

Electrons and Light

Name: _____ Block: _____

Learning Targets

1. I CAN describe the characteristics of metals, non-metals, and metalloids and their location on the periodic table
2. I CAN draw a Bohr Model for an atom
3. I CAN define valence electrons and use the periodic table to determine how many valence electrons an atom has
4. I CAN describe an ion and calculate the number of protons, neutrons, and electrons in an ion.
5. I CAN assign oxidation numbers for monoatomic ions using the periodic table
6. I CAN describe the electromagnetic spectrum and compare the wavelengths of waves on the spectrum
7. I CAN explain the relationships between energy, wavelength, and frequency
8. I CAN describe how light is produced; I CAN explain how different colored light is produced
9. I CAN describe an electron in terms of its quantum numbers N (Energy Levels 1, 2, 3, 4, ...), l (sublevels s, p, d, f) m_l (orbitals eg. $P_x, p_y, p_z, d_{xy}, d_{xz}, d_{yz}, \dots$, and m_s (spin).
10. I CAN write the electron configuration for any given atom (including shorthand); I CAN identify the atom when given its electron configuration
11. I CAN write and interpret an orbital diagram; I CAN identify the atom when given its orbital diagram

Practice with Oxidation Numbers

Determine the oxidation number for the following elements by filling in all the information:

Element Name	Group #	# of Valence Electrons	Should electrons be added or lost?	How many electrons should be transferred to become stable?	What is the oxidation number?
Calcium					
Fluorine					
Aluminum					
Neon					
Lithium					
Phosphorous					

Write the number of valence electrons and the oxidation number for the following elements:

Bromine

Strontium

Gallium

Sodium

Selenium

Barium

Hydrogen

Helium

Indium

Iodine

Germanium

Nitrogen

Fluorine

Aluminum

Calcium

Lithium

Quantum Numbers Worksheet

- 1) What are quantum numbers?
- 2) What information does the first three quantum numbers indicate?
- 3) What does the fourth quantum number indicate?
- 4) What does the principal quantum number indicate?
- 5) The letter, n , is used to designate the principal quantum number (True or False).
- 6) What does the orbital quantum number indicate?
- 7) Orbitals with different shapes occupy different regions. These regions are called _____.
- 8) The quantum numbers designated in ascending order use the letters _____.
- 9) What is the shape of the s orbital?
- 10) What is the shape of the p orbital?
- 11) In the n th principal energy level, orbitals of _____.
- 12) What does the magnetic quantum number indicate?
- 13) There is only one orientation of the s orbital (True or False).
- 14) How many possible orientations are there for the p orbital?
(a) What are these orientations called?
- 15) What does the spin quantum number indicate?
- 16) The first three quantum numbers completely indicate _____.
- 17) How many electrons can the first principal energy hold?
- 18) How many electrons can the second principal energy level hold?
- 19) The third principal energy level can hold 18 electrons. What orbitals are found in the third principal energy level?
- 20) The fourth principal energy level can hold 32 electrons. What orbitals are found in the fourth principal energy level?

Practice with EM Spectrum and Waves

1. Draw a wave and label the amplitude, wavelength, crest, trough, and frequency.
2. Light can exist as both a _____ or in particle form, called a _____.
3. List the types of waves on the electromagnetic spectrum from longest wavelength to shortest.
4. List the colors of the visible light spectrum from highest to lowest frequency.
5. Explain the relationship between frequency and wavelength (as wavelength increases, what happens to frequency?). Use the equations $c=\lambda f$ and $E=hf$ to explain your reasoning.
6. In each case, circle the wave that has the higher frequency:
A) Microwave or Infrared B) Ultraviolet or Radio C) X-rays or Infrared
7. In each case, circle the wave that has the longer wavelength:
A) Infrared or Ultraviolet B) Green or Yellow C) X-ray or Gamma

Atomic Orbitals Web Quest

Instructions:

- Go to this website: <http://www.learner.org/interactives/periodic/index.html>
- Using this website, gain some extra practice with how electrons are configured. Apply this knowledge to the periodic table. Start by selecting "It's Elementary" tab at the top and answer the questions as you go.

1. What is the Aufbau Principle?
2. List the three different energy levels discussed, including how many orbitals they have and the maximum number of electrons.

3 Energy Levels			
Number of Orbitals			
Maximum # of Electrons			

3. Which energy level is filled first?

4. Draw the following orbitals:

s orbital

p_x orbital

p_y orbital

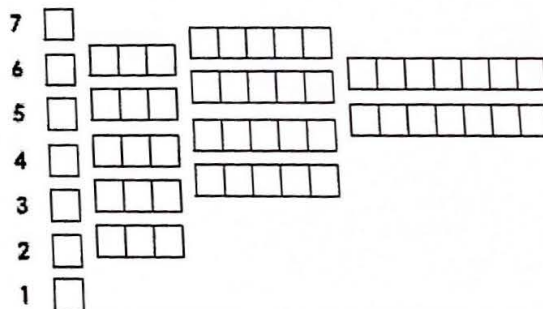
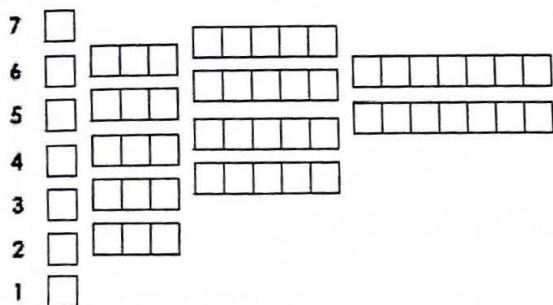
p_z orbital

5. What is Hund's Rule?

6. Write out the electron configuration and the orbital notation for the following elements:

Sulfur

Magnesium



Practice Writing Orbital Diagrams and Electron Configurations

1. Draw the Orbital Diagram and Electron Configuration for Nitrogen

Spectroscopic Notation

ELECTRON CONFIGURATION:

2. Draw the Orbital Diagram and Electron configuration for Iron

Spectroscopic Notation

ELECTRON CONFIGURATION:

3. Draw the Orbital Diagram and Electron Configuration for Argon

Spectroscopic Notation

ELECTRON CONFIGURATION:

4. Draw the Orbital Diagram and Electron configuration for Bromine

Spectroscopic Notation

ELECTRON CONFIGURATION:

5. Draw the Orbital Diagram and Electron Configuration for Calcium

Spectroscopic Notation

ELECTRON CONFIGURATION:

6. Draw the Orbital Diagram and Electron configuration for Copper

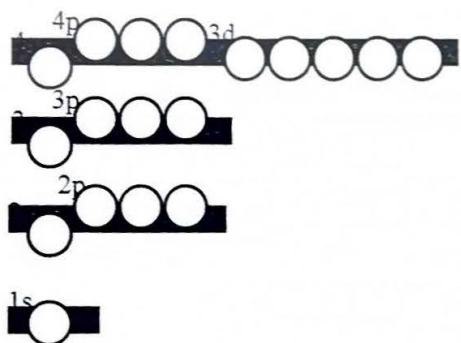
Spectroscopic Notation

ELECTRON CONFIGURATION:

Practice Writing Electron Configurations and Orbital Diagrams

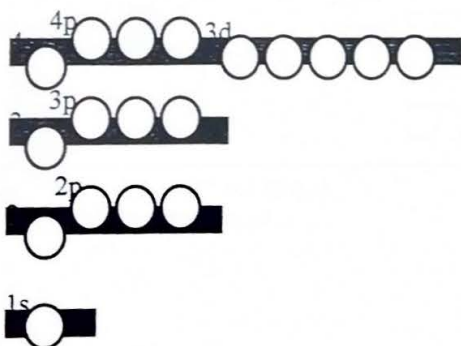
For each given element, fill in the orbital diagram with correct arrows.

Element: Ar	Element: Mg	Element: N	Element: Li	Element: P	Element: Cl
# of e ⁻ s: ____	# of e ⁻ s: ____	# of e ⁻ s: ____	# of e ⁻ s: ____	# of e ⁻ s: ____	# of e ⁻ s: ____



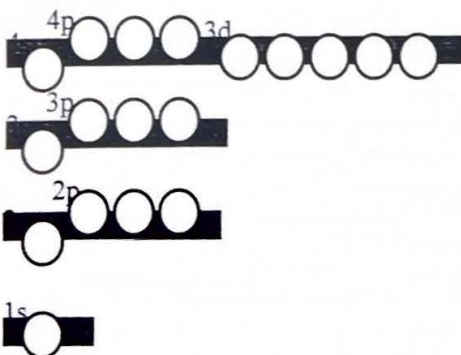
Fill in the orbital diagram for the element Germanium, and write the electron configuration of Ge:

Ge:



Fill in the orbital diagram for the element, Cr, and write the electron configuration Chromium.

Cr:



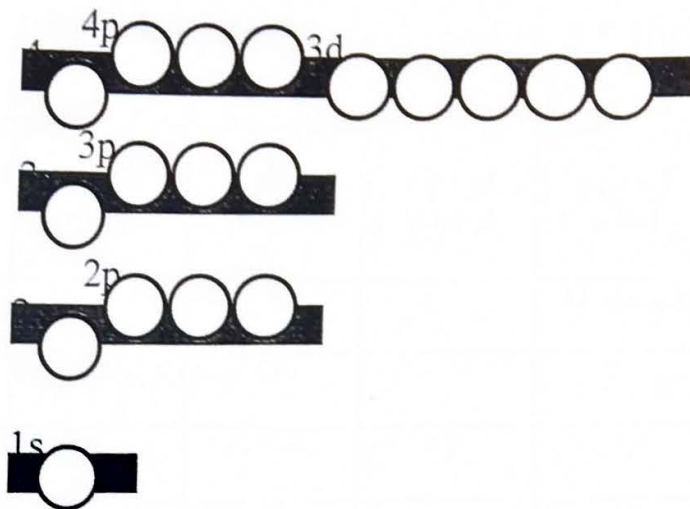
Fill in the orbital diagram for the element, Zn, and write the electron configuration of Zinc.

Zn:

1) Fill in the orbital diagram for the element Beryllium:

Complete Electron Configuration:

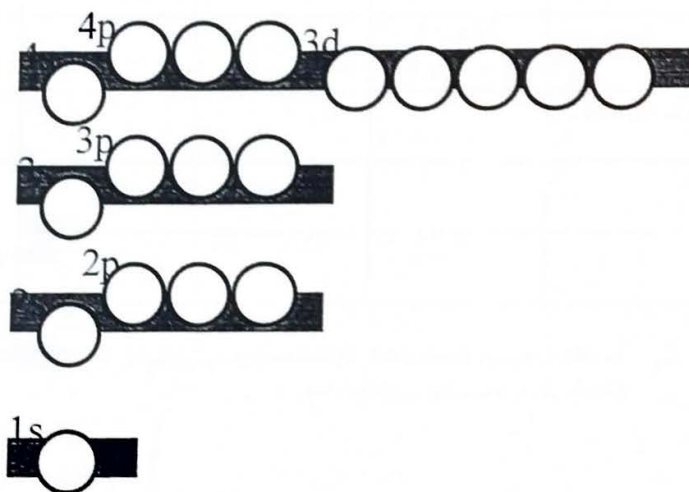
Noble Gas Configuration (Shorthand):



2) Fill in the orbital diagram for the element Nickel:

Complete Electron Configuration:

Noble Gas Configuration (Shorthand):



3) Fill in the orbital diagram for the element Phosphorus:

Complete Electron Configuration:

Noble Gas Configuration (Shorthand):

