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 <u>trial and</u> <u>error</u> 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-1 hayat) Foundation of youth: cure diseases.

Alchemy is not a science because: Alchemists used <u>trial and error</u> <u>method.</u>

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.

- Althoughs along is choice on 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:
- $H_2SO_4 = Sulfuric acid.$
- □ HCI = Hydrochloric acid.
 - HNO = 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 Egym

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 adhensive (such as albümin, 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-

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 HCI+ regiume 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 Boyle1627 - 1691)

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

Antoine-Laurent Lavoisie (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?





Lif inc i undanicital 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-branch es-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 transmution 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 analyses 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 <u>criminal chemistry.</u>

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

\odot)	Ý	Q	O'	21	ħ
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.

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,
- Carbon: C,
- Oxygen: O,
- , Phosphorous : P,
- , lodine: l

- Boron : B, Nitrogen : N,
 - Fluorine : F
 - Sulfur: S

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

Symbolic Language of Elements

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	<mark>1</mark> 6	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 CI	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 	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 TI	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 FI	115 Uup	116 Lv	117 Uus	118 Uuo

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

	Periodic I	able Key											
	X	X	X	X	Alkali Metals	Alkali Earth	Transition	Other Metals	Metalloids	Other Non	Halogens	Noble Gases	Lanthanides
	Synthetic	Liquids or melt	Solids	Gases		Metals	Metals			Metals			& Actinides
	Elements	at close to											
5		room temp											

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 in to 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, brome 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 (0_3) and sulfur (S_8) are polyatomic elements.

Element	Symbol	Element	Symbol
Hydrogen	Н	Helium	Не
Lithium	Li	Beryllium	Be
Boron	B	Carbon	С
Nitrogen	N	Oxygen	0
Fluorine	F	Neon	Ne
Sodium	Na	Magnesium	Mg
Aluminum	AI	Silicon	Si
Phosphorous	Р	Sulfur	S
Chlorine	CI	argon	Ar
Potassium	K	Calcium	Ca
Chromium	Cr	Manganese	Mn
Iron	Fe	Cobalt	Со
Nickel	Ni	Copper	Cu
Zinc	Zn	Bromine	Br
Silver	Ag	Tin	Sn
lodine		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 $[O_2]$.

One atom of carbon combines with two atoms of oxygen to form a molecule of carbon dioxide $[CO_2]$.

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
NO3-	Nitrate
SO42-	Sulfate
CO32-	Carbonate
PO43-	Phosphate

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

Formula	Compound Name	Common Name of Compounds
H ₂ O	Dihydrogen monoxide	Water
HCI	Hydrogen chloride	Hydro chloric acid tuz ruhu
H ₂ SO ₄	Hydrogen sulfate	Sulfuric acid
HNO ₃	Hydrogen nitrate	Nitric acid(kezzap)
NaCl	Sodium chloride	Table salt
CaO	Calcium oxide	Unhydrated lime
CH ₃ COOH	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

a) $_{12}$ Mg and $_{17}$ Cl

a) $_{20}$ Ca and $_{8}$ O

a) Na⁺ and PO₄³⁻ ions



Charge of Some Elements Metal Ions

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

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

Metal Lons (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	cadmi um 2,3,4,	
	C 10+2	C 10+4		

Non Metal Ions

Hydride	H ⁻¹	Oxide Ion	O ⁻²
Ion			
Fluoride	F ⁻¹	Sulfide Ion	S ⁻²
Ion			
Chloride	Cl ⁻¹	Nitride Ion	N ⁻³
Ion			
Bromide	Br ⁻¹	Phosphide	P ⁻³
Ion		Ion	
Jodide Ton	T -1		
	-		

The important polyatomic anions and cations

Formula	Name	Formula	Name	
OH-	hydroxide	CN⁻	cyanide	
0 ₂ ²⁻	peroxide	NH ₂ -	amide	
NO ₂ -	nitrite	NO3-	nitrate	
SO ₃ ²⁻	sulfite	<i>SO</i> ₄ ²⁻	sulfate	
PO ₃ ³⁻	phosphite	PO4 ³⁻	phosphate	
CIO2-	chlorite	ClO ₃ -	chlorate	
CIO-	hypochlorite	C ₂ H ₃ O ₂ -	acetate	
CO32-	carbonate	HCO3-	bicarbonate	
CrO ₄ ²⁻	chromate	Cr ₂ O ₇ ²⁻	dichromate	
MnO ₄ -	permanganate	MnO4 ²⁻	manganate	
HS-	HS ⁻ Hydrogen sulfide		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

- a) Na₃PO₄
- b) CaS
- c) AIN
- d) KNO₃
- e) FeMnO₄
- f) CuCr₂O₇
- g) Pb(OH)₄
- h) SnCl₂
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 if 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 chémical 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: A wide used to transp substances.



beaker

iner >



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.



small amount of liquid or aqueous chemicals



Graduated C measure volu



: Used to ry precisely

Test tube I tube so yc Test tube I 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



crucible tongs

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



Wacth glass: They can be used for evaporation purposes and also can function as a lid for a beaker. It can hold a small ar Solid

Spatulas and scooping sol



are for

Striker: Used to light a Bunsen burner. Bunsen Burner: Used to heat objects





stand and used to hold a variety of lab equipment

Eye Dropper: Use a very small amo





or aqueous chemical that is being

Wash bottle: sides of flask



ash the itration.

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.



inquid is added of used



separate immis ''''' 'iquids.



	Task	Laboratory Equipment
1.	Holding 100 mLof 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.
з.	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.





LABORATORY SAFETY SYMBOLS



This is the sofity symbol for a Biologord.



This is the human's combel/for texts substances.



This sign means you need to wear glover or other hand protoclion.



This symbol indicator manhatory is all protection clariting







This symbol so sign indicates the location of a fire estingutions.



This is the safety symbol for electricity.



This sign talk you requiratory protection is requiral.



The symbol indicates insodetery are all protective distances

4. Match the following symbols with the symbol definition and state what care should be taken.



	Symbol definition	Care
	Oxidizing ()	
N	Corrosive ()	
	Dangerous for the environment ()	
	Taxic ()	
	Flammable ()	
R.	Harmful ()	
	Explosive ()	

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

mber of the first		Name of the first	Ŧ	Number of the second		Name of the s
onmetal in Latin	T	nonmetal	Т	nonmetal in Latin	Т	nonmetal as an a

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: N₂O₅

NO

Exercises:

1. Name the following covalent compounds

- a) S_2O_3
- b) PCI5
- c) N_2O_3
- d) SiF_4
- e) CO

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 Š	Sulfured hydrogen
CH ₃ COOH	Winegar, asetic acid
	Spirit of salt(tuz ruhu), Hydrochloric
ПСІ	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_2SO_4	Oil of vitriol(zaç yağı), sulfuric acid
KNO ₃	Saltpeter(güherçile)
NaHCO ₃	Food soda, Sodium bicarbonate
NaCO ₃ .10H ₂	Washing code
0 I	washing soua
$KAI(SO_4)_2$.	Alumn(con)
12H,0	Alumi(şap)
NHĴĈI	Anne ium chloride(nişadır)

Symbolic Language of Elements


Common elements

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