**Vocabulary**

For each word, provide a short but specific definition from YOUR OWN BRAIN! No boring textbook definitions. Write something to help you remember the word. Explain the word as if you were explaining it to an elementary school student. Give an example if you can. Don’t use the words given in your definition!

Proton: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Neutron: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Electron: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Mass Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Atomic Number: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Atom: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Anion: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Nuclear charge: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Isotope: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Atomic Mass: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Electron Configuration: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Valence Electrons: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Orbital: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Ground State: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Excited State: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Light Spectra: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dalton: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Thompson: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Rutherford: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Gold foil experiment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Alpha particle: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Deflected: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Bohr: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Quantum Mechanical Model: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Video 3.1 Theory and Scientists**

* The modern model of the atom has evolved over a long period of time through the work of many scientists.
* Each atom has a nucleus, with an overall positive charge, surrounded by one or more negatively charged \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Subatomic particles contained in the nucleus include \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The proton is positively charged, and the neutron has no charge. The electron is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charged.
* Protons and electrons have equal but opposite charges. The number of protons equals the number of electrons in an atom.
* The mass of each proton and each neutron is approximately \_\_\_\_\_\_\_\_\_\_\_\_ to one atomic mass unit. An electron is much \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ massive than a proton or a neutron.
* The number of protons in an atom (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) identifies the element.

1. What discoveries concerning the Modern Atomic Theory are each of the following scientists credited with?

1. *John Dalton* –
2. *J.J. Thomson* –
3. *Ernest Rutherford*-
4. *Neils Bohr* –

2. Draw each atomic model and identify which scientist is associated with it:

|  |  |  |  |
| --- | --- | --- | --- |
| **Dalton** | **Thompson** | **Rutherford** | **Bohr** |
|  |  |  |  |
| *Model Nickname:* | *Model Nickname:* | *Model Nickname:* | *Model Nickname:* |
| *Order:* | *Order:* | *Order:* | *Order:* |

**Video 3.2 Subatomic particles**

1. Name the three subatomic particles and give their actual mass, relative mass (in amu), charge and location.

|  |  |  |  |
| --- | --- | --- | --- |
| **Particle** | **Charge** | **Mass** | **Location** |
| neutron |  |  |  |
|  | +1 | 1 |  |
| electron |  |  |  |

2. If the atomic number tells you the number of protons an atom has and atoms are neutral, how can you determine the number of electrons the atom has?

3. Explain how to determine the number of neutrons an atom has given the atomic and mass numbers.

4. An example of isotopes includes C-12 and C-14. Cabon-14 is radioactive where as Carbon-12 is very stable. Determine the number of protons, neutrons and electron each has and develop a rule to understand why certain isotopes are unstable.

**Video 3.3 Isotopes**

* The number of protons in an atom (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) identifies the element. The sum of the protons and neutrons in an atom (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) identifies an isotope. Common notations that represent isotopes include: 14C, 14C, carbon-14, C-14.
* Atoms of an element that contain the same number of \_\_\_\_\_\_\_\_\_\_ but a different number of \_\_\_\_\_\_\_\_\_\_ are called isotopes of that element.
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an element is the weighted average of the masses of its naturally occurring isotopes.

1. Define isotope

2. Which of the following are isotopes?

1. 11H and 11H c. 126C and 127N
2. 3517Cl and 3518Ar d. 3216S and 3316S

3. Write the isotopic notation for the following and determine the number of each subatomic particle:

1. Nitrogen-14 and Nitrogen-16
2. Boron-10 and Boron-11

**Video 3.4 Atomic Mass**

1. In questions 3a of the previous homework, which isotope is more abundant, N-14 or N-16? Explain your answer.

2. Explain the difference between mass number and atomic mass.

3. Find the atomic mass of metal M which has 35% M-250, 10% M-251, and 55% M-252.

**Video 3.5 Bohr Diagrams**

* In the wave-mechanical model (electron cloud model), the electrons are in \_\_\_\_\_\_\_\_\_\_\_\_, which are defined as the regions of the most probable electron location (ground state).
* Each electron in an atom has its own distinct amount of energy.
* When an electron in an atom gains a specific amount of energy, the electron is at a higher energy state (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ state).
* When an electron returns from a higher energy state to a lower energy state, a specific amount of energy is emitted. This emitted energy can be used to identify an element.
* The outermost electrons in an atom are called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrons. In general, the number of valence electrons affects the chemical properties of an element.
* The placement or location of elements on the Periodic Table gives an indication of physical and chemical properties of that element. The elements on the Periodic Table are arranged in order of increasing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* For Groups 1, 2, and 13-18 on the Periodic Table, elements within the same group have the same number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (helium is an exception) and therefore similar chemical properties.

1. What are orbitals?

2. Which have more energy: electrons closer to the nucleus or electrons furthest away? Why?

3. How many electrons fill the first shell? \_\_\_\_ The second? \_\_\_\_ The third? \_\_\_\_ The fourth? \_\_\_\_

4. Why don’t you really have to memorize the facts in question 3? (Where could you look?)

5. Give the electron configurations for the following:

a. Carbon \_\_\_\_\_\_\_\_\_\_\_\_ d. Strontium \_\_\_\_\_\_\_\_\_\_\_\_

b. Fluorine \_\_\_\_\_\_\_\_\_\_\_\_ e. Argon \_\_\_\_\_\_\_\_\_\_\_\_

c. Sodium \_\_\_\_\_\_\_\_\_\_\_\_ f. Lithium \_\_\_\_\_\_\_\_\_\_\_\_

6. Give the valence electrons for the examples in question 5.

a. Carbon \_\_\_\_\_\_\_\_\_\_\_\_\_ d. Strontium \_\_\_\_\_\_\_\_\_\_\_\_

b. Fluorine \_\_\_\_\_\_\_\_\_\_\_\_\_ e. Argon \_\_\_\_\_\_\_\_\_\_\_\_

c. Sodium \_\_\_\_\_\_\_\_\_\_\_\_\_ f. Lithium \_\_\_\_\_\_\_\_\_\_\_\_

7. Which of the examples in questions 5/6 have the same number of valence electrons? What else do they have in common as far as were they are found on the periodic table?

8. Using number 7 as your guide, how many valence electrons do all elements in group 1 have? \_\_\_\_

Group 2? \_\_\_\_ Group 13? \_\_\_\_ Group 14? \_\_\_\_

Group 15? \_\_\_\_ Group 16? \_\_\_\_ Group 17? \_\_\_\_

Group 18? \_\_\_\_

**Video 3.6 Light Spectra**

**The Electromagnetic Spectrum**

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**HIGH ENERGY**

**LOW ENERGY**

**Answer the questions below based on the electromagnetic spectrum above.**

1. The energy of light from red to green to blue.

*(increases, decreases,* or *remains the same?)*

1. The shorter the wavelength of light, the its energy.

*(higher* or *lower?)*

1. The shorter the frequency of light, the its energy.

*(higher* or *lower?)*

1. Energy and wavelength have a(n) relationship

*(direct* or *inverse?)*

1. Energy and frequency have a(n) relationship.

*(direct* or *inverse?)*

6.) In terms of energy, order the following forms of light from the highest (#1) to the lowest (#7):

red, blue, green, yellow, orange, infrared, ultraviolet

7.) Explain why an element’s spectra can be referred to as a “fingerprint for elements.”

8.) What is the difference between the ground state configurations found on the periodic table and the excited state?

9.) Why isn’t it feasible to write excited states on the periodic table?

10.) Explain using ground and excited states, how bright light spectrums are seen.