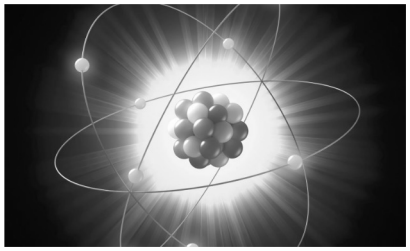
# Introduction to Chemistry

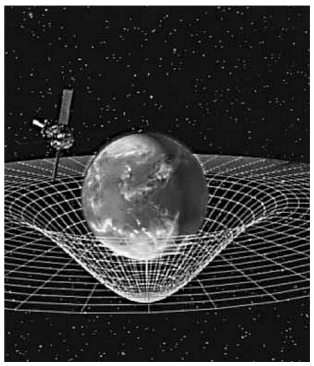


## Chemistry

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



Matter is made of basic parts including atoms, particles smaller than atoms (*subatomic particles*), and combination of atoms (*compounds/molecules*)

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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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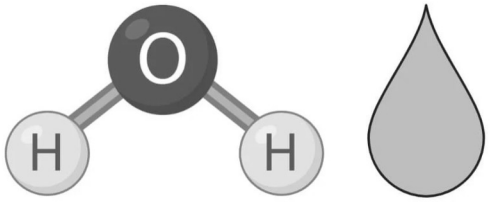
# Combining Atoms




## 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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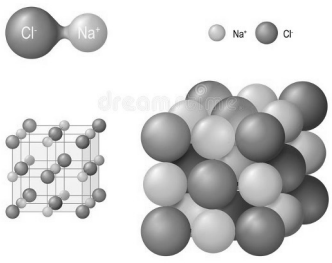
# Compound and Molecules

**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

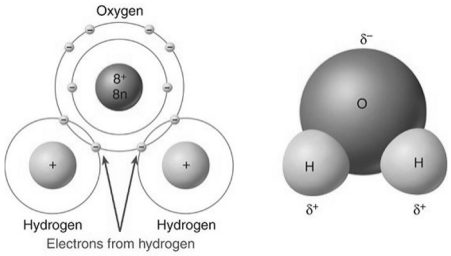
## Compound

Sodium Chloride (NaCl), Salt




## Molecule

Dihydrogen Monoxide ($H_2O$), Water

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## Development of Chemistry

### Metallurgy and Pottery

Metallurgy: Mixing of Metals to form an *Alloy*, two metals combined

Pottery: Mixing of natural *clays*


### Alchemy

The process of using basic elements to change matter into new forms of matter (*mainly silver, Ag, and gold, Au*)

- Elements: Fire, Air, Water, Earth -

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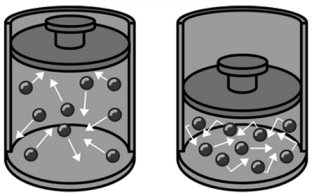
## Development of Chemistry

### Modernization of Science

Scientists began experimenting with basic forms of matter to understand nature and the reactions of matter.

Boyle – Gas studies, Pressure related to volume
Hook – Combination of gases in air with oxygen
Mayow – Respiration in animals



*Lavoisier* came later and put together the many independent discoveries to create the first textbook of chemistry in 1700's

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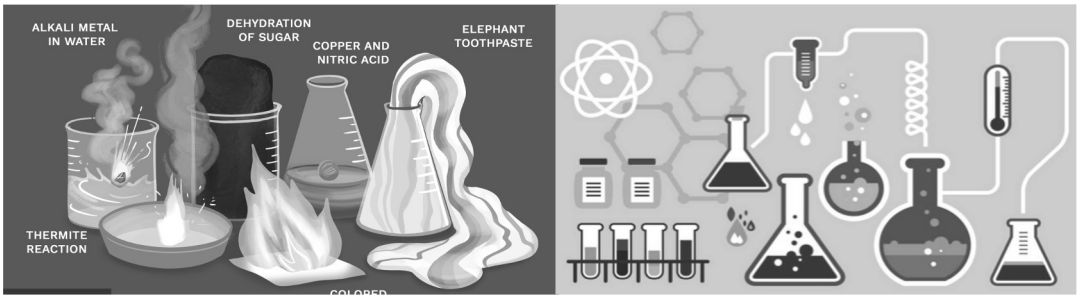
# Development of Chemistry

## Modern Chemistry

Chemistry is the study of the composition (*make up*) of the atoms, compounds, molecules, and macro substances (*states of matter interactions*) that work in nature.

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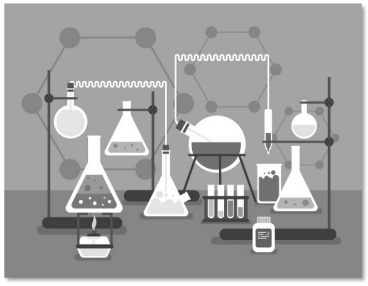
# Development of Chemistry

## Laboratory Experiments

Labs are done as part of the class to accomplish the following

- Part of the scientific method
- Learn a Lab technique or process
- Verify or provide evidence in the process of learning a new topic or concept
- Allow the practice of both a new topic while using laboratory techniques



Labs are very important for both teaching skills both in and out of the classroom but to also analyze information and draw conclusions

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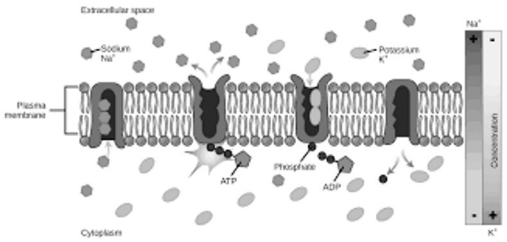
# The Central Science

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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