Chapter 4
Elements, Atoms and Ions

Sec. 1 and 2

Elements and symbols. Read.

Sec. 3 Dalton's atomic theory

Scientists determined:

- most _____ materials are _____
- pure substances are:

- a certain _____ always has the same _____ of elements by _____ regardless of where it is found
  ( )
- _____ was a scientist and in 1808 gave an _____ for the above. ( )

1. _____ consist of tiny particles called _____.
2. All atoms of a _____ element are _____.
3. _____ of one element _____ from atoms of another.
4. Atoms of different elements _____ to form _____.
5. Atoms are_____ in chemical reactions. Not _____ or _____, rearranged.

Atom comes from the word:

Sec. 4 Formulas and Compounds

Chemical formulas express the _____ and _____ in a compound, using:

CO_2 NO SO_2

Rules for writing formulas pg. 81

Ex. A molecule from acid rain contains one sulfur atom and three oxygen atoms.

Sec. 5 The structure of the atom

What does and atom look like?

-_____ in 1890's discovered _____ particles emitted from elements under certain conditions. (electrons)

-Lord Kelvin(William Thomson) thought the atom was a uniform "pudding" of _____ with electrons scattered throughout. (Plum pudding model)

-_____, in 1911, discovered the _____.

Fig. 4.5 pg. 84

1. _____ at gold foil
2. screen detected _____ when hit
3. some went:
4. some _____
5. some bounced _____

Thus center must be_____.
1919 he concluded _____ are in the nucleus.

Electron =

Protons =

-_____ in 1932 showed that _____ are in the nucleus. (no charge)

Sec. 6 Introduction to the Modern concept of the Atomic Structure

Today's concept:

-small dense _____ w/ neutrons and _____

-electron move _____ the nucleus

Ex. If the nucleus is the size of a grape, the electrons would be about 1 mile away.

Table 4.4 pg. 85, masses and charges.

*_____ determine _____ behavior and are the part of the atom involved in the chemical _____.

Sec. 7 Isotopes

All _____ have _____ and _____. The number of protons _____ the number of electrons in an atom.

Ex. Sodium, Na, has 11 protons.

How many electrons does it have?

_____ are also found in the _____ of atoms.
All _____ atoms have ___ protons, but sodium atoms can have _____ numbers of _____.

Dalton's idea that _____ atoms of a given element are _____ has changed. Therefore "all atoms of the _____ element contain the _____ number of _____ and electrons but can have different numbers of _____."

Isotopes are:

The number of _____ in the nucleus of an atom is called the _____.

Sodium's atomic # is 11

The _____ of the protons and neutrons in the _____ of an atom is called the _____.

_____ are represented by symbols.

$^{A}_{Z}X$ where X =
A =
Z =

You also may see them represented this way.

Ex. $^{23}_{11}Na$ has a total of 23 protons and neutrons and only 11 protons.

How many neutrons does this sodium atom have? (aka sodium-23)

$^{24}_{11}Na$ How many protons does this sodium atom have? How many neutrons? How many electrons?

Ex. What is the isotope symbol for a magnesium atom with a mass number of 24?

Ex. What is the isotope symbol for a silver atom with 61 neutrons?

Average Atomic Mass

Atomic mass (weight) is the _____ of all the _____ of an element.

Must have:

Ex. Determine the atomic mass of chlorine. Chlorine – 35 is found 75.77% in nature and chlorine – 37 is found 24.23% in nature.

(mass number x % found in nature, as decimal)

This is the mass found on the periodic table.

Sec. 8 Intro to the periodic table

An important tool in chemistry is the _____.

Each box represents a different _____.

Ex. 1
H
1.008

Elements are arranged according to_____. Dmitri Mendeleev first organized the elements into a_____. Elements are grouped in _____ and _____ because of similar chemical and physical _____.

Columns are called:

Elements found within a column have

similar _____.
Columns are _____ with a digit and
a letter.
Letter A. (Representative elements,
Group A.)

Group 1 =
Group 2 =
Group 7=
Group 8=

The elements in the short columns are called "_____" (Group B)

Most elements are _____. They have similar physical properties:

1.
2.
3.
4.

Metals are found _____ and to the _____ of the zig-zag line. (except _____: it's a nonmetal)

_____ lack the properties of metals. Many nonmetals are _____.
These elements are found in the _____ right-hand _____ of the periodic table. (right of the zig-zag line)

_____ have mixtures of properties.
(found _____ the zig-zag line, except_____. It is a pure metal.)
Fig. 4.10 pg. 93

Sec. 9 Natural states of elements

Read through the section.

Some _____ are made up of _____ of the same _____ of atom. These are called _____ (made up of 2 atoms, both the same.)

Seven of them, you must memorize.

Some atoms of _____ can arrange themselves into different _____ or crystal structures. These are called _____. (carbon- graphite, diamond, bucky ball)

Sec. 10 Ions

_____ have a balance of _____ and _____ charge, they are_____. (p = e)

If _____ are _____ or _____ off by an atom, the atom carries a _____. It either has _____ protons than electrons, _____ charge, or has _____ electrons than protons, _____ charge. These are called_____.

Ex. If sodium loses one electron it now has 10 electrons and 11 protons.

$Na \rightarrow Na^{+} + e^{-}$

If the atom _____ electrons it becomes _____ and is called a _____.

Al loses __ electrons, thus: Al →

(cation)

The name of the _____ is the _____ name plus the _____ ion. ( )

If the atom _____ electrons it becomes _____ and is called an _____.

Cl gains ____ electron, thus: $Cl + e^{-} \rightarrow$

(anion)

The name of the _____ is the _____ of the element and _____ at the _____, plus the word ion. ( )

$O + 2e^{-} \rightarrow$ (oxide ion)

ions are _____ formed by changing the number of _____, only the number of _____.
(ions do not form on their _____, but in the presence of some other _____. Usually:)

Ionic charges:
First: _____ form positive ions ( ) which means they _____ electrons.
Second: _____ form negative ions ( ) which means they _____ electrons.

We can determine the _____ for many ions from the _____.
-metals in groups _____ all have a charge _____ to their _____ number.
Ex. Na, group 1 =
Al, group 3 =
Ca, group 2 =
_____ metal charges can not be _____ from the periodic table.

-_____ have a _____ equal to their group number _____ 8.
Ex. selenium, group 6;
argon, group 8;
chlorine, group 7;
Groups __ and __ can form _____ charges, or not at all.
_____ and _____ from group 5 form _____ charges.

Sec. 11 Compounds that Contain Ions

_____ compounds are composed of a _____ and a _____, which have become _____ in the presence of each other.
Properties of ionic compounds are:
-
-
-_____ when _____ in water and when _____.
_____ chemical compounds have a _____ charge of _____, even if it is composed of _____

So, in an ionic compound the _____ of _____ and _____ must be such that the net charge is _____.
Ex. sodium chloride
Na^+ and Cl^-, how many Na^+ and Cl^- to be neutral?

(metals are written _____, nonmetals _____)

Mg^{2+} , Cl^{-} How many Mg^{2+} and Cl^{-}?

Ex. Ba^{2+} , O^{2-}

Ex. Ca^{2+} , P^{3-}

Flip-flop method: