

I. Short Answer and Fill in the Blanks:

1. _____ are a familiar idea used to explain unfamiliar facts observed in nature while a _____ is an *explanation* of observable facts and phenomena.
2. To remain valid, models and theories must:
 - a.
 - b.
3. The existence of the atom was proposed by the Greek philosopher _____. The word "atom" comes from the Greek word "atomos" which means _____.
4. _____ was a Greek philosopher who rejected the idea of the atom.
5. _____ was an English schoolmaster who explained the Law of Conservation of Mass, the Law of Definite Proportions, and the Law of Multiple Proportions using an atomic theory. His theory proposed that atoms:
 - a.
 - b.
 - c.
 - d.
 - e.
6. The discovery of the atom's nucleus can be credited to _____, whose _____-foil experiment provided experimental detail about the atom's structure. In his experiment, Rutherford aimed _____ particles at a piece of _____ foil. _____ of the particles passed through the foil, but a few were _____, and some even bounced back (were reflected). He concluded that most of the atom is _____
_____. He also concluded that the atom has a dense, _____ charged core we call the nucleus.
7. The particles that make up the nucleus of the atom are called _____ and are comprised of the _____ and _____ in an atom.
8. Atoms are _____ because the number of _____ charged protons equals the number of _____ charged electrons.

9. _____ are atoms of an element that have different numbers of neutrons, and consequently, different atomic _____.
10. The _____ of an atom is the sum of all the nucleons of an atom.
11. Rutherford's planetary model of the atom faced a major problem. Classical physics predicted that the electron, as it circled the nucleus, would _____ energy so eventually the atom would collapse!
12. Bohr placed e^- in _____ levels, assuming that the electron won't lose energy as long as it stays in the allowed level.
13. Bohr suggested that electrons can _____ a quantum or _____ of energy, and then jump to a _____ energy level. This is called the _____ state. This is an unstable state, and the atom soon gives off the same amount of energy absorbed. Some of this energy is in the form of _____ light.
14. The science of studying visible light through the use of a spectroscope is called _____. The _____ lines identify an element and are called the element's _____ spectrum.
15. The modern view of light is that it has a _____ nature, behaving as both a _____ and a stream of _____. It simply depends on the experiment!
16. Four _____ are used to describe the location of an electron in an atom. They are _____, _____, _____, and _____. The principal quantum number, _____, represents the main _____ level of the electron. The maximum number of electrons in this level is found using the formula: _____. The second quantum number, _____, describes the _____ shape.
17. In the electron distribution $1s^2$, the "1" represents the _____ level, the "s" represents the _____, and the "2" represents the number of _____ in the _____.
18. _____ Rule states that orbitals of equal energy are each occupied by _____ electron before any orbital is occupied by a _____ electron.
19. The _____ Exclusion Principle states that no two electrons in the _____ atom can have the _____ set of four _____.

II. Charts and Problems: Show all work if applicable.

1. Complete the following table:

Hyphen Notation	Nuclear Symbol	Atomic Number	Mass Number	# of Protons	# of Electrons	# of Neutrons
Carbon - 12		6				
	${}_{19}^{40}\text{K}$					
		5				6

2. The relative abundance of the isotopes of oxygen are:

Oxygen-16: 99.760% Oxygen-17: 0.037% Oxygen-18: 0.204%

Calculate the average atomic mass of oxygen:

3. In a bright-line spectrum, the wavelength of a particular line is $6.0 \times 10^{-7}\text{m}$. What is the frequency of this color of light?

4. The maximum number of electrons in a main energy level is calculated using the formula _____. Therefore, the maximum number of electrons in the 5th main energy level is:

5. How many sublevels are present in the 4th main energy level? _____
What are they? _____

6. The maximum number of electrons that can occupy an orbital is _____, if they have _____.

7. Do the electron distribution and the orbital notation for:
Li:

O: