 5f^4$

F. In the space below, write the Noble Gas (abbreviated) electron configurations of the following elements:

6) cobalt $[Ar] 4s^2 3d^7$

7) silver $[Kr] 5s^2 4d^9 \rightarrow [Kr] 5s^1 4d^{10}$

8) tellurium $[Kr] 5s^2 4d^{10} 5p^4$

9) radium $[Rn] 7s^2$

10) lawrencium $[Rn] 7s^2 5f^{14} 6d^1$

G. Determine what elements are denoted by the following electron configurations:

11) $1s^2 2s^2 2p^6 3s^2 3p^4$ S

12) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$ Rb

13) $[Kr]\ 5s^2 4d^{10} 5p^3$ Sb

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

15) $[Rn]\ 7s^2 5f^{11}$ Fm

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H. Determine which of the following electron configurations are not valid: State which rule has been violated.

16) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^5$ 3d 10

17) $1s^2 2s^2 2p^6 3s^3 3d^5$ $3p^5$

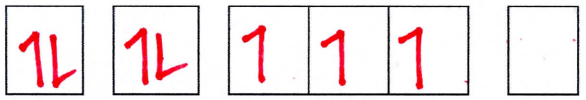
18) [Ra] $7s^2 5f^8$ must be a noble gas

19) [Kr] $5s^2 4d^{10} 5p^5$ correct

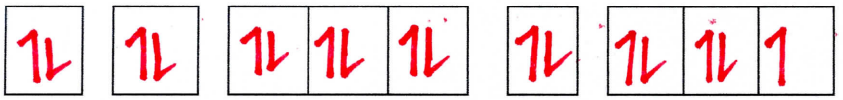
20) [Xe] correct

I. Write the full electron configuration, short-hand electron configuration, and fill in the orbital diagrams, for the following elements.

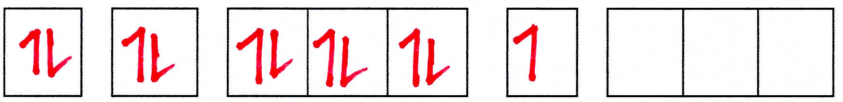
1. Nitrogen $1s^2 2s^2 2p^3$ $[He]\,2s^2 2p^3$



2. Chlorine $1s^2 2s^2 2p^6 3s^2 3p^5$ $[Ne]\,3s^2 3p^5$



3. Sodium $1s^2 2s^2 2p^6 3s^1$ $[Ne]\,3s^1$



4. Neon $1s^2 2s^2 2p^6$ [Ne]

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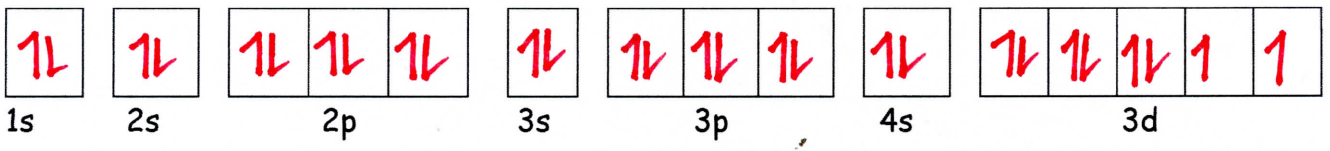
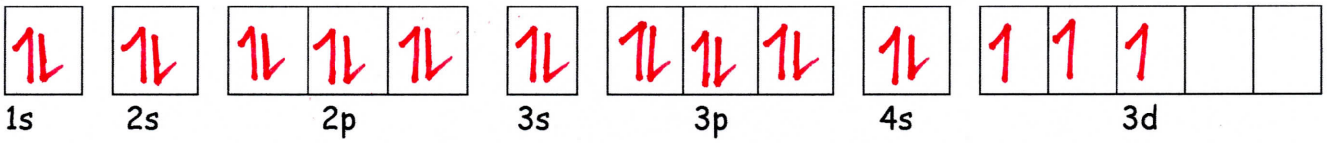
5. Nickel $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$ $[Ar]\,4s^2 3d^8$



6) Vanadium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$ $[Ar]\,4s^2 3d^3$



7) Copper $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$ $[Ar]\,4s^2 3d^9$