Name:	Class Period:
Lab Partner	Lab Partner

Lab # 4: The Atomic Mass of Washerum (Wa)

Purpose: To analyze the isotopes of Washerum and to calculate its atomic mass

Background: Although all the atoms of a given element must contain the same number of protons, the number of neutrons can vary. These different forms of an atom are called isotopes. To determine the atomic mass of an element, you must take into account the average mass of all the isotopes in an element, as well as the percent abundance of each isotope.
Imagine a new element has been discovered, and has been given the name "washerum." Students at local high schools have been given the job of determining the number of isotopes of this new element, the mass of each isotope, the abundance of each isotope and the "atomic mass" of the new element.

Materials:
Sample of Washerum Balance

Procedure:
Obtain a sample of Washerum. Separate the three isotopes (small, medium and large size) and measure the mass of each isotope. Count the numbers of small washers, medium washers and large washers. Record your data in Figure A.

	Small Washerum	Medium Washerum	Large Washerum
Total Mass Of each Isotope			
Number of Particles in each Isotope			
Average Mass of One Wa in Isotope			
Relative Abundance			
Percent Abundance			
Relative Mass			

Figure A

Analysis: Using the experimental data, record the answers to the following questions.

1. Calculate the <u>average mass of each isotope</u> by dividing its total mass by the number of particles of that isotope. Show work here. Record your data in Figure A.

2. Calculate the <u>relative abundance of each isotope</u> by dividing its number of particles by the total number of Washerum. Show work here. Record your data in Figure A.

3. Calculate the <u>percent abundance</u> <u>of each isotope</u> by taking the relative abundances that you found in Step 2 and multiplying by 100. Record your data in Figure A.

4. Calculate the <u>relative mass of each isotope</u> by multiplying its relative abundance from Step 2 by its average mass. Show work here. Record your data in Figure A.

5. Calculate the <u>average mass of all Washerum particles</u> by adding the relative masses from Step 4. This average mass is the atomic mass of Washerum. Show work here

Questions for Discussion:

1. Would the mass of all 20 washers be equal to 20 times the mass of one washer? Explain why or why not. _____
   _____

2. How are the three isotopes of Wa alike and how are they different? _____
   _____

3. How are the three isotopes of carbon (Carbon-12, Carbon-13 and Carbon-14) alike and how are they different? _____
   _____

1) Atoms of the same element that have different numbers of neutrons are classified as
   A) charged nuclei B) charged atoms C) isotopes D) isomers

2) What is the mass number of the nuclear symbol $^{19}_{9}\mathrm{F}$?
   A) 19 B) 10 C) 28 D) 9

3) All the isotopes of a given atom have
   A) different mass numbers and different atomic numbers
   B) the same mass number but different atomic numbers
   C) the same mass number and the same atomic number
   D) different mass numbers but the same atomic number

4) An atom of carbon-12 and an atom of carbon-14 differ in
   A) atomic number
   B) mass number
   C) number of electrons
   D) nuclear charge

5) Which two nuclides are isotopes of the same element?
   A) $^{39}_{19}\mathrm{K}$ and $^{40}_{20}\mathrm{Ca}$ B) $^{39}_{19}\mathrm{K}$ and $^{42}_{19}\mathrm{K}$ C) $^{20}_{11}\mathrm{Na}$ and $^{20}_{10}\mathrm{Ne}$ D) $^{14}_{6}\mathrm{Na}$ and $^{14}_{7}\mathrm{Ne}$

6) What is the total number of neutrons in an atom of aluminum-27?

7) The table below gives information about two isotopes of element *X*.

Isotope	Mass	Relative Abundance
X-10	10.01	19.91%
X-11	11.01	80.09%

Calculate the average atomic mass of element *X*. [*Show a correct numerical setup. Express your answer to the correct number of significant figures.*]

Name _____ Period _____

THE PROCESS OF DRAWING PARTICLE MODELS OF ATOMS

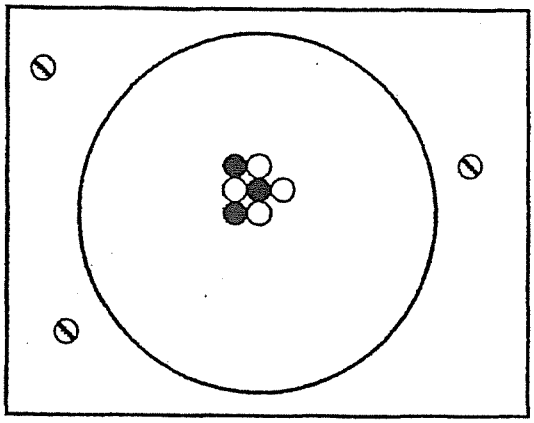
OBJECTIVE- To draw particle models for various atoms.

EXAMPLE- Consider the neutral atom $^{7}_{3}Li$ ← mass number (number of protons + neutrons)
← atomic number (number of protons)

Let's say the following key is use

● = protons, ○ = neutrons, ⊘ = electrons.

The area inside the circle represents the nucleus. The area outside the nucleus represents the electrons cloud.



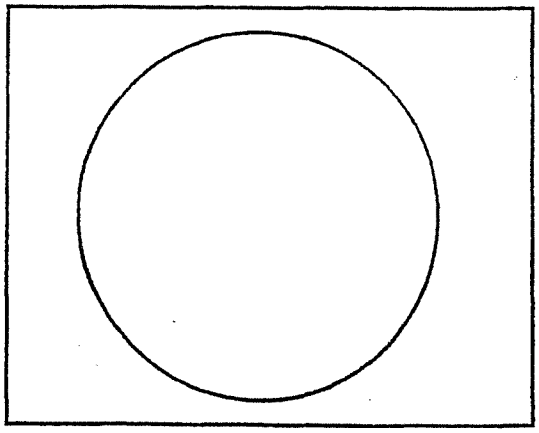
DIRECTIONS

1. Obtain 3 different colored crayons (or markers) and fill out your key below:
○ = proton ○ = neutrons ○ = electron

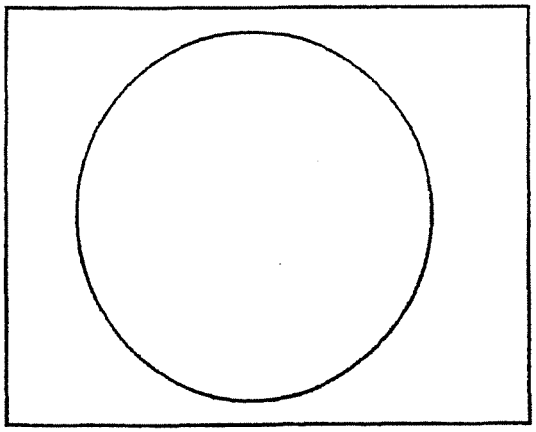
2. Draw particle models and answer questions as indicated.

QUESTIONS:

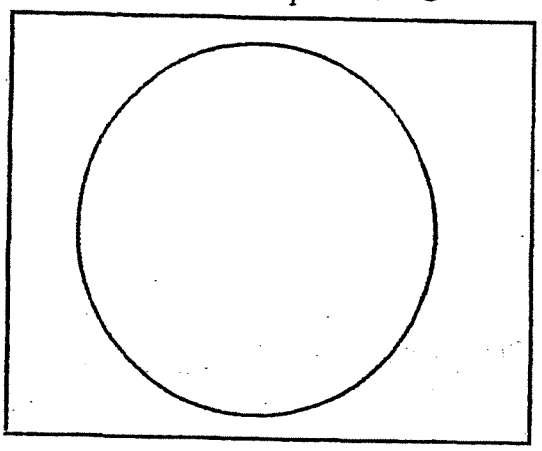
1) Draw a model to represent ^{3}H



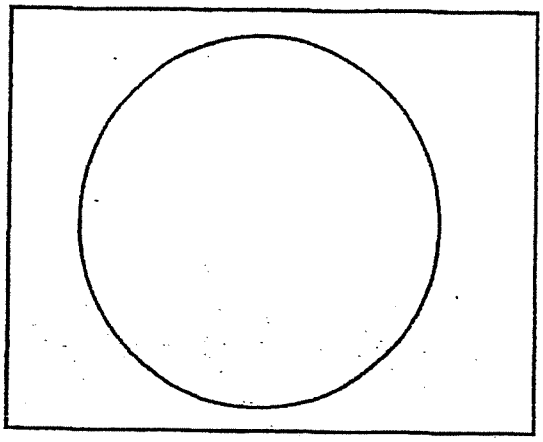
2) Draw a model to represent ^{14}N



3) Draw a model to represent ^{12}C



4) Draw a model to represent ^{14}C

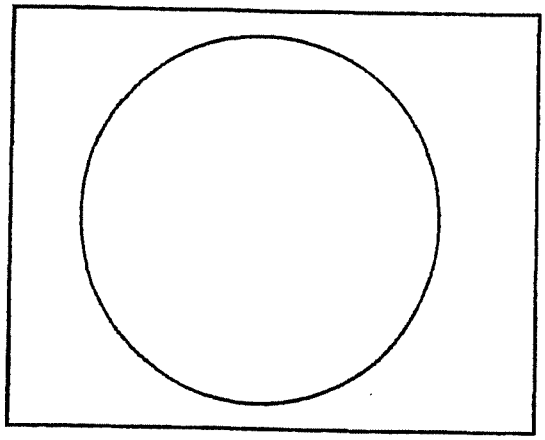


5) ^{12}C and ^{14}C are isotopes of each other. Look at the models above. How are they the same (be specific)?

6) ^{12}C and ^{14}C are isotopes of each other. Look at the models above. How are they different (be specific)?

7) Define isotopes. How are isotopes of the same element the same? How are isotopes of the same element different?

8) Draw a model to represent ^{10}B



9) Draw a model to represent ^{11}B