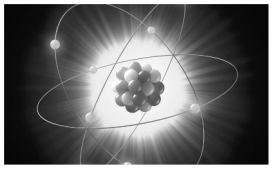
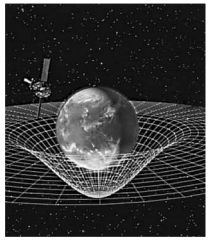
Introduction to Chemistry



Chemistry
The study of matter and how matter changes

Matter
Any substance that has **mass** and takes up **space**
Mass – how *heavy* a substance is (*based on weight*)
Space – the amount of space (*volume*) and object takes up



Density
Density (*D*) is the ratio of mass (*m*) and volume (*v*) of matter in the universe (*D = m/v, or g/mL*)

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Structure of Matter

Matter consists of single particles (*atoms*), and combination of particles (*compounds/molecules*)

The atom
The *atom* is the most fundamental form of matter, containing all the main particles (*subatomic particles*) that make up matter.

Elements
Individual *types* of atoms based on the internal structure of the atoms

Ex: All atoms of the element sodium (Na) are the same based on the base subatomic particles (protons, p^+) in the atom

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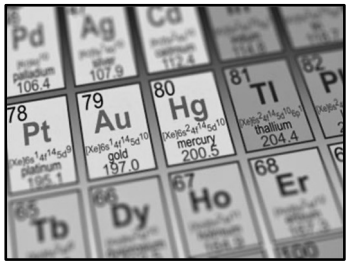
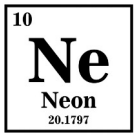
The Periodic Table

Atoms are arranged on a table based on their internal subatomic particles on the *Periodic Table of the Elements*

Groups
Up and *down* columns on the table with elements that are similar to each other based on atomic structure.

Periods
Left to right rows on the table with elements that inc. or dec. particles





Element Symbol (*Ne*) and Name (*Neon*) for the 10th element on table

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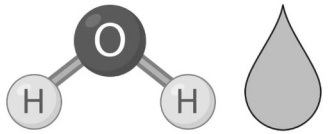
Combining Atoms



Combination of Atoms
Atoms commonly are found in combination with other atoms, both atoms of the same type (*diatomic element*), and with atoms of different types (*compounds and molecules*)

Compounds and Molecules
A *compound* is a combination of two types of atoms, a *metal*, and a *non-metal*. A *molecule* is a combination of two non-metals, and are forms of matter that are common in nature.

Compounds: NaCl (1Na, 1Cl, table salt) **Molecules**: H_2O (2H, 1O, water)

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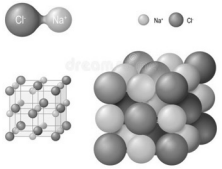
Compound and Molecules

Compounds are formed when repeating positive (+) and negative (-) ions (*charged atoms*) interact together to form a connection (*bond*)
Molecules are formed when to *non-metals* interact together to bond

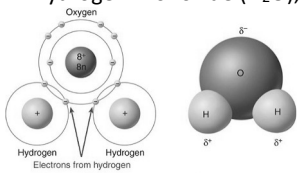
Compound

Sodium Chloride (NaCl), Salt



Molecule

Dihydrogen Monoxide (H_2O), Water



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Chemical Reactions

Chemical Reactions are the result of the interaction of various forms of matter to produce a new substance

Decomposition of Water

$2H_2 + O_2 + \text{Energy} \rightarrow 2H_2O$

H_2 and O_2 are elements, H_2O is a molecule

Thermal Energy (*Heat*) is often required to make a reaction proceed by allowing the connections between atom (*bonds*) to break and form. Other energy sources include *mechanical* and *electrical*

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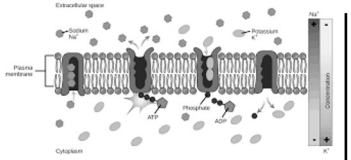
The Central Science

Chemistry is considered the **central science** because it serves as the explanation for larger *scientific study* and *research*



Cellular Ion Transport

In *Biology* ions are transported over cell membranes due to + and – ion charges

Volcanos

In *earth science* volcanos form due to the *thermal energy* flow within the crust and magma inside

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