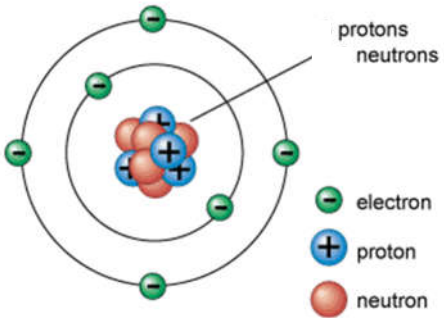
Chemistry
Ms. Ye

Name _____
Date _____Block_____

Review: Bohr Model of the Atom



- Electrons are shown in concentric **shells** or **energy levels** around the nucleus
  - The first shell can hold up to _____
  - The second shell can hold up to_____
  - The third shell can hold up to _____
  - The fourth shell can hold up to _____
  - When filling electrons, you fill the _____ first
  - **Valence electrons**= _____

Lewis Structures (Electron Dot Diagrams)

A Lewis structure is in a sense a shortcut for representing the structure of an atom.

A Lewis structure contains 2 parts

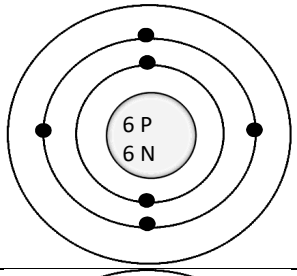
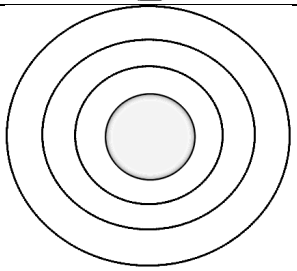
1. _____ (representing the nucleus) and
2. _____ (representing valence electrons)

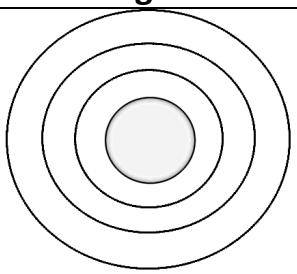
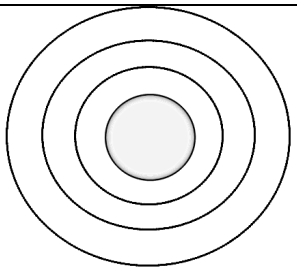
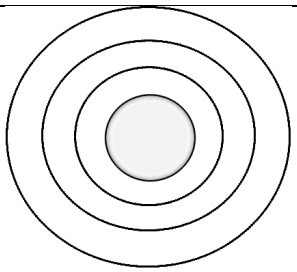
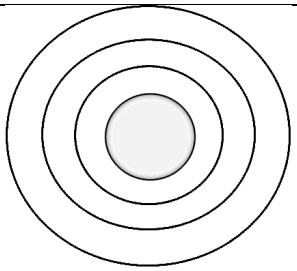
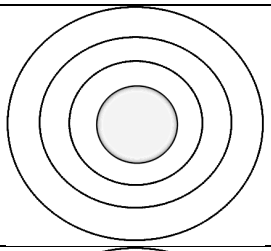
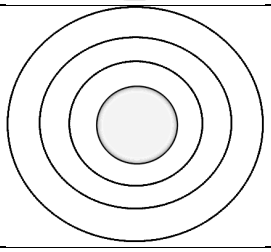
Ex: N has 5 valence electrons, so it's Lewis structure would look like:

Note: by convention, you should not have more than _____ **per "side"**

The maximum number of valence electrons you can have is_____.

Practice: Bohr Diagrams, Electron Configuration, Valence Electrons

Element	Subatomic Particles	Bohr Diagram	# Valence Electrons	Lewis Structure
Carbon $^{12}_{6}C$	# protons=6 # neutrons=6 # electrons=6		4	
Sulfur S	# protons= # neutrons= # electrons=			

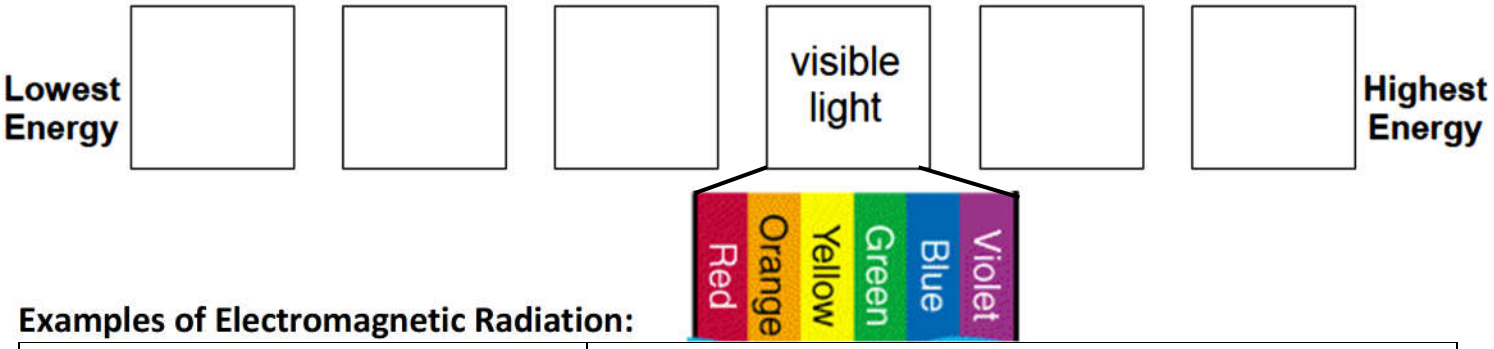
Element	Subatomic Particles	Bohr Diagram	# Valence Electrons	Lewis Structure
Helium $^{4}_{2}\mathrm{He}$	# protons= # neutrons= # electrons=			
N	# protons= # neutrons= # electrons=			
Na	# protons= # neutrons= # electrons=			
Al^{+3}	# protons= # neutrons= # electrons=			
Cl^{-1}	# protons= # neutrons= # electrons=			
Ne	# protons= # neutrons= # electrons=			

*Look at the atomic structure for Neon compared to the other elements. What is different about its outermost shell?

**What happens to the # of valence electrons when an atom becomes an ion?

Electromagnetic Radiation

- a form of _____ that has wavelike properties
- all forms found in the _____ spectrum
- The different forms of EMR arranged in order from lowest energy to highest energy

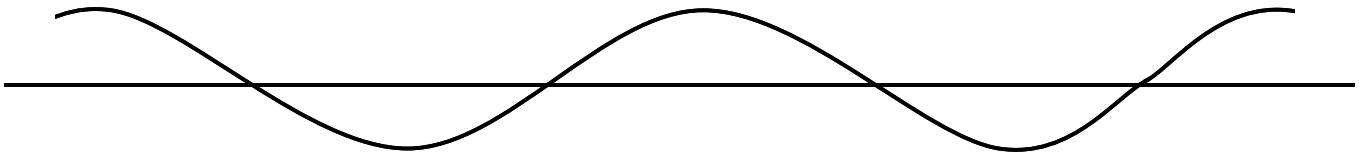


Examples of Electromagnetic Radiation:

Type of EMR	Real-life example
Radio waves	
Microwaves	
Infrared	
Visible light	
Ultraviolet (UV) light	
X-rays	

Properties of Waves

i. _____ and _____ are two important properties of waves.



ii. _____ - The shortest distance between two equivalent points (meters)

iii. _____ - How many waves pass a certain point per second (1/s or s^{-} or Hz).

iv. _____ - The height of a wave from crest to origin.

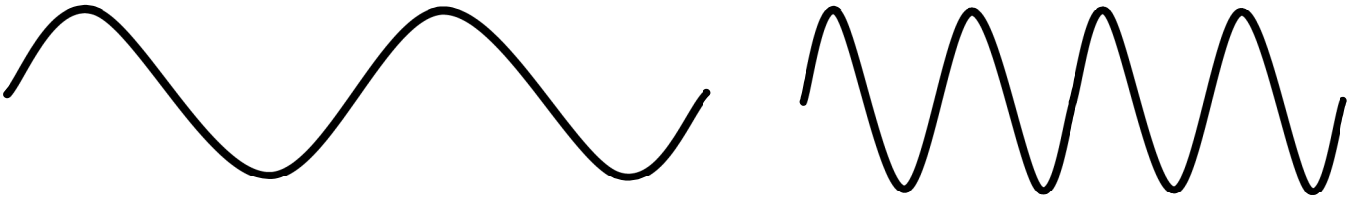
v. What kind of relationship do frequency and wavelength have?

vi. What kind of relationship do frequency and Energy have?

vii. What kind of relationship do energy and wavelength have?

Energy, Wavelength, and Frequency: Qualitative Comparisons:

1.



WAVE A **WAVE B**

- Wave B has a _____ frequency than wave A.
- Wave B has a _____ wavelength than wave A.
- Wave B has a _____ energy than wave A.

2. When comparing the radio stations 96.7 MHz and 92.3 MHz
   a. Which one has a higher energy? How do you know?

   b. Which one has a longer wavelength? How do you know?

3. Red light has a longer wavelength than blue light
   a. Which color light has a higher energy associated with it? Why?

   b. Which color light is emitted at a higher frequency? How do you know?

Electrons and Energy Levels

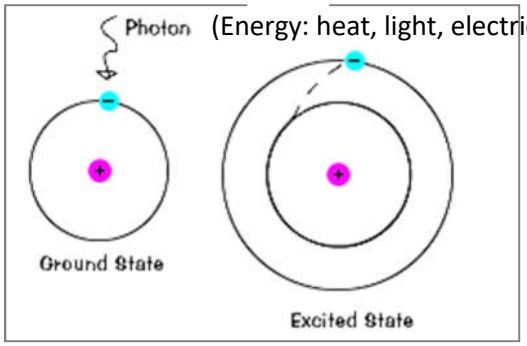
- Each electron has a distinct amount of _____ related to the energy level (shell) it is in
- Electrons with the **lowest energy** are found in the shell _____
- Electrons with the **highest energy** are found in the shell _____
- The _____ from the nucleus, the _____ of the electron

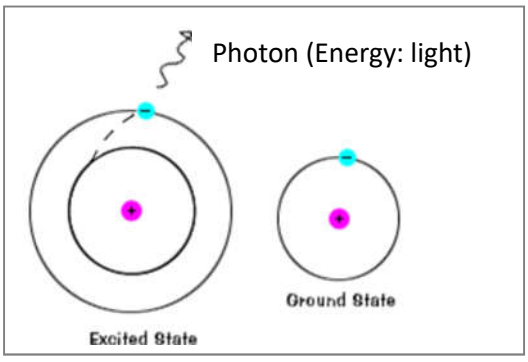
How many electrons can each energy level (electron shell) hold?

Electron Shell	# of electrons
n=1	
n=2	
n=3	
n=4	

Ground State vs. Excited State

- **Ground state**=when the electrons occupy the _____
- **Excited state**=electrons are _____ (even when a lower energy level is not completely full)
- When an electron _____, it jumps to a _____ energy level or shell
  - This is a very _____ condition
  - We call this condition the _____
- Very rapidly, an electron in the excited state will _____ and move back to a _____ energy level or shell
  - When excited electrons fall from an excited state to a lower energy level, they release energy in the form of _____ (which can be infrared, ultraviolet, or visible)





Bright Line Emission Spectrum (Visible Light Spectrum)

- Electrons falling from an _____ down to the _____

  give off _____ light

- Different elements produce different colors of light or _____
- The atomic emission spectrum is _____ for _____

  (just like a human fingerprint is unique to each person)

- We use spectral lines to identify different elements.

Demo:

Substance	Color

1. Which statement describes how an atom in the ground state becomes excited?
   a) The atom absorbs energy, and one or more electrons move to a higher electron shell
   b) The atom absorbs energy, and one or more electrons move to a lower electron shell
   c) The atom releases energy, and one or more electrons move to a higher electron shell
   d) The atom releases energy, and one or more electrons move to a lower electron shell

2. The light emitted from a flame is produced when electrons in an excited state
   a) Absorb energy as they move to lower energy states
   b) Absorb energy as they move to higher energy states
   c) Release energy as they move to lower energy states
   d) Release energy as they move to higher energy states

Waves & Energy HW: Describe the relationships between ***energy, frequency, and wavelength***

1. What is the relationship between energy and frequency?

2. What is the relationship between energy and wavelength?

3. What is the relationship between frequency and wavelength?

4. In the diagrams below, which wave has the higher frequency? Higher wavelength? Higher energy?

Wave A Wave B

5. How many valence electrons are in an atom of Mg-24 in the ground state?
   Correct Answer: _____
   Explanation:

6. An atom of aluminum in the ground state and an atom of boron in the ground state have the same
   a. Mass
   b. Total number of neutrons
   c. Total number of protons
   d. Total number of valence electrons
   Correct Answer: _____
   Explanation:

7. Which Bohr electron configuration represents the electrons of an atom in an excited state?
   a. 2-4
   b. 2-6
   c. 2-7-2
   d. 2-8-2
   Correct Answer: _____
   Explanation:

8. An atom in the excited state has a Bohr electron configuration of 2-7-4. Write the electron configuration of this atom in the ground state.
   Correct Answer: _____
   Explanation:

9. The light produced by signs using neon gas results from electrons that are
   a. Moving from a higher to a lower principal energy level
   b. Moving from a lower to a higher principal energy level
   c. Being lost by the Ne atoms
   d. Being gained by the Ne atoms

   Correct Answer: _____
   Explanation:

10. Compared to a sodium atom in the ground state, a sodium atom in the excited state must have
    a. A greater number of electrons
    b. A smaller number of electrons
    c. An electron with greater energy
    d. An electron with less energy

    Correct Answer: _____
    Explanation: