Name: Answer Key Period: _____ Date: ____

Unit 3 –Atomic Structure

Test Review

Evolution of the Atom

1. List the 4 main points of Dalton's Atomic Theory?

atoms tiny, indivisible & indestructible particles
atoms of 1 element are all the same
atoms of different elements are different
compounds form by combining atoms

2. While working with the cathode ray tube, a gas discharge tubes with metal plates containing positively charged anodes and negatively charge cathodes J.J Thomson discovered that atoms have electrons and thought that they were embedded in positively charged material.

3. John Dalton proposed that matter is composed of atoms and the atoms of an element are identical. His Atomic Theory suggested that atoms can be thought of as being much like a small uniformly solid ball. This model is called the Billiards Ball

4. Ernest Rutherford fired alpha particles at a thin sheet of gold in his famous Gold Foil Experiment. Expecting the alpha particles to be blocked, he discovered almost all of them went through the thin gold sheet and concluded that there is a small, dense, positively charged nucleus.

5. Erwin Schrodinger proposed that electrons travel in electron clouds.

6. Niels Bohr suggested that electrons travel in well-defined paths.

7. Democritus proposed that all matter is made up of tiny particles called "atomos" (from the word that means "indivisible.")

8. James Cladwick determined the nucleus contained an additional particle that traveled close to the same speed of a proton, thereby having approximately the same mass as a proton yet did not have a charge. This addition particle he named Neutron, due to it having a neutral charge.

Atomic Particles

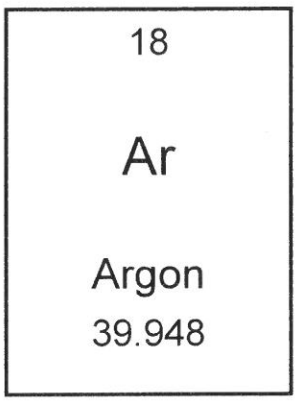
1. Atomic number is the number of protons in an atom. If the atom is neutrally charged then the atomic number will also represent the number of electrons in the atom.

2. The atomic mass is the weighted average mass of an atom in a naturally occurring sample of the element. The weighted average reflects both the mass and the relative natural abundances of the isotopes of that element as they occur in nature.

3. In determining the number of particles in a neutrally charged atom. We take the atomic mass and round it to a whole number. When we round the atomic mass we refer to this rounded number as the mass number.

4. The mass number is equal to the number of protons and neutrons in the atom.

5. Label the information provided from the periodic table below.



atomic #

Element Symbol

Element Name

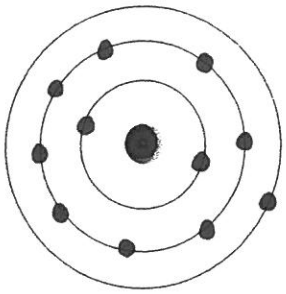
atomic mass

6. Find the numbers of protons, neutrons, and electrons for atoms of the following elements.

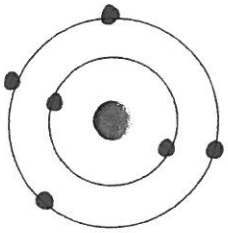
Name of Element	Element Symbol	Mass Number	Atomic Number	Protons	Neutrons	Electrons
Boron	B	11	5	5	6	5
Sodium	Na	24	11	11	13	11
Copper	Cu	64	29	29	35	29
	Pb	207	82	82	125	82
Molybdenum	Mo	96	42	42	54	42
Thallium	Tl	204	81	81	123	81
	H	1	1	1	0	1
Carbon	C	12	6	6	6	6
	N	14	7	7	7	7
	Ba	137	56	56	81	56
Calcium	Ca	40	20	20	20	20
	Si	28	14	14	14	14
Argon	Ar	40	18	18	22	18

Electron Configuration

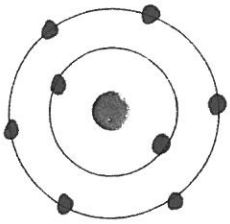
1. Bohr's model accounts for the total number of electrons in an atom.
2. According to Bohr, how many electrons can each level hold? 1st = 2 2nd = 8 3rd = 18 4th = 32
3. What term is used for the electrons in the outermost shell or energy level? valence electrons.
4. The electrons in the outermost shell are the electrons that form chemical bonds.
5. For each element, write the total number of electrons on the line. Then color in the correct number of electrons for each orbit. Remember, fill the orbit closest to the nucleus first, but never exceed the number each orbit can hold. You may use your periodic table.



Sodium (Na) 11 # electrons



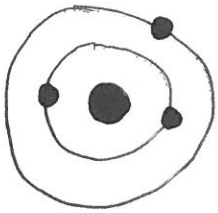
Carbon (C) 6



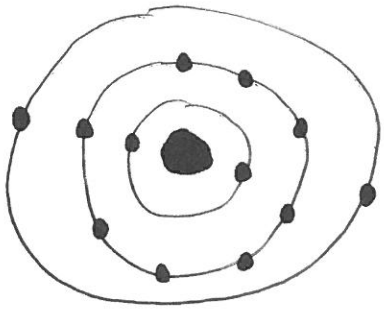
Oxygen (O) 8

6. Draw your own Bohr model diagrams for the following atoms:

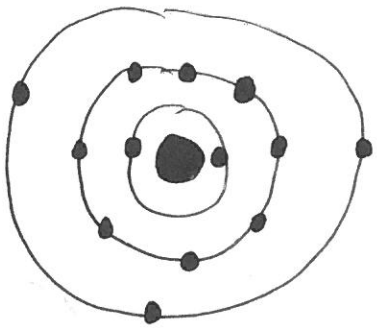
Lithium (Li) 3e-



Magnesium (Mg) 12e-



Aluminum (Al) 13e-



7. Lewis Dot Structures accounts for only the valence electrons in an atom. Remember these electrons are found on the outermost energy level.

8. Draw the Lewis Dot Structure for the elements below. You may use your Bohr diagrams you completed in question 5 and question 6 in this section. Remember to start with your first dot on the right and fill one dot at a time moving counter clockwise. (Right, Top, Left, Bottom and repeat)

Na  

Isotopes

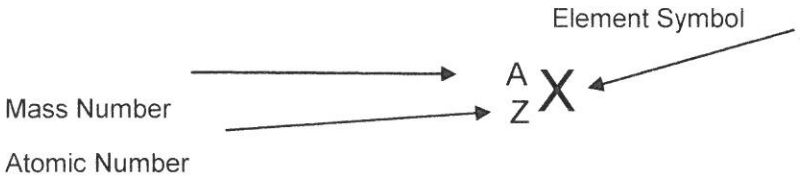
1. Isotopes of a given element have the same number of protons but a different number of neutrons.

2. In hyphen notation (nuclear notation). The number next to the hyphen is the mass number.
Ex. Chromium – 58

3. Complete the table for each of the following isotopes. Assume all atoms are neutral. You may use your periodic table.

Isotope name	atomic #	mass #	# of protons	# of neutrons	# of electrons
Uranium-235	92	235	92	143	92
Uranium-238	92	238	92	146	92
Boron-10	5	10	5	5	5
Boron-11	5	11	5	6	5
Iron- 56	26	56	26	30	26
Iron-58	26	58	26	32	26

4. When symbols are used to represent an isotope (Isotope Notation) the mass number is written next to the symbol on the top left. The atomic number is written on the bottom left. Recall the atomic number is the number of protons. The mass number is number of protons and neutrons.



5. Complete the following chart. Assume all atoms are neutral.

Isotope name	atomic #	mass #	# of protons	# of neutrons	# of electrons
235 92 U	92	235	92	143	92
238 92 U	92	238	92	146	92
10 5 B	5	10	5	5	5
11 5 B	5	11	5	6	5

Atomic Mass Unit (amu)

- Atomic mass unit is defined as 1/12 the mass of Carbon-12. Carbon 12 has 6 neutrons and 6 protons and its mass is set at 12 amu. The 12 protons and neutrons account for nearly all the mass so a single proton or a single neutron is 1/12 of the mass or 1 amu.
- Scientist picked a reference isotope as a standard every atom is compared to that reference isotope which is Carbon-12
- The atomic mass listed for each element on the periodic table is relative to Carbon-12
- Recall in nature most elements occur as a mixture of two or more isotopes. It is assumed that the composition of a sample of an element (in terms of the **percent natural abundances** of each of the element's isotopes) is the same everywhere on Earth.

Calculation of Atomic Mass

Atomic mass is also known as atomic weight. Recall Atomic mass is the weighted average mass of an atom in a naturally occurring sample of the element. A weighted average mass reflects both the mass and the **relative natural abundance** of the isotopes of that element as they occur in nature.

Ex- What is the average atomic mass of this sample of Carbon?

^{12}C	12.0014 amu	87.3 %
^{14}C	13.9960 amu	12.7 %

12.0014 amu (0.873) + 13.9960 amu (0.127) = 12.254 amu

1. Calculate the average atomic mass for Li if 7.5% of Li atoms are ^{6}Li with a mass of 6.0151223 amu and 92.5% are ^{7}Li with a mass of 7.0160041amu.

(6.0151223amu)(0.075) + (7.0160041amu)(0.925)

0.451amu + 6.49 amu

6.941 amu

2. Find the atomic mass for B if 19.9% of B atoms are ^{10}B with a mass of 10.0129371amu and 80.1% are ^{11}B with a mass of 11.0093055amu. (10.0129371amu)(0.199) + (11.0093055amu)(0.801)

1.99 amu + 8.82 amu

10.8 amu