Chemistry 11

Atomic Theory II

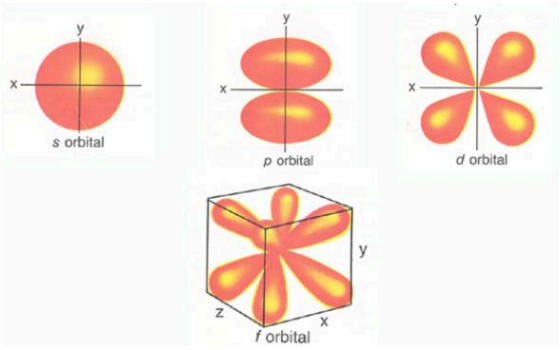
Name:
Date:
Block:

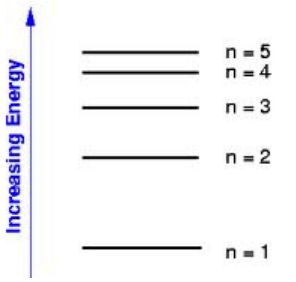
1. **Electronic Structure**
2. **Electron Configuration**
3. **Orbital Diagrams**

Electronic Structure

Video: The Uncertain Location of Electrons https://www.youtube.com/watch?v=8ROHpZ0A70I

- Electrons are found in orbitals (_____ _____) around the nucleus
- There are 4 different types of orbitals:
- Each type of orbital has a different _____
- The orbital that an electron occupies depends on its energy level (called n)





Energy level

-

Bohr's experiments with hydrogen atoms were fundamental to figuring out the electronic structure of the atom:

Bohr's Postulate #1:

- The hydrogen atom had only certain allowed _____ or stationary states.
- The lowest (smallest) orbit was called the "_____" and designated n = 1.
- The larger orbits were called "_____" and designated as n = 2, n = 3, n = 4, etc.

Bohr's Postulate #2:

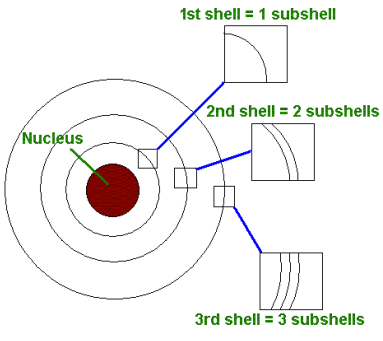
- As long as the electron moved within the same energy level, the electron did not radiate or absorb energy

Bohr's Postulate #3:

- The electron could only move from one allowed energy level to another if it _____ or _____ an amount of energy equal to the energy different between the two energy levels.

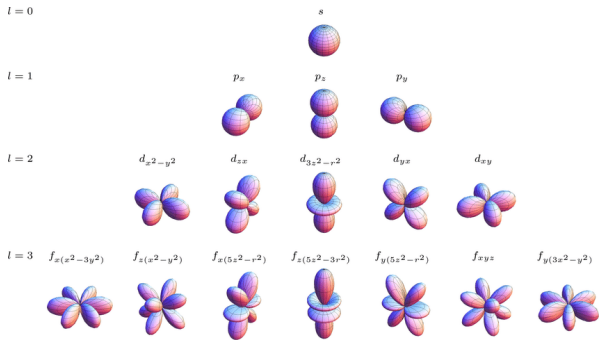
Expanding Bohr's Theory

- Each energy level (called shells) is split up into subshells and orbitals.
  - A shell matches the energy level of the electron
  - Each subshell contains a _____ (s, p, d, f)
  - An orbital is the region of space occupied by an electron



Atomic Orbitals

- There is _____ s orbital
- There are _____ p orbitals
- There are _____ d orbitals
- There are _____ f orbitals



Electrons fill orbitals from the lowest energy to the highest

- 1s 2s 2p 3s 3p 4s 3d 4p 5s 4d 5p 6s 4f 5d 6p 7s 5f 6d 7p

Electron Configuration

- **Shows where the electrons are located within the orbitals**
- **There are three "rules" that we must remember:**

Rule #1: Aufbau Principle

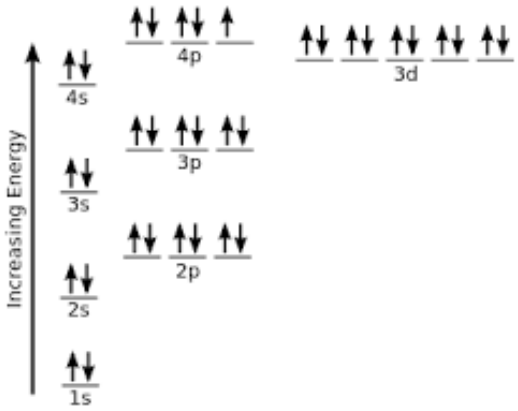
- Aufbau means "building up" in German
- When filling orbital, the _____

Rule #2: Pauli Exclusion Principle

- Each orbital can hold a maximum of _____

Rule #3: Hund's Rule

- When orbitals of equal energy are being filled, electrons are most stable when _____ _____



Let's practice!

1. Lithium – 3 electrons

2. Beryllium – 4 electrons

3. Boron

4. Carbon

5. Nitrogen

6. Oxygen

7. Fluorine

8. Neon

More Practice:

1. F

2. Ca

3. Cu

4. Kr

5. Mo

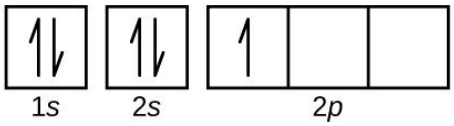
6. Ba^{2+}

7. Xe

8. I^-

9. **How are Ba^{2+}, Xe, and I^- related?**

Orbital Diagrams

B $1s^2 2s^2 2p^1$ 

Element	Electron Configuration	Orbital Diagram
Li		
S		
Ne		
V		

<u>Complete the Electron Configuration Worksheet</u>

Chemistry 11

Electron Configuration Worksheet

Name:
Date:
Block:

What is the electron configuration for the following?

1. Sc _____
2. Ni _____
3. Fe _____
4. Xe _____
5. B _____
6. Na _____
7. K _____
8. Pd _____
9. I _____
10. F _____

Which element is represented by the following?

11. $1s^2 2s^2 2p^6 3s^2 3p^3$
12. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^{14} 6d^{10} 7p^2$
13. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^6$
14. $1s^2 2s^1$
15. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1$
16. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10}$
17. $1s^2 2s^2 2p^6 3s^2 3p^2$
18. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$
19. $1s^2 2s^2 2p^6$
20. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$

In the space below, write the electron configurations and orbital diagrams of the following elements/ions.

Element	Electron Configuration	Orbital Diagram
Na^{+}		
Fe^{2+}		
Ar		
Br^{-}		
Mg		
Co		

Determine which of the following electron configurations are not valid? Explain:

11) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^{10} 4p^5$ _____

12) $1s^2 2s^2 2p^6 3s^3 3d^5$ _____