

atomic/Bonding: Electronic structure

Objectives

How does an atom acquire a charge.

- Student will be able to model Understand how an atom acquires a charge.
- Understand why an atom acquires a charge.
- Be able to determine an atom's most common charge and why. (octet rule)

What is the electronic structure of an atom?

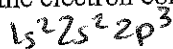
- Student will be able to write electron configurations.
- Student will be able to write orbital diagrams.



1. Considering the limitations on values for the various quantum numbers, state whether an electron can be described by each of the following sets. If a set is not possible, state why it is not.

- $n=2, l=1, m(l)=-1$ 2p - ☺ exists
- $n=1, l=1, m(l)=-1$ ---
- $n=7, l=3, m(l)=+3$ 1p ☹
- $n=3, l=1, m(l)=-3$ 7g ☺ - follow aufbau

2. a. Write the electron configuration for nitrogen.



b. How many valence electrons does nitrogen have?

5

c. What is the common charge for nitrogen?

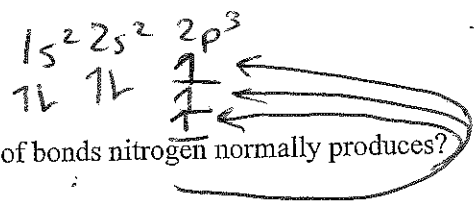
-3

d. Ammonia is a common substance. With the formula of ammonia in mind, how many times does nitrogen normally bond?



3

e. Draw out the orbital diagram for Nitrogen.



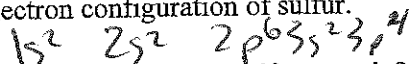
f. Does the orbital diagram confirm the number of bonds nitrogen normally produces?

NH_3 - Promotion - yes

g. What is the formula for ammonium???? can this be possible?

3. Sulfur Hexafluoride is a common molecular structure of sulfur and fluoride. Only central elements in the 3rd row of the periodic table or bigger can violate the Octet rule.

a. write out the electron configuration of sulfur.



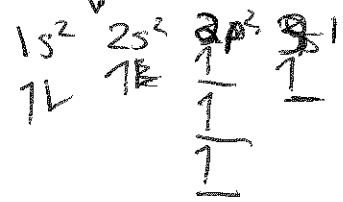
b. How many valence electrons does sulfur contain?

6

c. What is sulfur's typical ionic charge, why?

-2 gains 2 to fill shell

d. Write out orbital diagram for sulfur.



e. As stated by the summary, SF_6 occurs but OF_6 does not. What changes between the two that might explain how many times the central atom might bond.

Bonding Quiz 2

Bonding Quiz 2

Name _____
 AP Chemistry
 Electron configuration and Orbital Notation

1. Objectives: What is the electronic structure of an atom?
- Student will be able to write electron configurations.
 - Student will be able to write orbital diagrams.

For the following atoms write the number of valence electrons and give the substance most commonly formed ion.

- | | | |
|-------------|-----------|---|
| 1. Fluorine | F^{-1} | 7 |
| 2. Chlorine | Cl^{-1} | 7 |
| 3. Sodium | Na^{+1} | 1 |
| 4. Oxygen | O^{-2} | 6 |

Write the electron configurations (long hand) for the particles

- | | | | | | | | | |
|--------------|---------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| 5. Fe^{+2} | \rightarrow | $1s^2$ | $2s^2$ | $2p^6$ | $3s^2$ | $3p^6$ | $4s^2$ | $3d^4$ |
| 6. Cu | | $\uparrow\downarrow$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ | $\uparrow\downarrow$ |
| 7. Cu^{+} | | | | | | | \uparrow | \uparrow |
| 8. Cu^{2+} | | | | | | | | \uparrow |

oops did orbital ignore arrows

$Cu: 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$

$\uparrow\downarrow$
 $\uparrow\downarrow$
 $\uparrow\downarrow$
 $\uparrow\downarrow$
 \uparrow

Cu^{+1} (lost e^{-})

Cu^{+2} (lost $2e^{-}$)

$3d^8$
 $\uparrow\downarrow$
 $\uparrow\downarrow$
 $\uparrow\downarrow$
 \uparrow
 \uparrow
 $3d^7$
 $\uparrow\downarrow$
 $\uparrow\downarrow$
 \uparrow
 \uparrow

Write the electron configurations (short hand) for the following.

- S $[Ne] 3s^2 3p^4$
- S^{-2} $[Ne] 3s^2 3p^6$
- Fe $[Ar] 4s^2 3d^6$

Write the orbital diagrams for the following:

- | | | | |
|--------------|----------------------|----------------------|----------------------|
| 12. Li | $1s^2$ | $2s^1$ | $1s^2$ |
| | $\uparrow\downarrow$ | \uparrow | $\uparrow\downarrow$ |
| 13. Li^{+} | | | $\uparrow\downarrow$ |
| 14. Al | $1s^2$ | $2s^2$ | $2p^1$ |
| | $\uparrow\downarrow$ | $\uparrow\downarrow$ | \uparrow |

Explain the following in terms of covalent valence bond theory.

- Oxygen bonds twice
- Hydrogen only bonds one time.

Bonds O_2

Explain the following in terms of ionic bond theory

- Hydrogen can form anion and bond with a metal and it can form a cation and bond with a non-metal.
- Aluminum forms a +3 charge when bonding with chlorine forming $AlCl_3$.

Bonds O_2