Name:____________
Block:____________

Atomic Structure Worksheet

1. **The 3 particles of the atom are:**

a. ________________________

b. ________________________

c. ________________________

Their respective charges are:

a. ________________________

b. ________________________

c. ________________________

2. The number of protons in one atom of an element determines the atom's ________________________ , and the number of electrons determines ________________________ of and element.

3. The atomic number tells you the number of ________________________ in one atom of an element. It also tells you the number of ________________________ in a neutral atom of that element. The atomic number gives the "identity " of an element as well as its location on the Periodic Table. No two different elements will have the ________________________ atomic number.

4. The ________________________ of an element is the average mass of an element's naturally occurring atom, or isotopes, taking into account the ________________________ of each isotope.

5. The ________________________ of an element is the total number of protons and neutrons in the________________________ of the atom.

6. The mass number is used to calculate the number of ________________________ in one atom of an element. In order to calculate the number of neutrons you must subtract the ________________________ from the ________________________ .

7. **Give the symbol and number of protons in one atom of:**

Lithium ____________________ Bromine ____________________

Iron ____________________ Copper ____________________

Oxygen ____________________ Mercury ____________________

Krypton ____________________ Helium ____________________

8. **Give the symbol and number of electrons in a neutral atom of:**

Uranium ____________________ Chlorine ____________________

Boron ____________________ Iodine ____________________

Antimony ____________________ Xenin ____________________

9. **Give the symbol and number of neutrons in one atom of:**

(To get "mass number", you must round the "atomic mass" to the nearest whole number)

Show your calculations.

Barium ____________________ Bismuth ____________________

Carbon ____________________ Hydrogen ____________________

Fluorine ____________________ Magnesium ____________________

Europium ____________________ Mercury ____________________

10. **Name the element which has the following numbers of particles:**

a. 26 electrons, 29 neutrons, 26 protons ______________________

b. 53 protons, 74 neutrons ______________________

c. 2 electrons (neutral atoms) ______________________

d. 20 protons ______________________

e. 86 electrons, 125 neutrons, 82 protons (charged atom) ______________________

f. 0 neutrons ______________________

11. **If you know only the following information can you always determine what the element is? (Yes/No).**

a. number of protons ____________

b. number of neutrons____________

c. number of electrons in a neutral atom____________

d. number of electrons____________

X = element symbol
A = mass number [# of protons (p) + # neutrons (n)]
Z = atomic number [# of protons]
N = # of neutrons
A - Z = N

A typical isotopic symbol takes this form: $^{A}_{Z}X$

ex. The isotopic symbol for Fluorine would be $^{19}_{9}F$

Fill in the missing items in the table below.

Name	Symbol	Z	A	#p	#e	#n	Isotopic Symbol
	Na						
		17					
Potassium							

Fill in the missing items in the table below.

Name	Symbol	Z	A	#p	#e	#n	Isotopic Symbol
	P						
Iron							
				53			

Fill in the missing items in the table below.

Name	Symbol	Z	A	#p	#e	#n	Isotopic Symbol
Silver							
		36					
	W						

ATOMIC WEIGHTS

Look at the atomic weights of a few different elements on your periodic table. Do you notice that very few of the elements have atomic weights that are close to being nice whole numbers?

Do you know why this is? After all, for our purposes, the mass of both the proton and the neutron are almost exactly 1, and in chemistry we usually ignore the mass of the electron because it is so very small.

Why then, if the mass of the atom comes mainly from the protons and neutrons it contains, don't the atomic weights of the all come out to be nice whole numbers?

The reason is this; the atomic weights given on your tables are "weighted averages" of the weights of the different naturally occurring isotopes of the element. Let's look at an example.

Approximately 75% of the chlorine atoms found in nature have a mass of 35. The other 25% have a mass of 37. What should we report as the atomic weight for chlorine?

What we do is to take the "weighted average" of these isotopes. We multiply 75% times 35 and then add that to 25% times 37...

$$[(.75)(35)] + [(.25)(37)]$$

$$= 26.25 \quad + \quad 9.25$$

$$= 35.5$$

In cases where there are three known isotopes you would simply multiply each mass number by the % (expressed as a decimal) of the atoms with that mass and then add the products together.

STUDENT PRACTICE

NOTE: The numbers in each of the following problems have been made up. If we used actual percentages and masses of isotopes then you could simply look up the atomic weight of the element on the periodic table.

1. Suppose that there were two isotopes of Sodium. 28% of the naturally occurring sodium atoms had a mass of 22, and 72% atoms had a mass of 23. What would the average atomic weight of sodium be?

2. Suppose that there were two natural isotopes of Copper. 80% of the atoms had a mass of 63, and 20% of the atoms had a mass of 65. What would that average atomic weight of copper be?

3. Suppose that a new element (E) were discovered that existed as three natural isotopes. 25% of the atoms had a mass of 278, 38% had a mass of 281, and the remainder had a mass of 285. What would be listed as the atomic weight of this element?