I. Short Answer and Fill in the Blanks: 1. Models 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. explain known facts **b**. make correct predictions The existence of the atom was proposed by the Greek philosopher 3. Democritus . The word "atom" comes from the Greek word "atomos" which means \_\_not to cut or indivisible Aristotle 4. \_ was a Greek philosopher who rejected the idea of the atom. John Dalton was an English schoolmaster who explained the 5. 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**. are the building blocks of matter **b**. are indivisible **c**. of the same element are identical d. of different elements are different **e.** unite in small, whole-number ratios to form compounds The discovery of the atom's nucleus can be credited to \_\_\_\_\_\_\_\_, whose 6. gold \_\_-foil experiment provided experimental detail about the atom's structure. In his experiment, Rutherford aimed <u>alpha</u> particles at a piece of <u>gold</u> foil. <u>Most</u> 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 \_\_\_\_\_empty space. He also concluded that the atom has a dense, positively charged core we call the nucleus. 7. The particles that make up the nucleus of the atom are called nucleons and are comprised of the <u>protons</u> and <u>neutrons</u> in an atom. Atoms are neutral because the number of positively charged 8. protons equals the number of \_\_\_\_\_\_ charged electrons.

Name

KEY

Review Sheet: Unit 3

9.	are atoms of an element that have different numbers of
	neutrons, and consequently, different atomic <u>masses</u> .
10.	The mass number 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
	lose energy so eventually the atom would collapse!
12.	Bohr placed e in <u>energy</u> levels, assuming that the electron won't lose
	energy as long as it stays in the allowed level.
13.	Bohr suggested that electrons can $\_\_\_absorb\_\_$ a quantum or $\_\_\_photon\_\_$ of
	energy, and then jump to a <u>higher</u> energy level. This is called the
	excitedstate. 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 <u>visible</u> light.
14.	The science of studying visible light through the use of a spectroscope is
	called <u>spectroscopy</u> . The <u>spectral</u> lines identify an element and
	are called the element'sbrightline spectrum.
15.	The modern view of light is that it has adual nature, behaving as
	both a <u>wave</u> and a stream of <u>particles</u> . It simply depends on
	the experiment!
16.	Four quantum numbers are used to describe the location of an
	electron in an atom. They are $\frac{n}{s}$ , $\frac{l}{s}$ , $\frac{m}{s}$ , and $\frac{s}{s}$ . The
	principal quantum number, $\underline{\hspace{0.5cm}}^{n}$ , represents the main $\underline{\hspace{0.5cm}}^{energy}$ level of
	the electron. The maximum number of electrons in this level is found using
	the formula: $\frac{2n^2}{l}$ . The second quantum number, $\frac{l}{l}$ , describes the
	<u>orbital</u> shape.
17.	In the electron distribution $1s^2$ , the "1" represents the <u>main</u>
	energy level, the "s" represents thesublevel, and the "2"
	represents the number of <u>electrons</u> in the <u>sublevel</u> .
18.	Hund's Rule states that orbitals of equal energy are each occupied by
	electron before any orbital is occupied by asecond
	electron.
19.	ThePauli Exclusion Principle states that no two electrons in the
	same atom can have thesame set of four <u>quantum</u>
	numbers

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	$^{12}_{6}C$	6	12	6	6	6
Potassium-40	<sup>40</sup> <sub>19</sub> K	19	40	19	19	21
Boron-11	11 B	5	11	5	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:

$$(0.99760)(16 u) + (0.00037)(17 u) + (0.00204)(18 u) = 16.00 u$$

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

$$c = \lambda f$$
  $3.0 \times 10^8 \frac{m}{s} = (6.0 \times 10^{-7} \text{ m}) \times f$   $f = 5.0 \times 10^{14} \text{ Hz}$ 

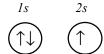
4. The maximum number of electrons in a main energy level is calculated using the formula  $2n^2$ . Therefore, the maximum number of electrons in the  $5^{th}$  main energy level is:  $2n^2 = 2 \times 5^2 = 2 \times 25 = 50$ 

5. How many sublevels are present in the 4<sup>th</sup> main energy level? 4 What are they? 5, p, d, f

6. The maximum number of electrons that can occupy an orbital is 2, if they have 9posite 9

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

Li:  $1s^2 2s^1$ 



 $O: 1s^2 2s^2 2p^4$ 



**CHEMISTRY:** A Study of Matter