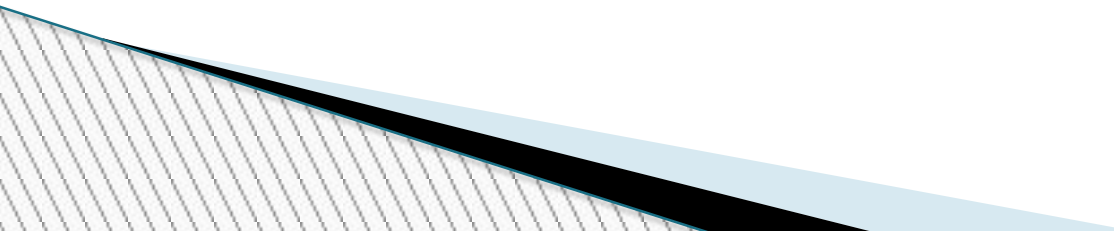
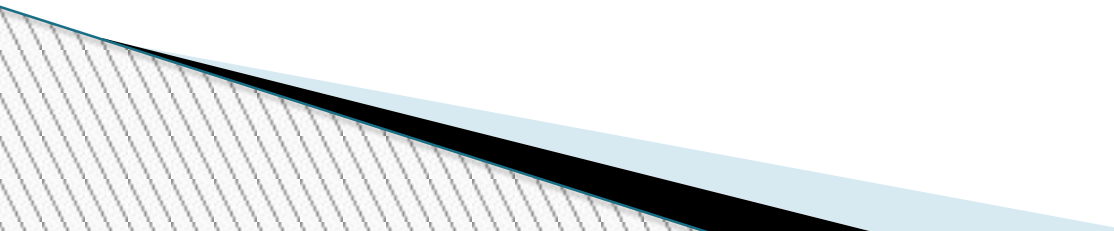



Science and Life

- How did science start?

CHEMISTS in the ANTIQUE AGE

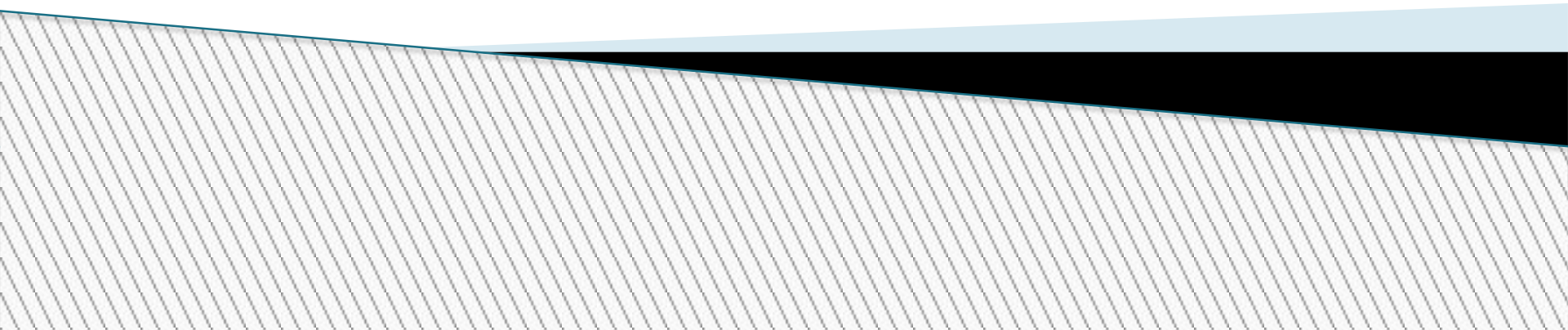
- Chemistry has always existed. The formation of the Earth and the development of life involved many chemical processes. In ancient times, many of the items discovered through **trial and error** by humans to meet the basic needs of the people.
- 

- ▣ **Sheltering**
 - ▣ **Medicine**
 - ▣ **Clothing**
 - ▣ **Protection**
- 

- After producing fire, ancient men started to construct tools to make their lives easier. They made:
 - Clothes from the leather of the animals
 - Weapons from metals.
 - Dyes.
 - Medicines from the plants and animal products.
 - Pots from the sand and metals.
 - Perfumes and detergents
- 

An Alchemy Recap

The People, Places and Discoveries



❑ **What is Alchemy?**

(**key words:** **philosophy** – goals- cure- diseases- prolonging – infinitely)

- ❑ (A form of medieval speculative thought
- ❑ A combination of philosophy, science and magic
- ❑ It laid the foundation for chemistry)
- ❑ **ALCHEMY** is a speculative philosophy with the goals of transmutation of cheap metals such as iron and lead to gold. Alchemists are also looking for a universal cure for diseases and a way of prolonging life infinitely
- ❑ An **ALCHEMIST** is a person who deals with alchemy theoretically and practically.

The Goals of Alchemy

Philosopher's Stone: a stone to make everything gold.(A tool that would allow the transmutation of cheap metals into gold)

Elixir of life: immortality. (ab-ı hayat)

Foundation of youth: cure diseases.

Alchemy is not a science because:

Alchemists used trial and error method.

Alchemists didn't use experimentation method.

Alchemy is only a mystical philosophy which is based on spiritual transformations with the help of intrinsic powers rather than physical scientific information.

□ **Contributions of Alchemy to Chemistry** Although alchemy is not considered a science, alchemists were the first chemists. Their subscription in the birth of chemistry cannot be ignored. Their contributions were:

□ **1.** Alchemists developed many laboratory equipments (glassware such as alembic).

□ **2.** Alchemists discovered many mineral acids. Such as:

□ H_2SO_4 = Sulfuric acid.

□ HCl = Hydrochloric acid.

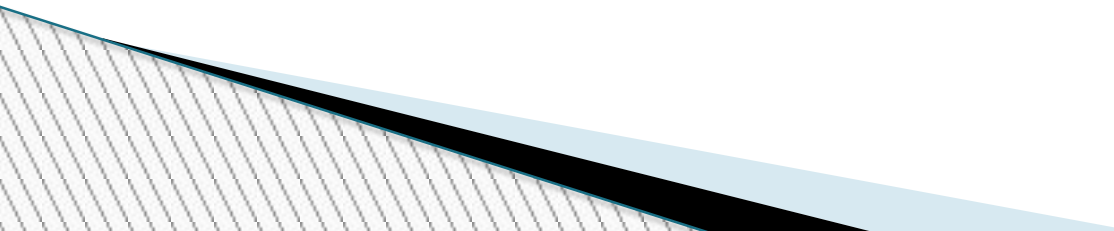
□ HNO_3 = Nitric acid.

- ▣ **3.** They discovered some elements such as mercury, lead and antimony.
- ▣ **4.** They discovered gun powder, ink,alumn(şap), soda, soap(oil+soda mixture)many cosmetics, dyes, ceramics, glass, and essences.
- ▣ **5.** They discovered many laboratory techniques such as grinding, mixing, heating, dissolving, crystallization, distillation, filtration and extraction.
- ▣ **6.** They made many alloys.
- ▣ **7.** They developed many cures for the illnesses with plants and mineral stones.

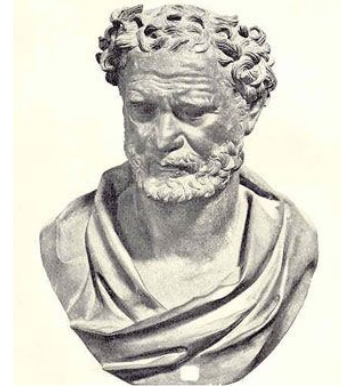
How It All Began

- A very brief timeline
 - Greek Philosophy
 - Egyptian Science
 - Chinese Alchemy
 - Arabic Alchemy

Empedocles (around 450 BC)

- A Greek philosopher.
 - He defined elements as the basic building blocks from which all other materials are made.
 - He stated that the ratio of these four elements (air, water, earth, fire) affected the properties of matter.
- 

Democritus (460-370 BC)

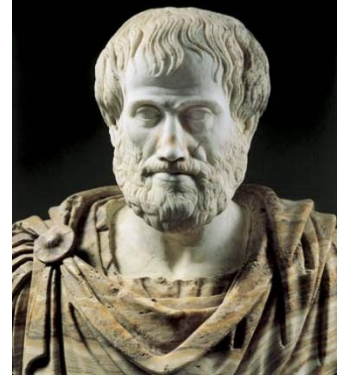


A Greek philosopher

Theory of Matter – all matter is made up of indivisible particles called *atomos* (which means indivisible)

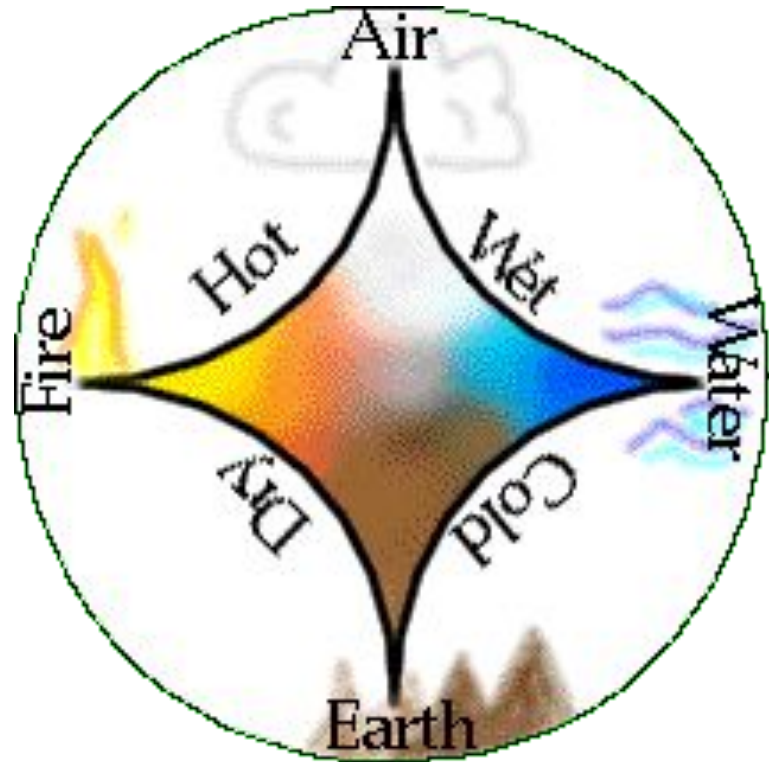
A substance could be changed by rearranging the atoms

Aristotle (384-322BC)

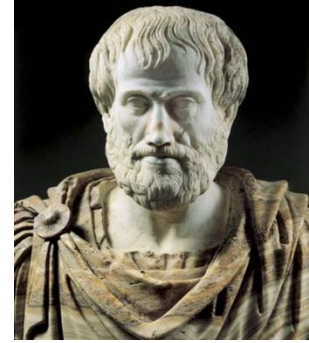


- Believed that the central part of the universe was comprised of 4 elements

- Earth
- Air
- Water
- Fire

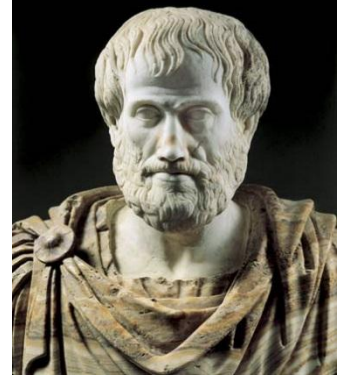


Aristotle



According to Aristotle, matter was composed of four elements: earth, fire, air and water. He classified the four elements with their properties: hot, cold, dry and wet. He was not an "atomist" like Democritus. To change one material into another all that is required is to alter the proportions of each element

Aristotle

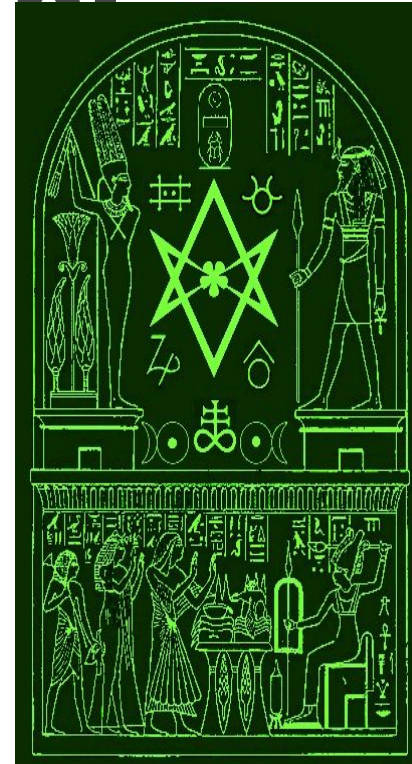


- ▣ Aristotle's theory ruled for 2000 years because:
 - It was comprehensive
 - It was based on common sense
 - It was accepted and taught by the church

Alchemy in Ancient Egypt

Egyptian' contribution to chemistry

- Producing tools for make up, building.
- Dyeing clothes and painting surfaces.
- Decoration.
- Ornamentation.
- Mummification.
- Processing metals for living
- They prepared some alloys.
- Developed many adhesive (such as albumin, gelatin, glue)



In Ancient Rome



In the Hellenistic (primary Greek or Roman) cultures, there are also some practices for alchemy and chemistry:

- They developed some techniques such as distillation.
- They tried to find endless life.
- Zosimos tried transmutation other metals into gold.

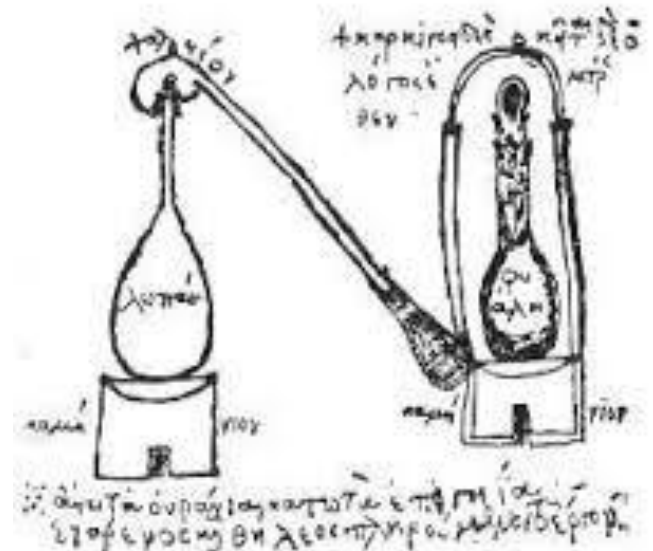
Chinese Alchemy

- Its main focus was **medicine**
 - Black Powder (greatest contribution – achieved)
 - used in fireworks and cannons
 - Gunpowder: China □ Japan □ Arab World □ Europe



Arabic Alchemy

Arabic alchemy was dominated by Jabir Ibn Hayyan (Geber) and Al-Razi





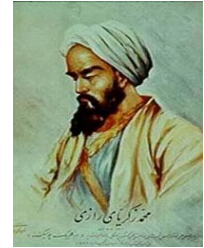
Jabir Ibn Hayyan & Al-

i

Born in 721, was either Arab or Persian.

- He was Islamic philosopher, alchemist, astronomer and physicist.
- He was known as the father of Arab chemistry
- Known as first experimental chemist.
- He created a number of practical applications for chemistry.
- Invented distillation and discovered various acids. For example; sulfuric and nitric acids.
- He developed **AQUA REGIA** that dissolves gold. (3 volumes HCl+ 1 volume HNO₃

□ **Al - Razi** wrote two books outlining his views of matter, equipment, tools and chemical operations related to pharmacy.



□ He proved toxicity of arsenic.

□ He developed “**AQUA VITAE**(a concentrated solution of ethyl alcohol)”.

□ He developed many laboratory equipments.

□ He distilled petroleum.

□ He produced antiseptics.

He developed many chemical processes such as sublimation

Ibn Sina:

He was concentrated on medicine.

He developed many healing methods with different drugs.

In his book, “the Book of Healing”, he discussed the philosophy of science and described the early scientific method.

He used distillation method to produce essential oils.

He classified inorganic substances as sulfurs, lapides, metals and salts.



EL - BIRUNI

In his work “Kitâbü’l-Camahir fi Mârifeti’l-Cevâhir” (on the properties of the ores), Biruni determined the densities of 23 solids and six liquids very close to their present values.

“Kitabu’s Saydane”, written on medicinal herbs and some medicines, he writes about how three thousand or so plants are used and how they are used.

Major Contributions from Alchemists

▣ Lab Techniques

- Distillation, filtration, crystallization, evaporation, extraction and coagulation

▣ Medicines

- Experimental drugs and synthetic drugs used to cure ailments and illnesses

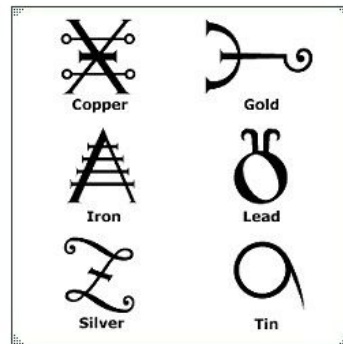
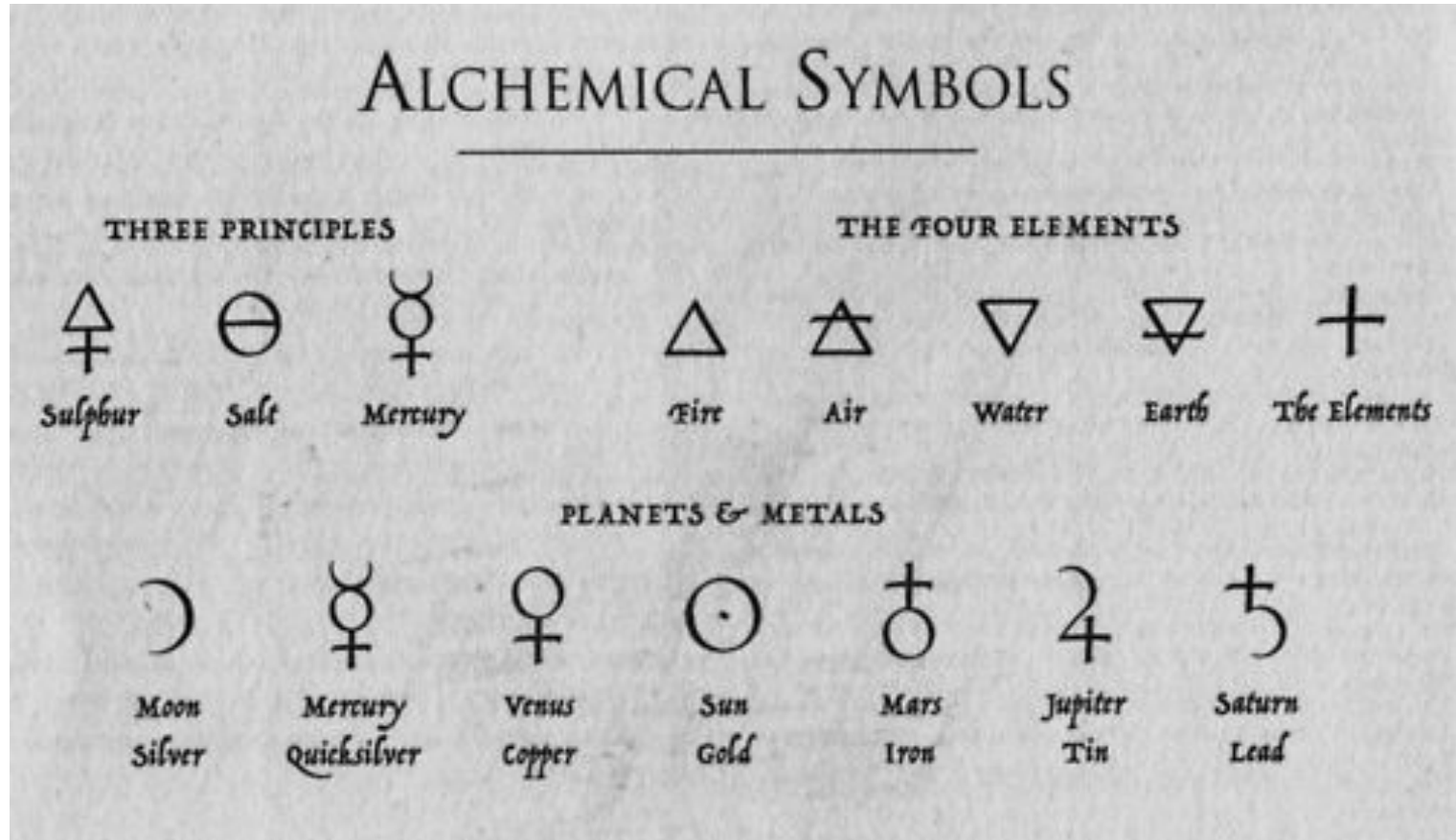
▣ Lab Tools and Supplies

- Mineral acids, alcohols, glassware

▣ Symbolic Language of Chemistry

- Symbols for chemicals and lab procedures
- 

Symbols in Alchemy



Paracelsus (1493-1541)



“Stop making gold,” he taught ***“instead find medicines.”***

- “discover new medicines rather than making gold”

Robert Boyle (1627 - 1691)

Robert Boyle redefined an element as **“a substance that could not be broken down into simpler substances.”** He separated chemistry from alchemy and introduced experimental methods..

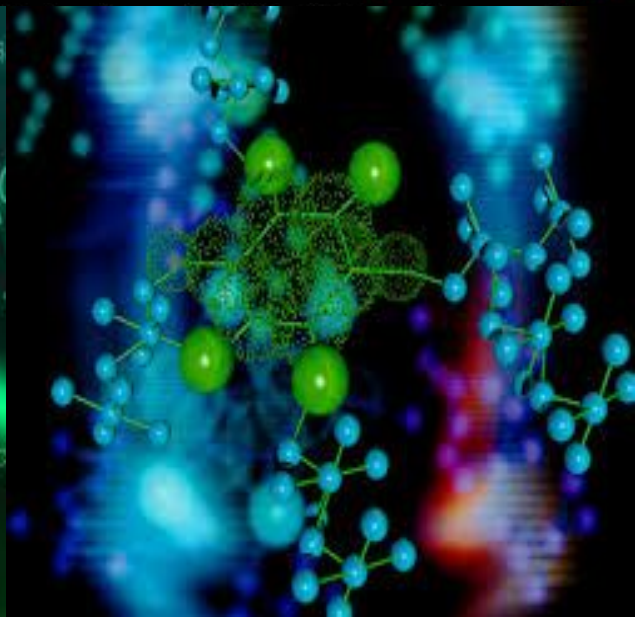
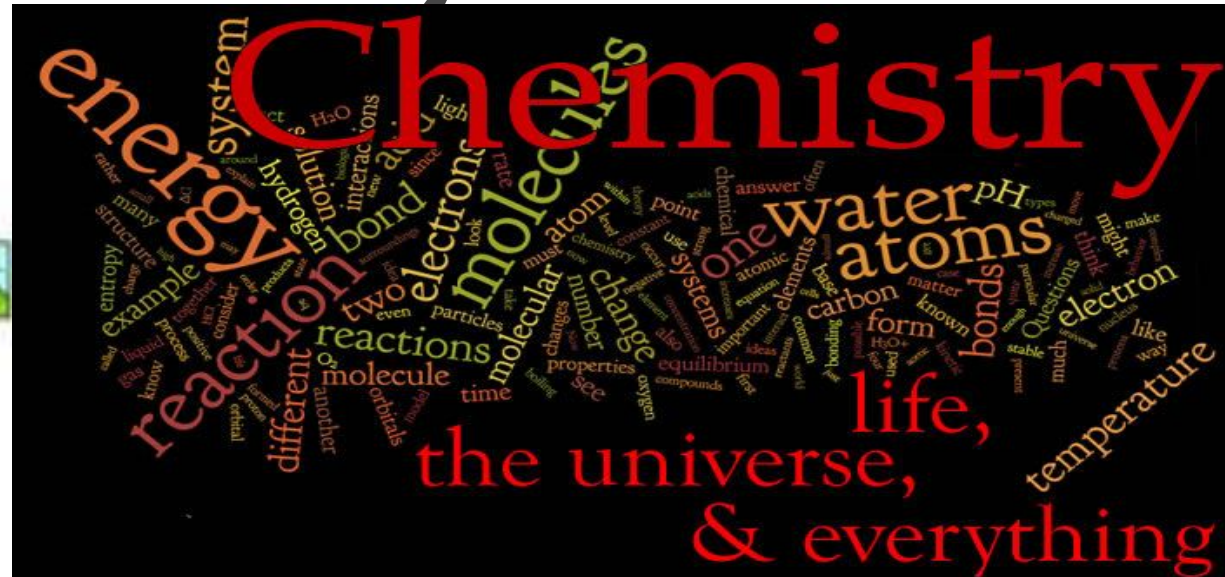
Antoine-Laurent Lavoisier (1743-1794)



- He believed that mass was conserved through chemical reactions
- The Law of Conservation of Mass
- Discovered the “composition” of many compounds containing oxygen.

What is chemistry?

C COMMUNITY 
H HEALTH 
E ENVIRONMENT 
M MEDICINE 
I INDUSTRY 
S SCIENCES 
T TEACHING 
R RESEARCH 
Y YOU! 



2.1 The Fundamental Disciplines of Chemistry

Analytical chemistry is a branch of chemistry which performs analysis, identification, separation and quantification of components and composition of natural and man-made materials.

Biochemistry is a branch of chemistry involving the study of materials and processes that occur in living things.

Organic chemistry is a branch of chemistry which is known as the study of carbon compounds

Inorganic chemistry is a sub-field of chemistry which deals with structure, composition and behavior of inorganic compounds.

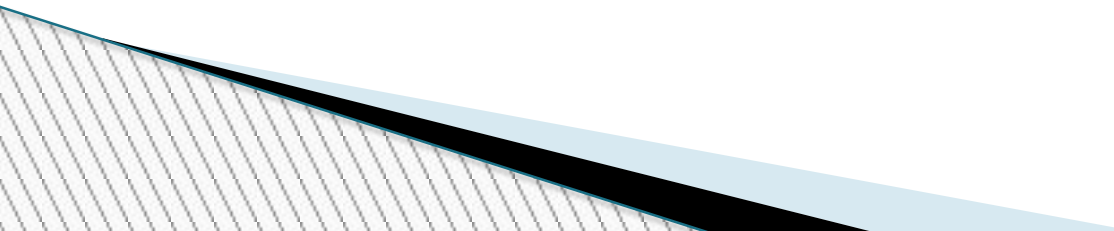
Physical chemistry is the study of the fundamental physical principles that govern the way that atoms, subatomic particles, molecules, and other chemical systems behave.

Polymer chemistry is a discipline that deals with long chemical chains. These long chemical chains are called polymers or macromolecules.

Industrial chemistry is concerned with using chemical and physical processes to transform raw materials into products that are beneficial to humanity

Six major branches of Chemistry

<https://quizlet.com/6483467/six-major-branches-of-chemistry-flash-cards/>



2.2 Application Areas of Chemistry Disciplines(chemistry at work)

Chemistry in Fertilizer Processing

A fertilizer is a plant nutrient added to a soil to increase its yield. Fertilizers are made of natural and artificial chemicals. natural fertilizer is not enough in the world

Chemistry In Petrochemistry

Petrochemistry is the study of the transmutation of crude oil(petroleum) to useable products. Chemists distill petroleum

Chemistry in Purification Process

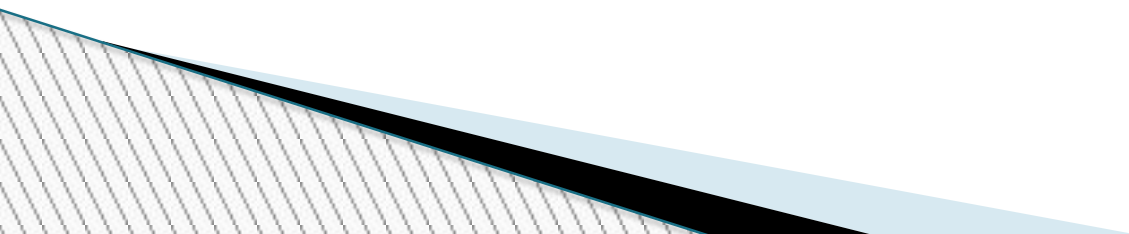
Water purification is a process of removing unwanted materials from water to produce drinking water.

- **Chemistry in Processing of Hardwood**

- Wood is composed of cellulose and once raw wood is obtained, it is processed to be used in different areas. Such as paper,

- **Chemistry in Medicine Processing**

- Medicinal chemistry: Medicinal chemistry is the application of chemical research techniques to the synthesis of pharmaceuticals.



• **Chemistry in Textile-Dyeing Process**

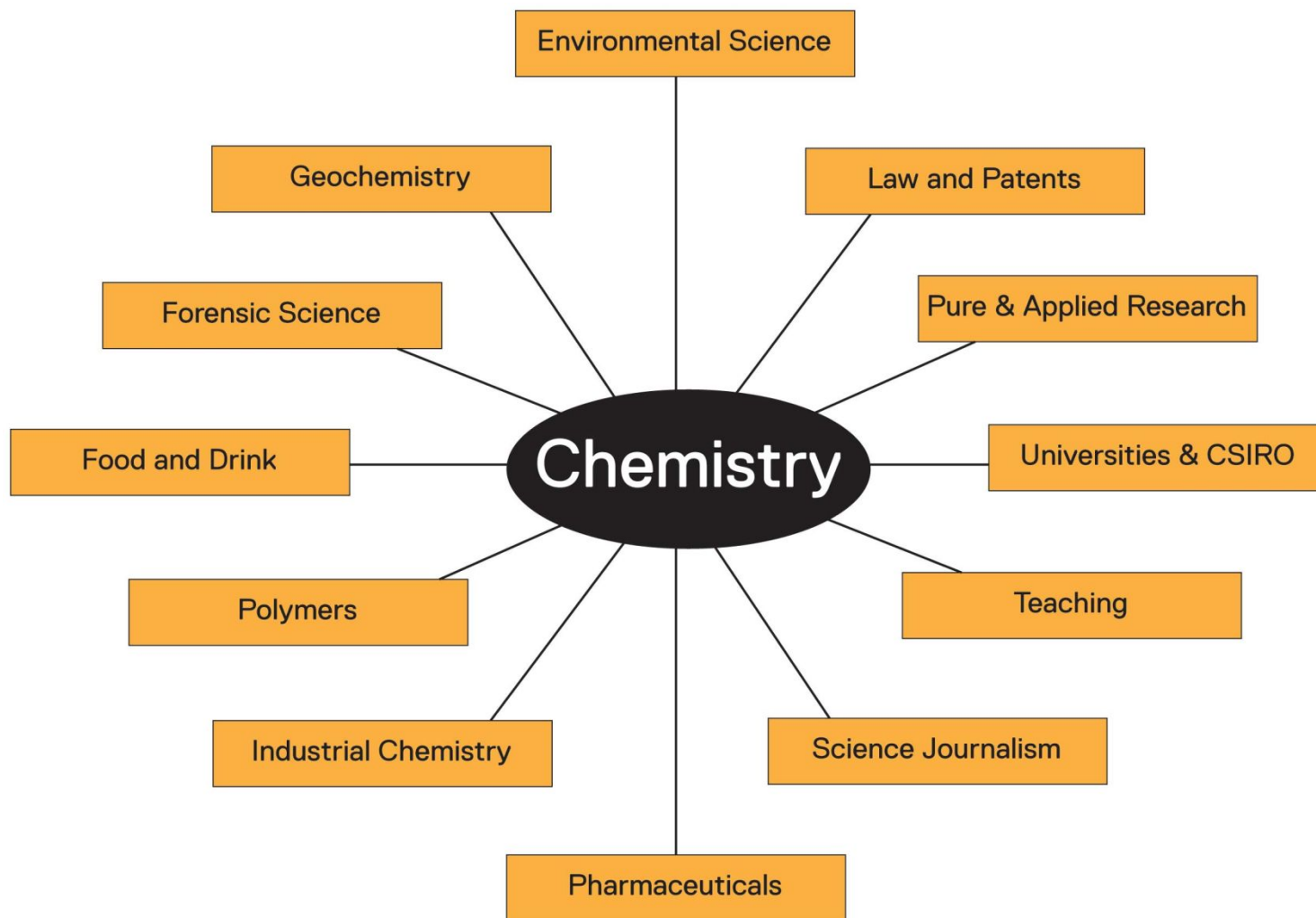
- **Textile chemistry:** Textile chemistry is a highly specialized field that applies the principles of chemistry to the production of textiles, such as those used in clothing, furniture, tire yarn and air bags.
- It is the job of chemists to develop the right dyeing material for each type of clothing

Environmental chemistry: Environmental chemists try to understand how chemicals move through the environment and their effects on human health and the environment itself.

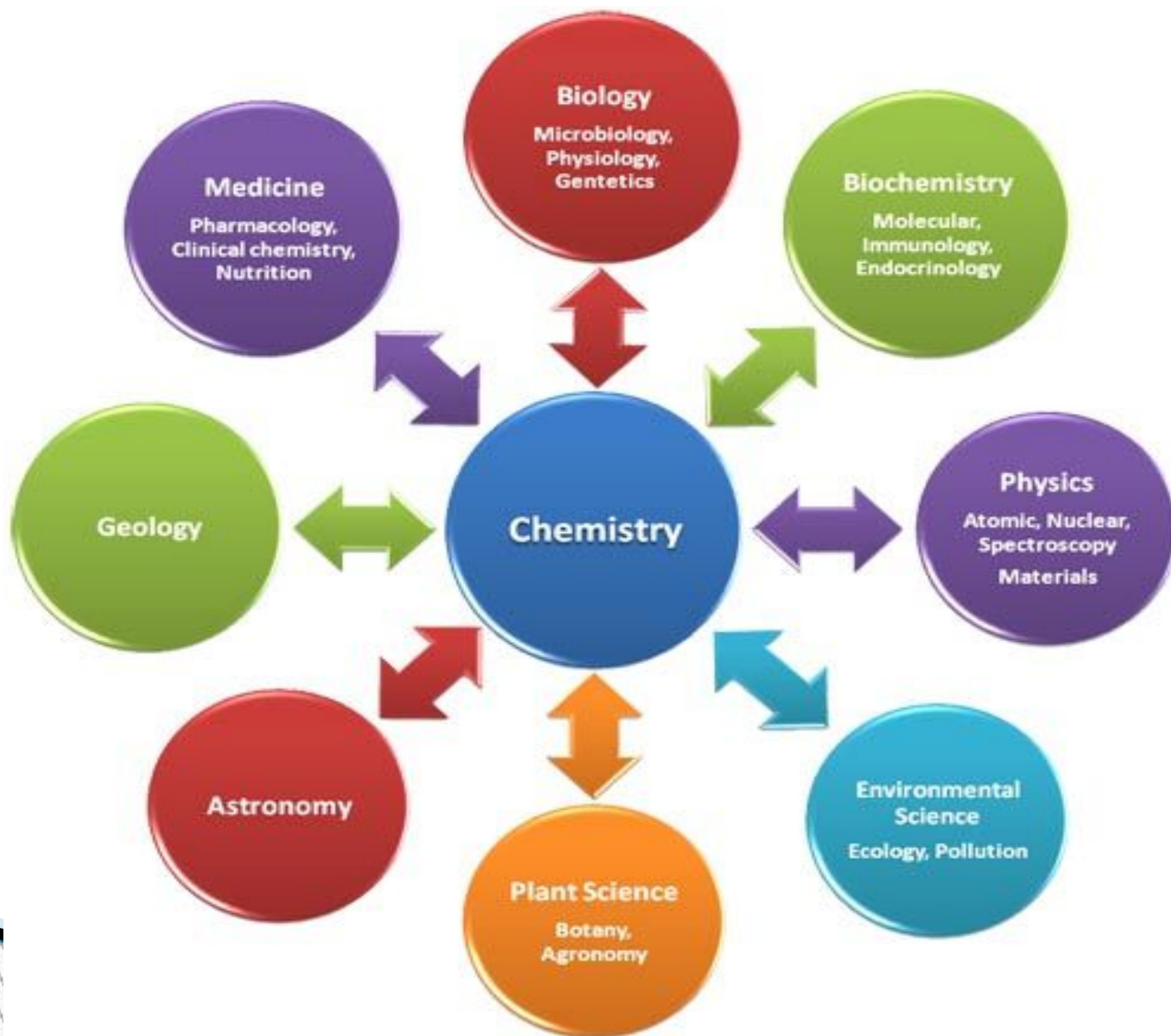
OTHER USES OF CHEMISTRY

- Chemistry is also used for detecting the doping materials in the body of the sportsmen. They also analyze poisons and explosives. In detecting the criminals, chemical analysis is used. Once an event occurs, chemists analyse the environment for the blood stains, hair or other living liquids in order to state the genetical password of the criminal. This area of chemistry is **criminal chemistry**.

Where a chemistry major can lead you

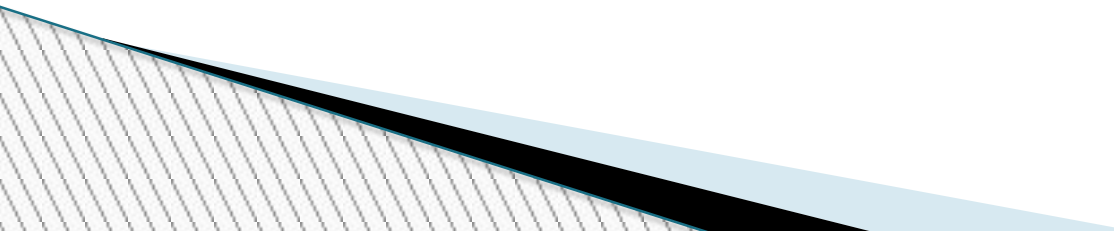


Where a chemistry major can lead you

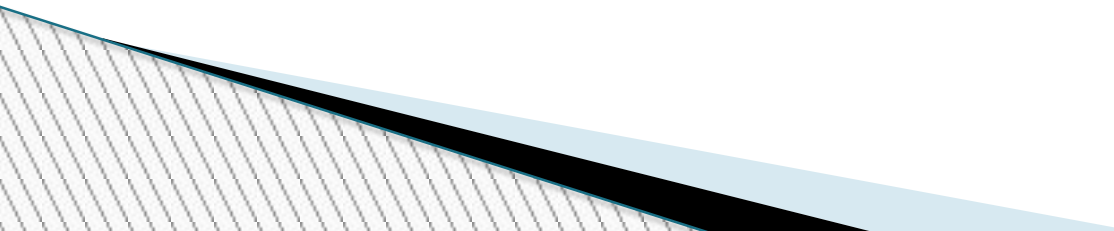


CHEMISTRY RELATED OCCUPATIONS

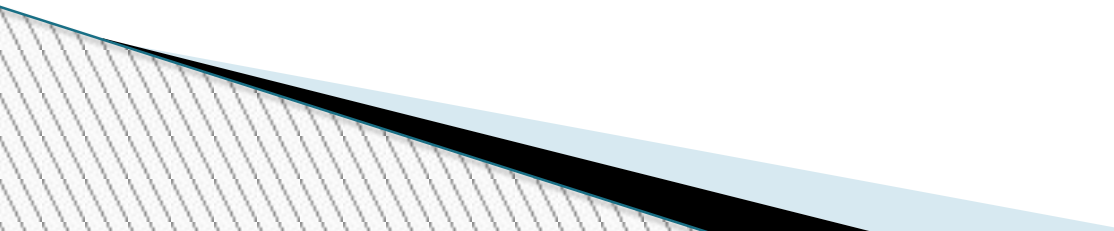
Chemical Engineering: Chemical engineering is all about turning raw materials into useful, everyday products. The clothes we wear, the food and drink we consume and the energy we use all depend upon chemical engineering.



Chemist: A chemist is a scientist who researches and experiments with the properties of chemical substances. They measure the effects of chemical compounds in various situations and study inter-chemical reactions.

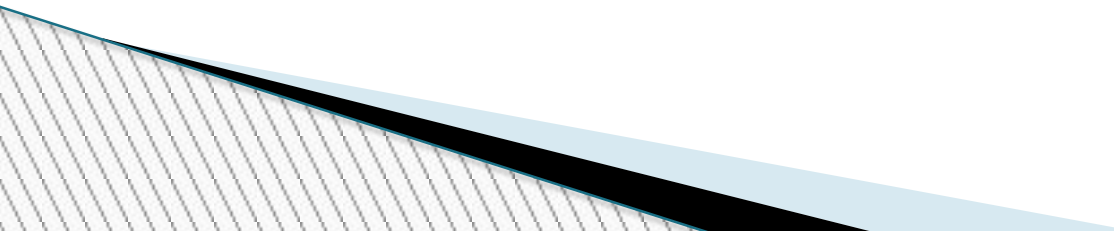


Metallurgical Engineering: Metallurgical engineering involves the study, innovation, design, implementation, and improvement of processes that transform mineral resources and metals into useful products that improve the quality of our lives

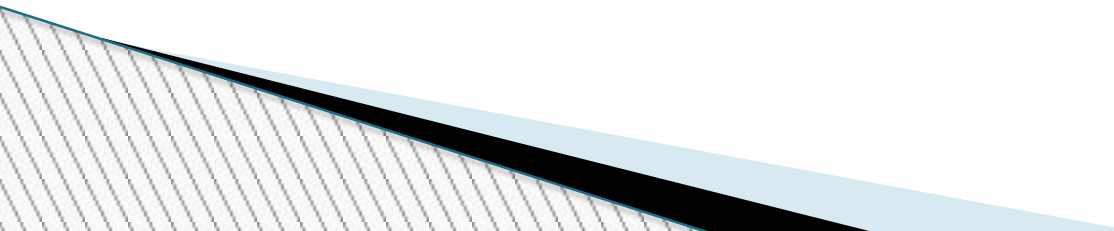


Pharmacology: Pharmacology is the science of drug action on biological systems. It involves chemical properties, biological effects and therapeutic uses of drugs. It is a science that is basic not only to medicine, but also to pharmacy, nursing, dentistry and veterinary medicine

Chemistry Teacher: A chemistry teacher teaches high school students about chemicals. chemistry teachers facilitate student learning and understanding of chemistry through guided inquiry, direct instruction, investigations, problem solving, and discussion.



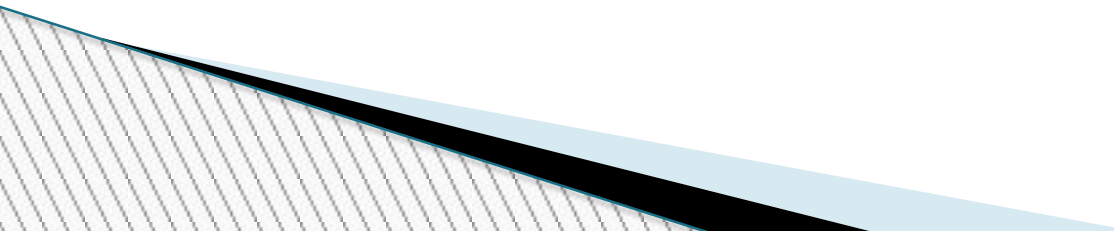
Symbolic Language of Elements

- Do we use any symbols in our life?
 - Why do we need symbols?
 - Why do we use international symbols?
 - Do you know any symbol about science?
 - Why do scientists use symbols?
 - What is the importance of symbolic language?
- 

ELEMENTS AND COMPOUNDS

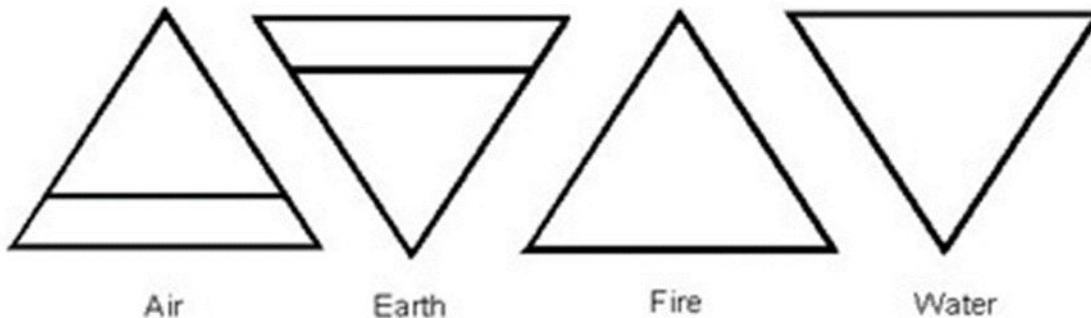
The Historical Development of the Symbolic Language of Chemistry

The modern symbols used to represent the chemical elements consist of one or two letters from the element's name. Historically, symbols were not always like this.






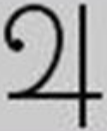



Empedocles at around 450 BC.

- Fire: Triangle points up
- Water: Triangle points down
- Air: Triangle points up with a horizontal line through center of triangle
- Earth: Triangle points down with a horizontal line through center of triangle



There were often many symbols for an element. For a time, the astronomical symbols of the planets were used to denote the elements

						
Sol Sun Ruler of Gold	Luna Moon Ruler of Silver	Mercurius Mercury Ruler of Quicksilver	Venus Ruler of Copper	Mars Ruler of Iron	Jupiter Ruler of Tin	Saturnus Ruler of Lead

DALTON

He used circles with markings to represent the various individual atoms. He used circles with dots, lines, crosses and shading in them. he put letters in the circles to represent the elements.

The diagram is a table titled "ELEMENTS" with two columns of elements. Each element is represented by a unique symbol in a circle, its name, a weight value, and its atomic weight. The symbols include various markings like dots, lines, crosses, and letters.

ELEMENTS					
○	Hydrogen	1	○	Strontian	46
○	Azote	5	⊗	Barytes	68
●	Carbon	5	⊙	Iron	50
○	Oxygen	7	⊙	Zinc	56
⊕	Phosphorus	9	⊙	Copper	56
⊕	Sulphur	13	⊙	Lead	90
⊕	Magnesia	20	⊙	Silver	190
⊕	Lime	24	⊙	Gold	190
⊕	Soda	28	⊙	Platina	190
⊕	Potash	42	⊙	Mercury	167

About ten years later, in Sweden, **Berzelius suggested just using letters to represent atoms of each element** .These are the symbols that we use today.

System for Determining Symbols of the Elements

- 1. The symbols of the most common elements, mainly nonmetals, use the first letter of their English name.

Examples:

Hydrogen: H,

Boron : B,

Carbon: C,

Nitrogen : N,

Oxygen: O,

Fluorine : F

, Phosphorous : P,

Sulfur: S

, Iodine: I

2. If the name of the element has the same initial letter as another element, then the symbol uses the first and second letters of their English name.

Examples: **Helium**:He,

Beryllium :Be,

Neon : Ne



3. If the first two letters of the element name are the same as another element, then the symbol consists of the first letter and the first consonant of the English name that they do not have in common.

Examples:

Magnesium has the symbol Mg (First letter and first consonant)

Manganese has the symbol Mn

Chlorine has the symbol Cl (First letter and first consonant NOT in common)

Chromium has the symbol Cr



4. Some symbols are based on the old name or Latin name of the element. There are eleven elements:

Sodium (Na): natrium	Antimony (Sb): stibium eski	Potassium (K): kalium
Iron (Fe): ferrum	Gold (Au): aurum	Copper (Cu): cuprum
Mercury (Hg): hvdrargyrum eski	Silver (Ag): argentum	Tin (Sn): stannum eski

Symbolic Language of Elements

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period 1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba	57-71	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra	89-103	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo

57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Periodic Table Key

X Synthetic Elements	X Liquids or melt at close to room temp.	X Solids	X Gases	Alkali Metals	Alkali Earth Metals	Transition Metals	Other Metals	Metalloids	Other Non Metals	Halogens	Noble Gases	Lanthanides & Actinides
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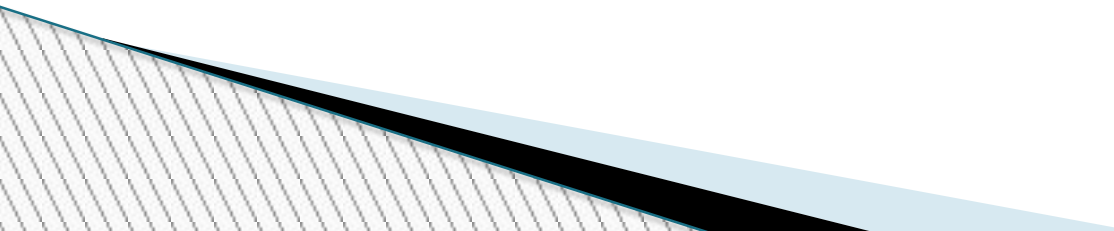
2 Elements and Symbols of Elements

All substances are made up of matter and the fundamental unit of matter is the atom. The atom constitutes the smallest particle of an element. An atom consists of two main parts. Firstly a nucleus in which protons, having a positive charge, and neutrons no charge, is tightly bound together. Secondly, surrounding the nucleus, are one or more electrons in shells, each of which has an associated energy level. The number of electrons is always equal to the number of protons, so the atom has no resultant charge

An element is a substance made up of atoms of one kind.

An element:

- consists of only one kind of atom,
- cannot be broken down into a simpler type of matter by either physical or chemical means, and
- can exist as either atoms (e.g. argon) or molecules (e.g., nitrogen).



Elements can be classified into 3 groups

Monatomic Element: Elements occur in the form of single atoms that are not bound to other atoms. For example; Gold (Au), copper (Cu) and noble gases (helium, neon, argon, krypton, xenon and radon) etc...

Diatomic Element: An element exists as a molecule made up of two atoms. For example; Nitrogen, oxygen, hydrogen, bromine and chlorine in nature are diatomic elements.

Polyatomic element: An element exists as a molecule made up of three or more atoms. For example; ozone (O_3) and sulfur (S_8) are polyatomic elements.

Element	Symbol	Element	Symbol
Hydrogen	H	Helium	He
Lithium	Li	Beryllium	Be
Boron	B	Carbon	C
Nitrogen	N	Oxygen	O
Fluorine	F	Neon	Ne
Sodium	Na	Magnesium	Mg
Aluminum	Al	Silicon	Si
Phosphorous	P	Sulfur	S
Chlorine	Cl	argon	Ar
Potassium	K	Calcium	Ca
Chromium	Cr	Manganese	Mn
Iron	Fe	Cobalt	Co
Nickel	Ni	Copper	Cu
Zinc	Zn	Bromine	Br
Silver	Ag	Tin	Sn
Iodine	I	Barium	Ba
Gold	Au	Mercury	Hg
Lead	Pb	Cadmium	Cd

Molecule: A molecule is formed when atoms of the same or different elements combine. A molecule is the smallest particle of a substance that can normally exist independently.

Examples:

- Two atoms of oxygen combine to form a molecule of oxygen [O₂].
- One atom of carbon combines with two atoms of oxygen to form a molecule of carbon dioxide [CO₂].

A compound is a pure substance formed when two or more chemical elements are chemically bonded together. Formula is the group of symbols that shows elements and number of elements in a compound

- consists of atoms of two or more different elements ***bound together***,
- can be broken down into a simpler type of matter (elements) by chemical means (but not by physical means),
- has properties that are different from its component elements, and
- always contains the same ratio of its component atoms.

Nomenclature of compounds

When compounds are named, some rules should be taken into consideration. If a compound consists of two elements, then it should be called with its elements' names. If a compound consists of two more elements, then it should be called with a special name. Some of the compounds that consist of two more compounds have special parts called as roots.

Root Formula	Root Name
OH-	Hydroxide
NO ₃ -	Nitrate
SO ₄ ²⁻	Sulfate
CO ₃ ²⁻	Carbonate
PO ₄ ³⁻	Phosphate

For the nomenclature of this type of compounds, firstly, the elements name that bonds to the root is called and then root's name should be called.

Formula	Compound Name	Common Name of Compounds
H_2O	Dihydrogen monoxide	Water
HCl	Hydrogen chloride	Hydro chloric acid tuz ruhu
H_2SO_4	Hydrogen sulfate	Sulfuric acid
HNO_3	Hydrogen nitrate	Nitric acid(kezzap)
NaCl	Sodium chloride	Table salt
CaO	Calcium oxide	Unhydrated lime
CH_3COOH	Ethanoic acid	Acid of vinegar (acetic acid)
NaOH	Sodium hydroxide	Sud Caustic soda
KNO_3	Potassium nitrate	Saltpetre(güherçile)
$CaCO_3$	Calcium carbonate	Limestone

General Rules

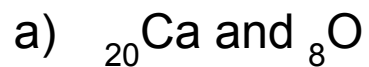
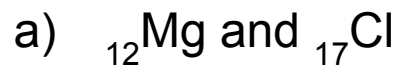
1. Firstly, the symbol of the cation (metal) is written and the symbol of the anion (non metal) is written last.

2. The sum of the charges in the compound must be equal to zero. Therefore, the subscripts are written to cancel out of the charges on cation and anion.

3. If more than one polyatomic ion is present in the formula, it is embedded in parenthesis and number of polyatomic ion is written as a subscript to the right of the final bracket.



Example: Write the formula of the compound formed between



CATION

Cation



When a neutral atom loses an electron, it forms a positively charged atoms or molecules



Monoatomic
ion

Polyatomic
ion

ANION

Anion



When a neutral atom gains an electron, It forms negatively charged atoms or molecules



Monoatomic

Polyatomic

Charge of Some Elements

Metal Ions

You know that elements metal or non metal to name the co

Lithium	Li^+	Magnesium	Mg^{2+}
Beryllium	Be^{2+}	Aluminum	Al^{3+}
Boron	B^{3+}	Potassium	K^+
Sodium	Na^+	Calcium	Ca^{2+}
Zinc	Zn^{2+}	Cadmium	Cd^{2+}
47 Silver	Ag^+	Barium	Ba^{2+}

Metal Ions (Metals that form more than one ion)

Copper	Cu^{+1}	Cu^{+2}		
Iron	Fe^{+2}	Fe^{+3}		
Manganese	Mn^{+2}	Mn^{+3}	Mn^{+4}	Mn^{+7}
Cobalt	Co^{+2}	Co^{+3}		
Lead	Pb^{+2}	Pb^{+4}		
Mercury	Hg^{+1}	Hg^{+2}	cadmium 2,3,4, 6	
Tin	Sn^{+2}	Sn^{+4}	gold?	nikel

Non Metal Ions

Hydride Ion	H^{-1}	Oxide Ion	O^{-2}
Fluoride Ion	F^{-1}	Sulfide Ion	S^{-2}
Chloride Ion	Cl^{-1}	Nitride Ion	N^{-3}
Bromide Ion	Br^{-1}	Phosphide Ion	P^{-3}
Iodide Ion	I^{-1}		

The important polyatomic anions and cations

Formula	Name	Formula	Name
OH^-	hydroxide	CN^-	cyanide
O_2^{2-}	peroxide	NH_2^-	amide
NO_2^-	nitrite	NO_3^-	nitrate
SO_3^{2-}	sulfite	SO_4^{2-}	sulfate
PO_3^{3-}	phosphite	PO_4^{3-}	phosphate
ClO_2^-	chlorite	ClO_3^-	chlorate
ClO^-	hypochlorite	$\text{C}_2\text{H}_3\text{O}_2^-$	acetate
CO_3^{2-}	carbonate	HCO_3^-	bicarbonate
CrO_4^{2-}	chromate	$\text{Cr}_2\text{O}_7^{2-}$	dichromate
MnO_4^-	permanganate	MnO_4^{2-}	manganate
HS^-	Hydrogen sulfide	NH_4^+	ammonium

(or polyatomic ion)

Example: NaCl

Mg(OH):

• **Example:** FeCl₃:

CuSO₄:

Name of
the
transition
metal

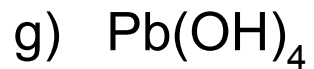
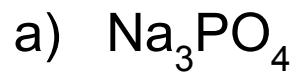
+

(Oxidation
number of the
transition metal in
Roman figures)

+

Name of
the anion
(or
polyatomic
ion)

1. Name the following compounds



1. Write the formula of the following ionic compounds

- a) Sodium nitrate
- b) Copper (II) hydroxide
- c) Calcium phosphate
- d) Ammonium chloride

SAFETY IN THE CHEMISTRY

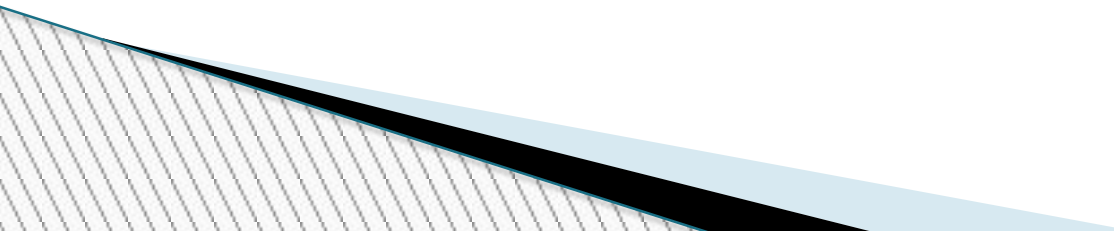
LABORATORY 1. Always wear goggles, gloves apron for safety.

2. Never reach across a flame.

3. Immediately notify your teacher if any chemical gets on your skin or clothing to find out what to do to clean it off.

4. Never look directly into a test tube when mixing or heating chemicals.

5. Always point a test tube away from you and others when heating it over a flame or other heat source.



6. Never smell a chemical directly from the container. Wave your hand over the opening of the container and “waft” the fumes towards your nose.

7. Never taste a chemical unless you are instructed by your teacher to do so.

8. Never mix chemicals without your teacher’s permission.

9. Never use broken or chapped glassware.

10. Immediately notify your teacher if you get cut or have another injury when performing an experiment

11. Long hair must be tied back.



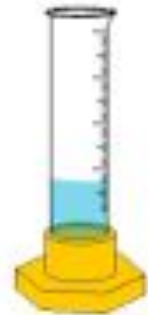
beaker



erlenmeyer flask



spatula



graduated cylinder



test tube



test tube holder



crucible



crucible tongs



stand and ring clamp



clay triangle



forceps



wire screen



dropper pipet



utility clamp



pinch clamp



funnel



buret clamp



evaporating dish



watch glass



rubber policeman

Beaker: A wide
used to transp
substances.



beaker

iner
e



erlenmeyer flask

Erlenmeyer Flask : A narrow-mouthed container used to transport, heat or store substances, often used when a stopper is required.

volumetric flask: It is used to measure an exact volume of liquid.

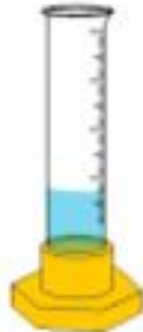


Test tube: Hold or used to mix a small amount of liquid or aqueous chemicals



test tube

Graduated C
measure volume



graduated cylinder

: Used to
measure precisely

Test tube 1
tube so you
Test tube 1
tubes.



... a test
to.
any test

Funnel: Used to pour liquids into containers with small openings or to hold filter paper



Tongs: Used to pick up or hold hot objects

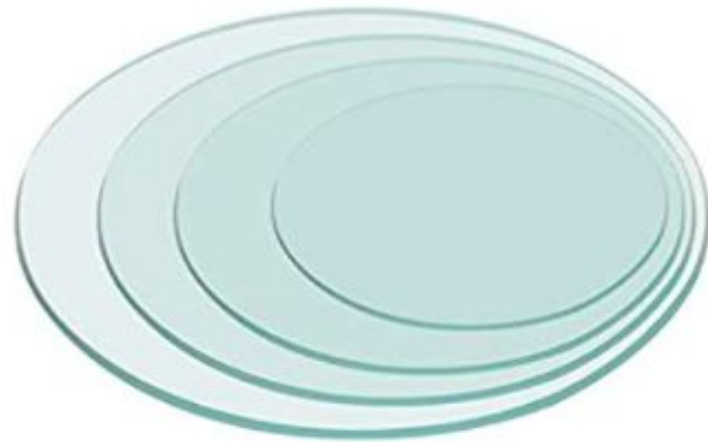


Triple Beam Balance: A device to measure the mass of an object or substance.



▪

Watch glass: They can be used for evaporation purposes and also can function as a lid for a beaker. It can hold a small amount of liquid or solid.



Spatulas and
scooping spoons

are for



Striker: Used to light a Bunsen burner.

Bunsen Burner: Used to heat objects

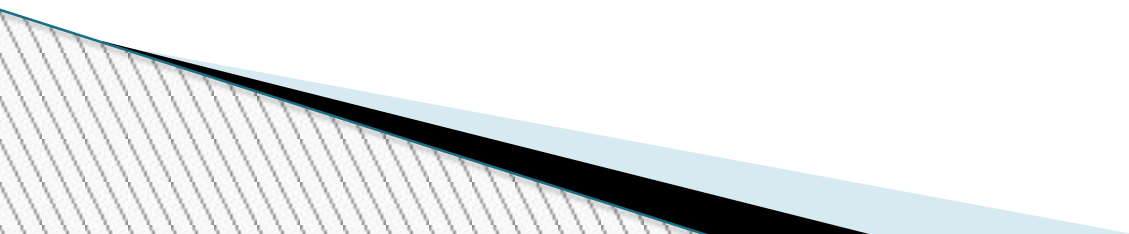


Ring Clamp: Attached to a lab stand and used to hold a variety of lab equipment



Eye Dropper: Used to dispense a very small amount of liquid





Evaporating dish: Holds a liquid or aqueous chemical that is being heated.



Wash bottle: Used to wash the sides of flask



to wash the sides of flask during titration.

Lab Coat or Apron: Protects the scientist and the scientist's clothes from hazard or hot chemicals



Pipette: Used to precisely measure a certain volume of liquid or aqueous chemical.

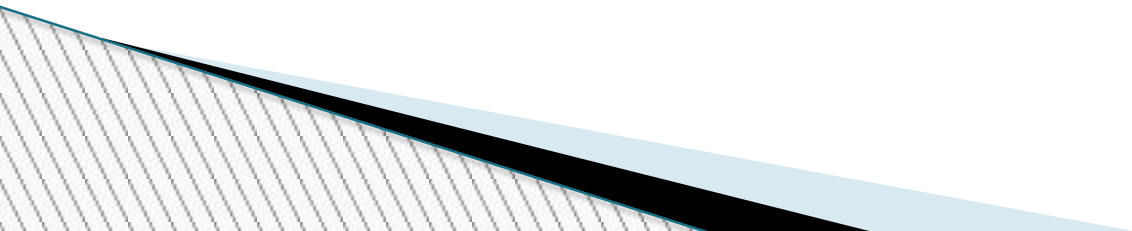


liquid is added or used



separatory funnel : used to
separate immiscible liquids.















	Task	Laboratory Equipment
1.	Holding 100 mL of boiling water:	.....
2.	Melting a crystal over a Bunsen Burner:	.....
3.	Pouring 80 mL of acid from one container to another:	.....
4.	Measuring exactly 41 mL of water:	.....
5.	Weighing out 110 grams of sodium chloride:	.....
6.	Keeping 80 grams of a compound from absorbing atmospheric moisture:	.....
7.	Suspending glassware over a Bunsen burner:	.....
8.	Removing chemicals from a reagent bottle:	.....
9.	Keeping the contents of a boiling beaker from splattering:	.....
10.	Mixing two liquids together:	.....

1.	Beaker
2.	Crucible
3.	Funnel
4.	Graduated cylinder
5.	Balance

6.	Desiccator
7.	Ring stand
8.	Spatula
9.	Watch glass
10.	Stirring rod

1.	Wash bottle		Used to wash the sides of flask during a titration.
2.	Evaporating dish		Holds a liquid or aqueous chemical that is being heated.
3.	Funnel		Used to accurately and cleanly add one chemical to another or to filter a solid from a liquid solution using filter paper.
4.	Test tube		Hold or used to mix a small amount of liquid or aqueous chemical(s).
5.	Test tube holder		Holds a test tube so you don't have to.
6.	Test tube rack		Holds many test tubes.
7.	Graduated cylinder		Precisely measure the volume of a liquid or aqueous chemical.
8.	Pipette		Used to precisely measure a certain volume of liquid or aqueous chemical.
9.	Erlenmeyer flask		Store liquid or aqueous chemicals.
10.	Rubber stoppers		Seal an Erlenmeyer flask.

1.	
2.	
3.	
4.	
5.	

6.	
7.	
8.	
9.	
10.	

LABORATORY SAFETY SYMBOLS



This is the safety symbol for a biohazard.



This is the hazard symbol for toxic substances.



This sign means you need to wear gloves or other hand protection.



This symbol indicates mandatory use of protective clothing.

CHEMICAL HAZARD SYMBOLS



Flammable



Compressed Gas



Oxidizing



Corrosive



Explosive



Health Hazard



Toxic



Skin Irritant



Environmental Hazard



This symbol or sign indicates the location of a fire extinguisher.



This is the safety symbol for electricity.



This sign tells you respiratory protection is required.



This symbol indicates mandatory use of protective clothing.

1-c	In addition to the normal precautions of wearing eye protection, anyone using an oxidizing substance should take care to keep it away from flammable substances, including clothing.
2-e	Anyone using a corrosive substance should wear gloves and eye protection, such as goggles or a face shield.
3-g	To an extent depending on the potential danger, do not dispose of in the drains, soil or the environment. Follow special disposal regulations.
4-d	Anyone who uses a toxic chemical needs to take great care. They should wear gloves and eye protection, and they may wear a mask over their mouth and nose, or handle the chemical in a fume cupboard.
5-a	In addition to the normal precautions of wearing eye protection, anyone using a highly flammable substance should take care to keep it away from flames and sparks, and also from oxidizing substances.
6-b	Anyone using a harmful substance should wear eye protection such as goggles, and they should take care to wash any spills off their skin immediately.
7-f	Explosive substances must be handled very carefully. It is illegal to carry out unauthorised experiments with explosive chemicals.

Naming Formulas of Covalent Compounds

Latin numerals must be learned before naming of covalent compounds

Mono	1	Hexa	6
Di	2	Hepta	7
Tri	3	Octa	8
Tetra	4	Nona	9
Penta	5	Deca	10

General Rule

Number of the first nonmetal in Latin	+	Name of the first nonmetal	+	Number of the second nonmetal in Latin	+	Name of the second nonmetal as an anion
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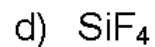
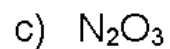
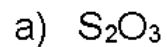
CAUTION: If the number of the first nonmetal is one “mono” cannot be written as a rule. But if the number of the second nonmetal is one “mono” is written.

Example: N_2O_5

NO

Exercises:

1. Name the following covalent compounds



2. Write the formula of the following covalent compounds

a) Tricarbon disulfide

b) Chlorine dioxide
















c) Carbon tetrachloride

d) Disilicon hexafluoride

e) Sulfur trioxide

Formula	Common Name
H ₂ O	Water
NH ₃	Ammonia
H ₂ S	Sulfured hydrogen
CH ₃ COOH	Winegar, asetic acid
HCl	Spirit of salt(tuz ruhu), Hydrochloric acid
CaCO ₃	Limestone
NaCl	Table salt
NaOH	Sud coastic soda
KOH	Potas coastic soda
CaO	Slaked lime
Ca(OH) ₂	Limewater
HNO ₃	Nitric acid(kezzap)
H ₂ SO ₄	Oil of vitriol(zaç yağı), sulfuric acid
KNO ₃	Saltpeter(güherçile)
NaHCO ₃	Food soda, Sodium bicarbonate
NaCO ₃ ·10H ₂ O	Washing soda
KAl(SO ₄) ₂ ·12H ₂ O	Alumn(şap)
NH ₄ Cl	Ammonium chloride(nişadır)

Symbolic Language of Elements

	1500s	1600s	1700s	1783	1808 (Dalton)	1813 (Berzelius)
Gold						Au (Aurum)
Mercury						Hg (Hy) (Hydrargyrum)
Lead						Pb (P) (Plumbum)

Common elements

- First 20 Elements
- Cr, Mn, Fe, Co, Ni, Cu, Zn, Br, Ag, Sn, I, Ba, Au, Hg, Pb