



*Al-Mustaqbal University College*  
*Department of Radiology Techniques - First Stage*  
**General Chemistry**

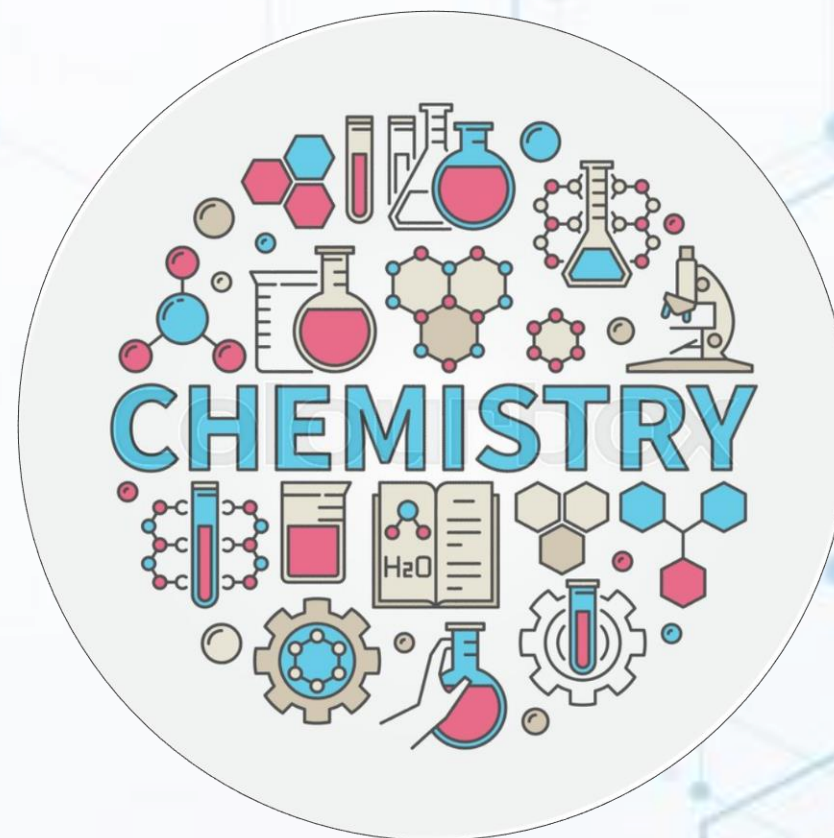
**First Lecture: Introduction to Chemistry**



**Asst. Lec. Alaa Salman Al-Labban**

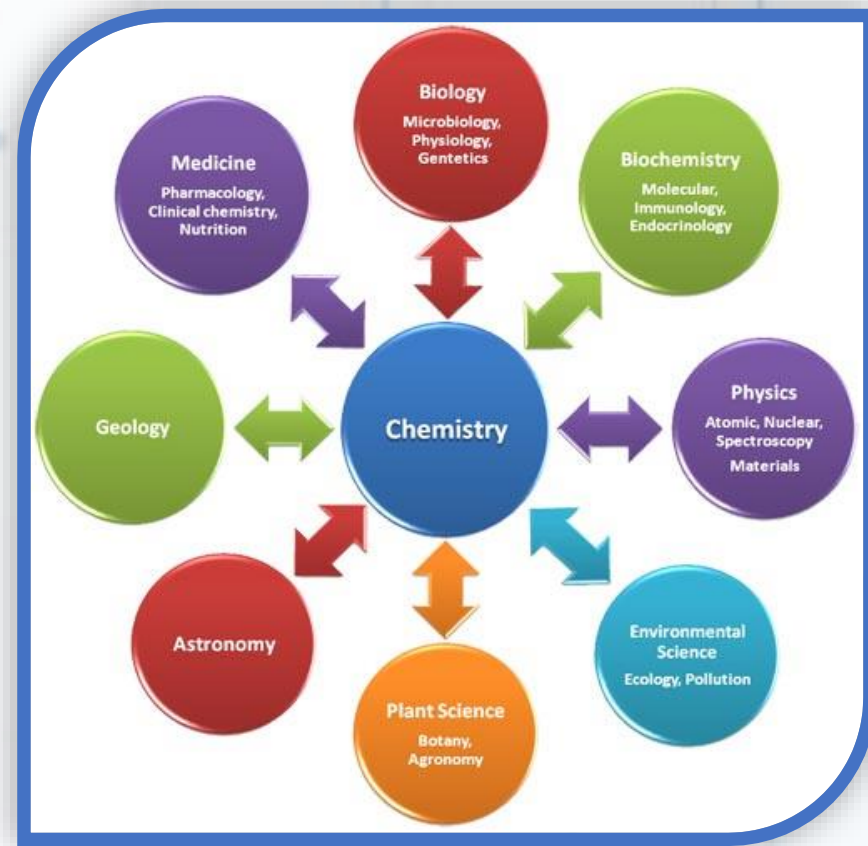
## *Out line*

- ✓ **What is chemistry?**
- ✓ **Branches of chemistry.**
- ✓ **Atom.**
- ✓ **Elements.**
- ✓ **Isotopes.**
- ✓ **Matter.**

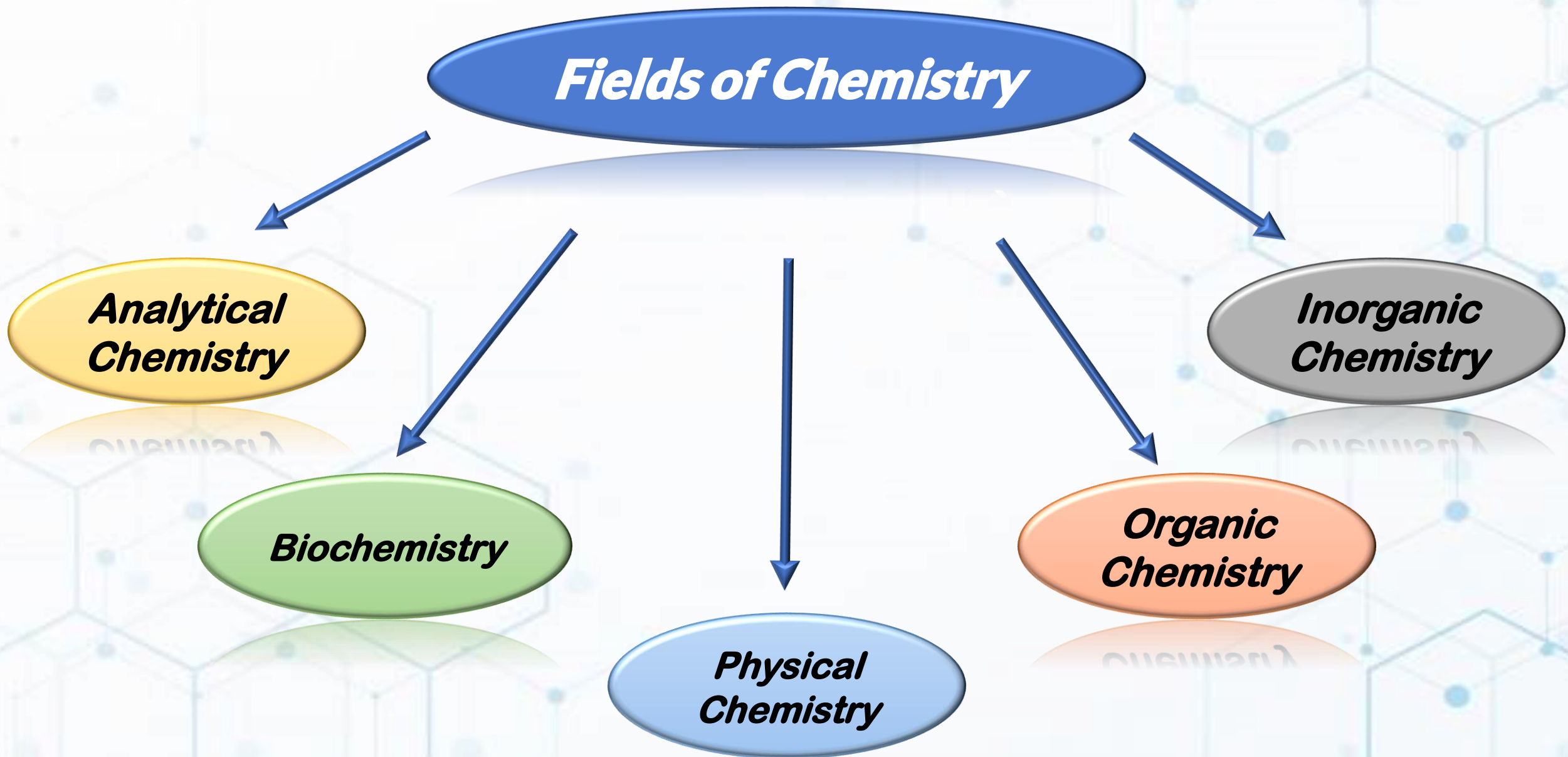


# What is Chemistry?

- **Chemistry:** Is a branch of sciences that studies the **composition, structure, properties and reactivity** of matter.
- Why we are study chemistry?
- Because of **chemistry** is a **part of everything** in our lives, and it is the science that help us to **describe and explain** our world. And **chemistry** is central to **understanding** a wide range of scientific disciplines.

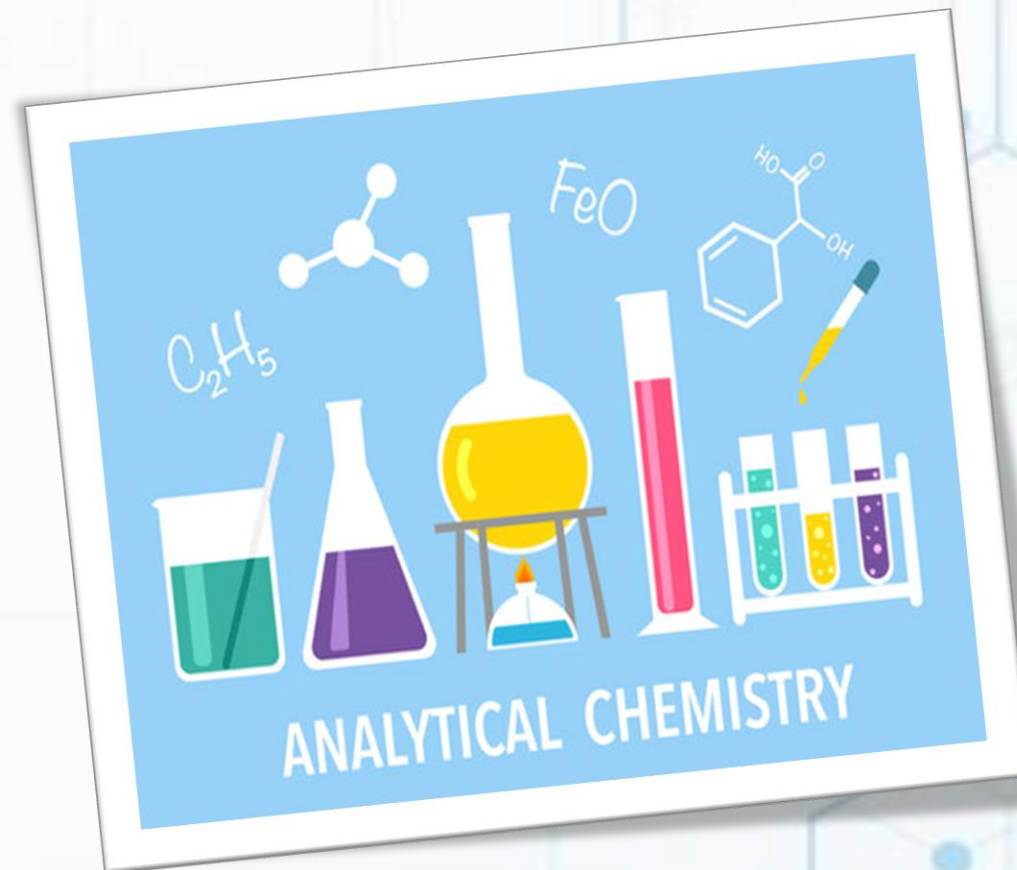






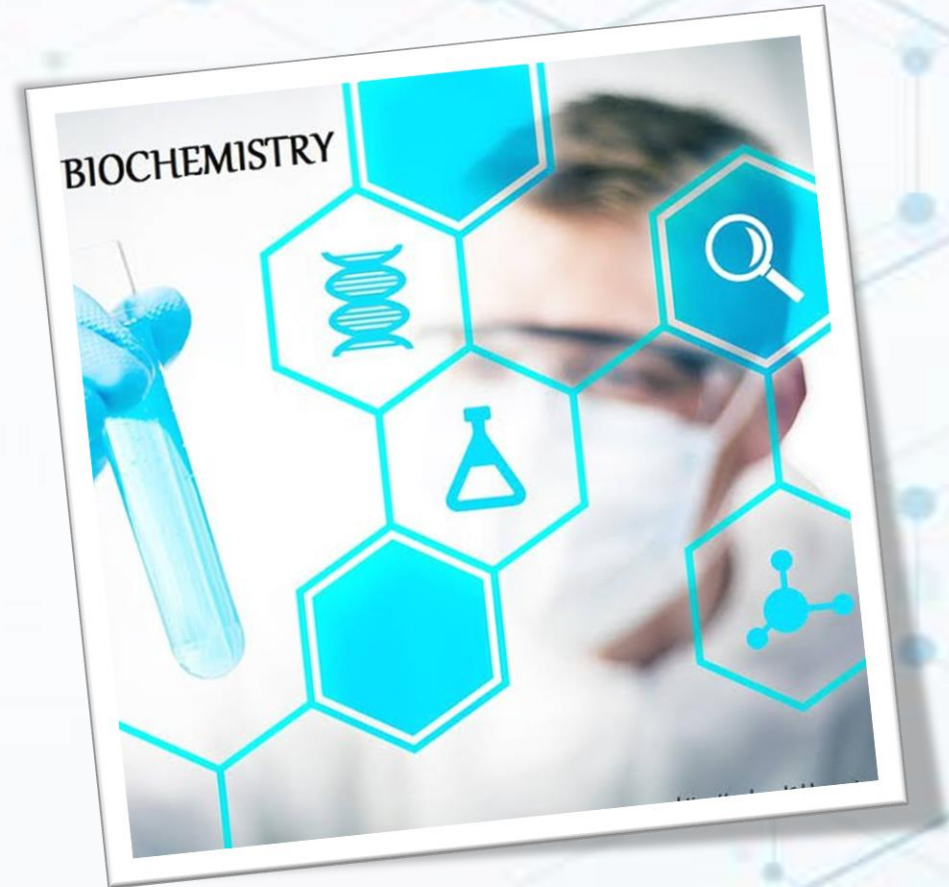
# 1. Analytical Chemistry

It concerned mainly with the various **techniques** and **laboratory methods** to determine the **composition** of matter.



## ***2. Biochemistry***

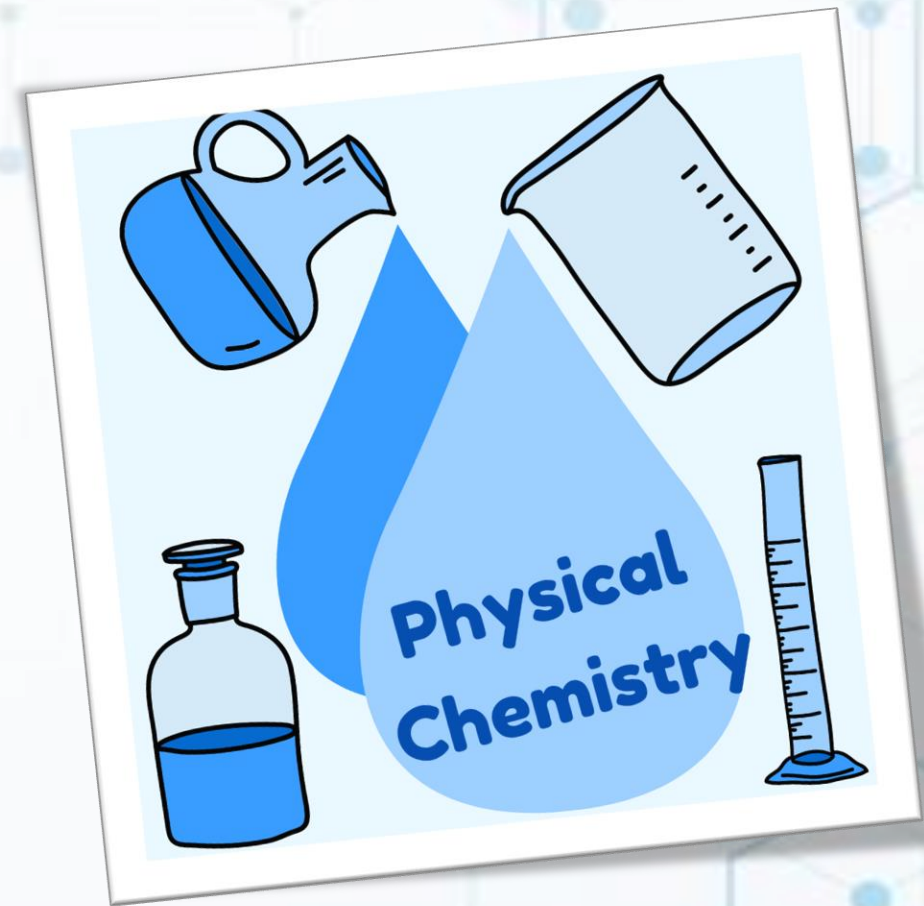
It concerned mainly with  
the **chemistry of life**  
processes and living  
organisms.





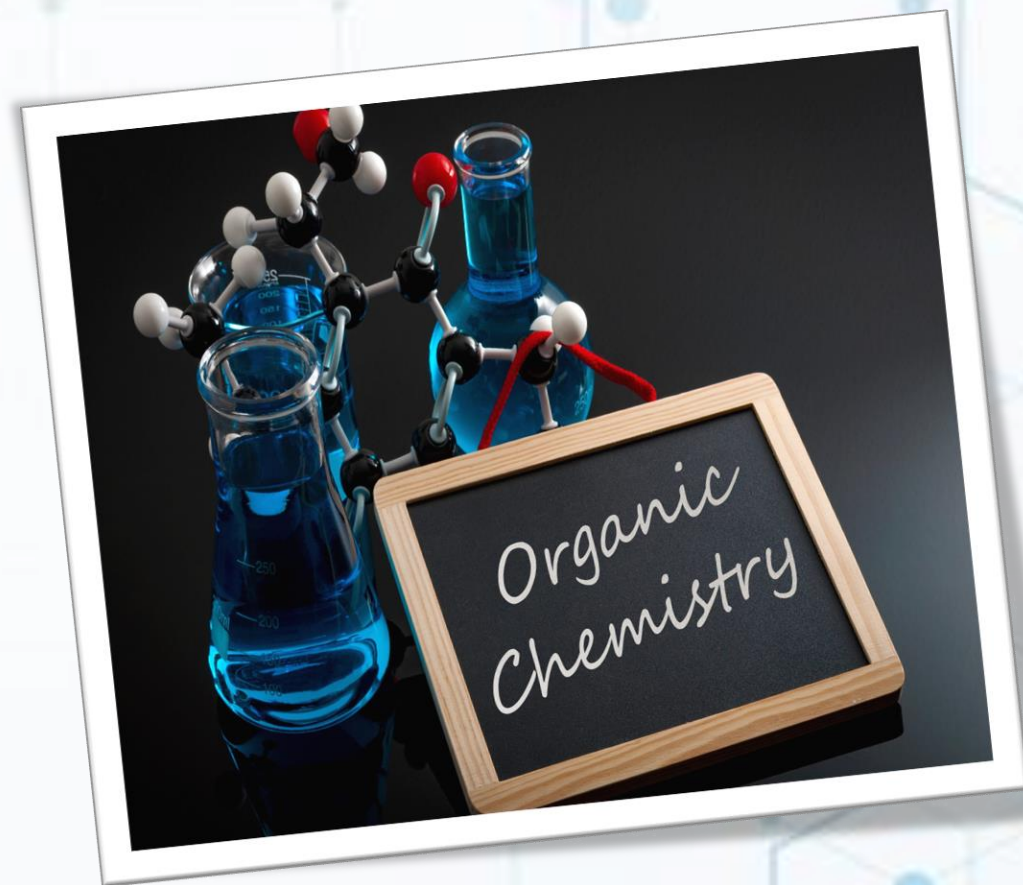
### ***3. Physical Chemistry***

It deals with the **application**  
of **physical laws** to  
**chemical change** and  
**chemical systems.**



## 4. Organic Chemistry

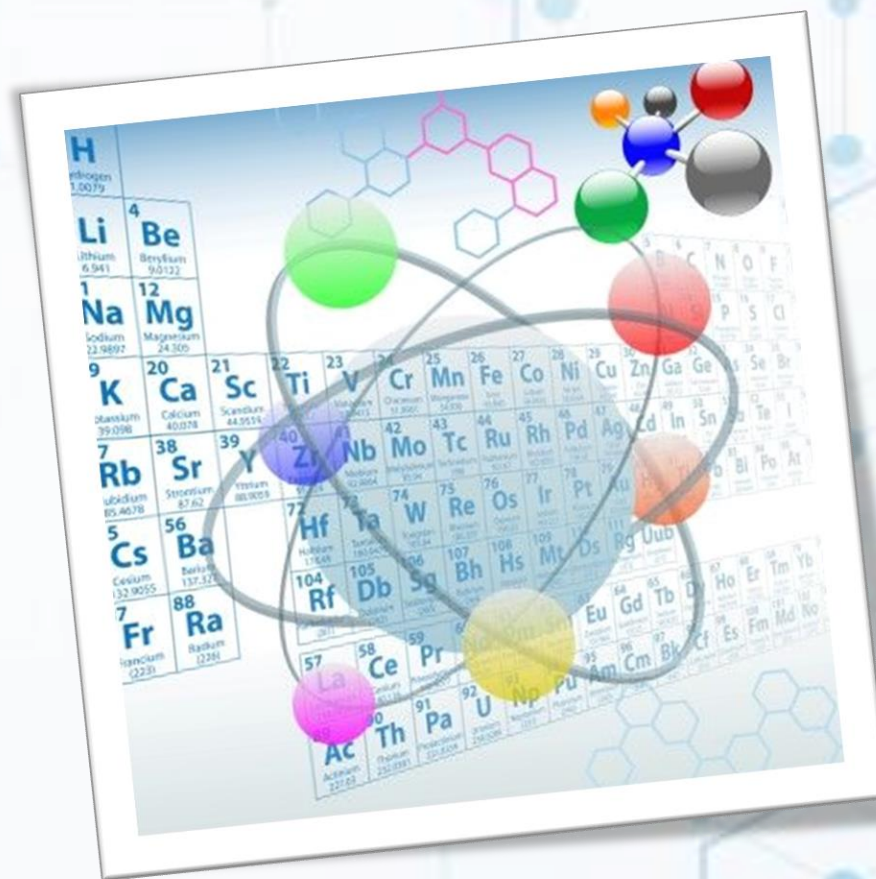
It is concerned with the **study** of **most** **carbon** based **compounds**.





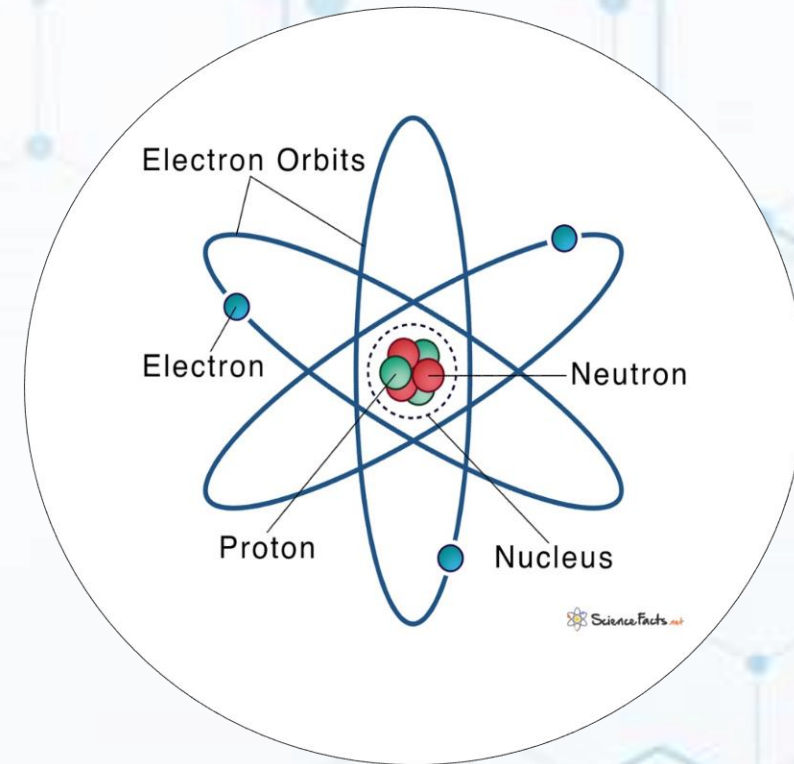
## 5. Inorganic Chemistry

It deals with the **substances** which are **not considered to organic** which may contain any of over **100 elements** (including **carbon**).



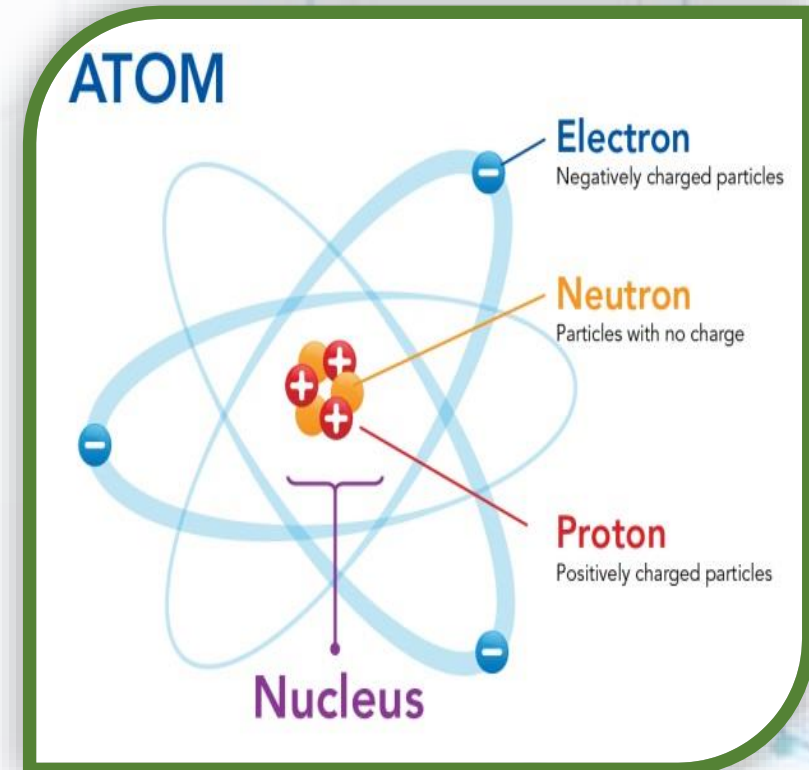
# Atom

- **Atoms:** are the basic units of matter and the defining structure of elements.
- **Atoms are made of three basic subatomic particles:**
  - ✓ The **protons** have a **positive** electric charge.
  - ✓ The **electrons** have a **negative** electric charge.
  - ✓ The **neutrons** have **no** electric charge.



# Atom

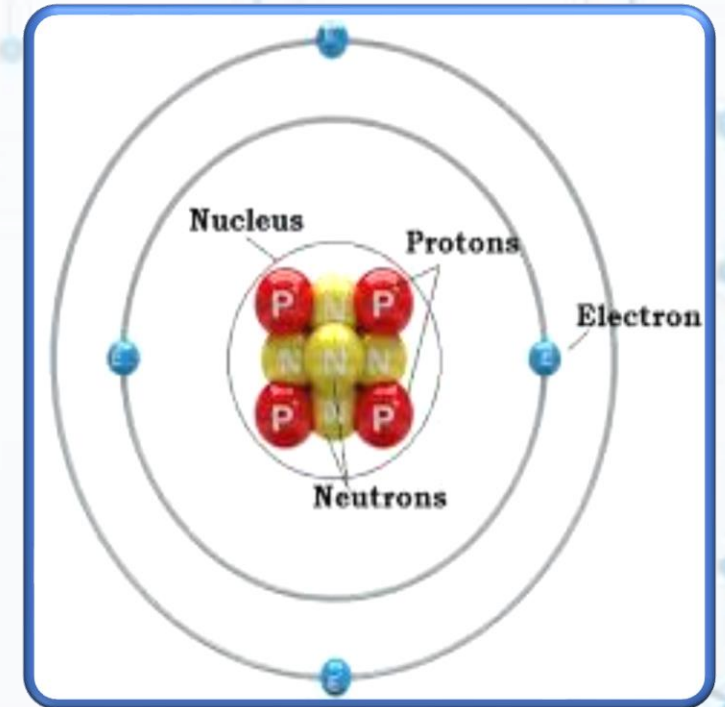
- **Protons and neutrons** are heavier than **electrons** and found in the **center of the atoms**, which is called **nucleus**.
- **Nucleus:** small, dense center of atom and contains almost all the mass of the atom and contains protons and neutrons.
- **Electrons** are very lightweight and exist in a cloud orbiting the nucleus.





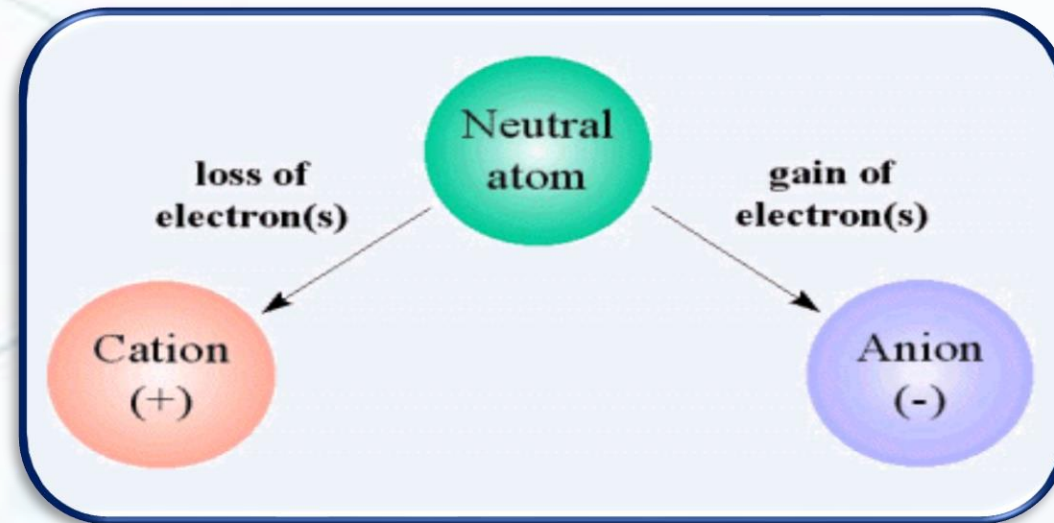
# Atom

- **Protons and neutrons** have approximately the same mass and different with **electrons** where one proton weighs more than **electron** by **1800** times.
- **Atoms** always have an **equal number of protons and electrons**, and the **number of protons and neutrons** is usually the **same in the nucleus** as well.



# Atom

- If the **number of protons and electrons are equal**, that atom is electrically **neutral**.
- If the atom has **more protons than electrons**, it will have a **positive charge**.
- While if the **electrons number more than protons** the atom has a **negative charge**.
- The atom in this case is called an **ion**.
- **Atoms can attach to another one or more by chemical bonds to form chemical compounds.**



# Elements

- Composed of **one type of atom**.
- **Element**: is a pure substance that cannot be changed into a simpler form of matter by any chemical reaction.
- Each element is assigned by **one or two letter chemical symbol** for example: **H, Na, Zn** etc.

**PERIODIC TABLE OF THE ELEMENTS**  
http://www.kgf-split.hr/periodni/en/

**Legend:**

- Metal (Blue)
- Semimetal (Orange)
- Nonmetal (Green)
- Alkali metal (Light Blue)
- Alkaline earth metal (Light Green)
- Transition metals (Dark Blue)
- Lanthanide (Light Purple)
- Actinide (Light Red)
- Chalcogens element (Light Green)
- Halogens element (Light Orange)
- Noble gas (Light Yellow)

**Standard State (25 °C, 101 kPa):**

- Ne - gas
- Fe - solid
- Ga - liquid
- Tl - synthetic

GROUP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1	1.0079 <b>H</b> HYDROGEN																	2.0026 <b>He</b> HELIUM	
2	3 6.941 <b>Li</b> LITHIUM	4 9.0122 <b>Be</b> BERYLLIUM																9 18.998 <b>F</b> FLUORINE	10 20.180 <b>Ne</b> NEON
3	11 22.990 <b>Na</b> SODIUM	12 24.305 <b>Mg</b> MAGNESIUM																17 35.453 <b>Cl</b> CHLORINE	18 39.948 <b>Ar</b> ARGON
4	19 39.098 <b>K</b> POTASSIUM	20 40.078 <b>Ca</b> CALCIUM	21 44.956 <b>Sc</b> SCANDIUM	22 47.867 <b>Ti</b> TITANIUM	23 50.942 <b>V</b> VANADIUM	24 51.996 <b>Cr</b> CHROMIUM	25 54.938 <b>Mn</b> MANGANESE	26 55.845 <b>Fe</b> IRON	27 58.933 <b>Co</b> COBALT	28 58.693 <b>Ni</b> NICKEL	29 63.546 <b>Cu</b> COPPER	30 65.39 <b>Zn</b> ZINC	31 69.723 <b>Ga</b> GALLIUM	32 72.64 <b>Ge</b> GERMANIUM	33 74.922 <b>As</b> ARSENIC	34 78.96 <b>Se</b> SELENIUM	35 79.904 <b>Br</b> BROMINE	36 83.80 <b>Kr</b> KRYPTON	
5	37 85.468 <b>Rb</b> RUBIDIUM	38 87.62 <b>Sr</b> STRONTIUM	39 88.906 <b>Y</b> YTTRIUM	40 91.224 <b>Zr</b> ZIRCONIUM	41 92.906 <b>Nb</b> NIOSBIUM	42 95.94 <b>Mo</b> MOLYBDENUM	43 (98) <b>Tc</b> TECHNETIUM	44 101.07 <b>Ru</b> RUTHENIUM	45 102.91 <b>Rh</b> RHODIUM	46 106.42 <b>Pd</b> PALLADIUM	47 107.87 <b>Ag</b> SILVER	48 112.41 <b>Cd</b> CADMIUM	49 114.82 <b>In</b> INDIUM	50 118.71 <b>Sn</b> TIN	51 121.76 <b>Sb</b> ANTIMONY	52 127.60 <b>Te</b> TELLESIUM	53 126.90 <b>I</b> IODINE	54 131.29 <b>Xe</b> XENON	
6	55 132.91 <b>Cs</b> CAESIUM	56 137.33 <b>Ba</b> BARIUM	57-71 <b>La-Lu</b> Lanthanide	72 178.49 <b>Hf</b> HAFNIUM	73 180.95 <b>Ta</b> TANTALUM	74 183.84 <b>W</b> TUNGSTEN	75 186.21 <b>Re</b> RHENIUM	76 190.23 <b>Os</b> OSMIUM	77 192.22 <b>Ir</b> IRIDIUM	78 195.08 <b>Pt</b> PLATINUM	79 196.97 <b>Au</b> GOLD	80 200.59 <b>Hg</b> MERCURY	81 204.38 <b>Tl</b> THALLIUM	82 207.2 <b>Pb</b> LEAD	83 208.98 <b>Bi</b> BISMUTH	84 (209) <b>Po</b> POLONIUM	85 (210) <b>At</b> ASTATINE	86 (222) <b>Rn</b> RADON	
7	87 (223) <b>Fr</b> FRANCIUM	88 (226) <b>Ra</b> RADIUM	89-103 <b>Ac-Lr</b> Actinide	104 (261) <b>Rf</b> RUTHERFORDIUM	105 (262) <b>Db</b> DUBNIUM	106 (266) <b>Sg</b> SEABORGIUM	107 (264) <b>Bh</b> BOHRIUM	108 (277) <b>Hs</b> HASSIUM	109 (268) <b>Mt</b> MEITNERIUM	110 (281) <b>Uun</b> UNUNNIUM	111 (272) <b>Uuu</b> UNUNUNIUM	112 (285) <b>Uub</b> UNUBIUM	114 (289) <b>Uuq</b> UNUNQUADIUM						

**LANTHANIDE**

57 138.91 <b>La</b> LANTHANIUM	58 140.12 <b>Ce</b> CERIUM	59 140.91 <b>Pr</b> PRASEODYMIUM	60 144.24 <b>Nd</b> NEODYMIUM	61 (145) <b>Pm</b> PROMETHIUM	62 150.36 <b>Sm</b> SAMARIUM	63 151.96 <b>Eu</b> EUROPIUM	64 157.25 <b>Gd</b> GADOLINIUM	65 158.93 <b>Tb</b> TERBIUM	66 162.50 <b>Dy</b> DYSPROSIUM	67 164.93 <b>Ho</b> HOLMIUM	68 167.26 <b>Er</b> ERBIUM	69 168.93 <b>Tm</b> THULIUM	70 173.04 <b>Yb</b> YTERBIUM	71 174.97 <b>Lu</b> LUTETIUM
--------------------------------------	----------------------------------	--	-------------------------------------	-------------------------------------	------------------------------------	------------------------------------	--------------------------------------	-----------------------------------	--------------------------------------	-----------------------------------	----------------------------------	-----------------------------------	------------------------------------	------------------------------------

**ACTINIDE**

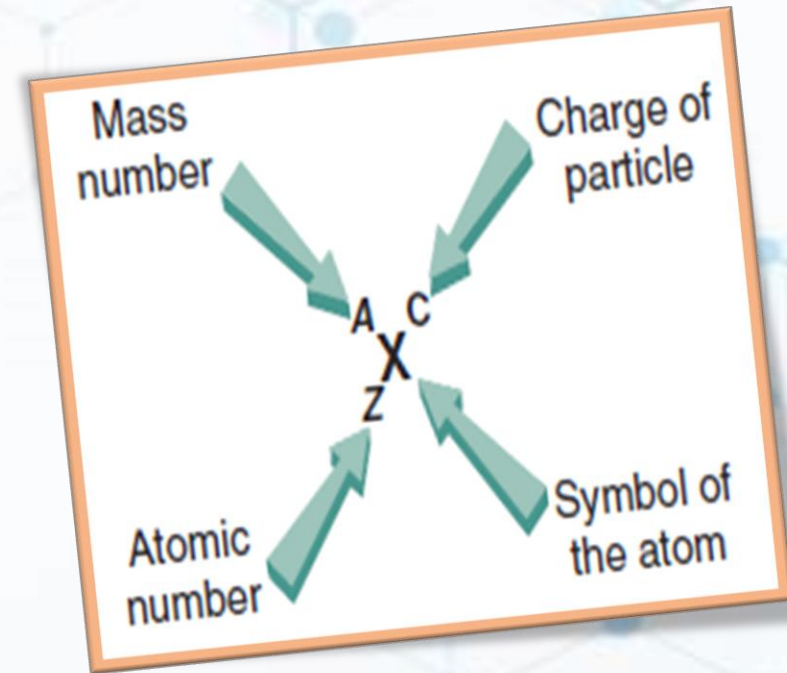
89 (227) <b>Ac</b> ACTINIUM	90 232.04 <b>Th</b> THORIUM	91 231.04 <b>Pa</b> PROTACTINIUM	92 238.03 <b>U</b> URANIUM	93 (237) <b>Np</b> NEPTUNIUM	94 (244) <b>Pu</b> PLUTONIUM	95 (243) <b>Am</b> AMERICIUM	96 (247) <b>Cm</b> CURIUM	97 (247) <b>Bk</b> BERKELIUM	98 (251) <b>Cf</b> CALIFORNIUM	99 (252) <b>Es</b> EINSTEINIUM	100 (257) <b>Fm</b> FERMIUM	101 (258) <b>Md</b> MENDELEVIUM	102 (259) <b>No</b> NOBELIUM	103 (262) <b>Lr</b> LAWRENCIUM
-----------------------------------	-----------------------------------	--	----------------------------------	------------------------------------	------------------------------------	------------------------------------	---------------------------------	------------------------------------	--------------------------------------	--------------------------------------	-----------------------------------	---------------------------------------	------------------------------------	--------------------------------------

Copyright © 1999-2003 Edvoo (www.edvoo.com)



# Elements

- Each element is identified by two numbers: **Atomic number** and **Atomic weight (mass number)**.
- **Atomic number (Z):** is the number of protons in the nucleus of the atom.
- The number of protons (atomic number) determine the **identity of an element**.
- **Note:** Adding a **proton** to an **atom** makes a **new atom**.

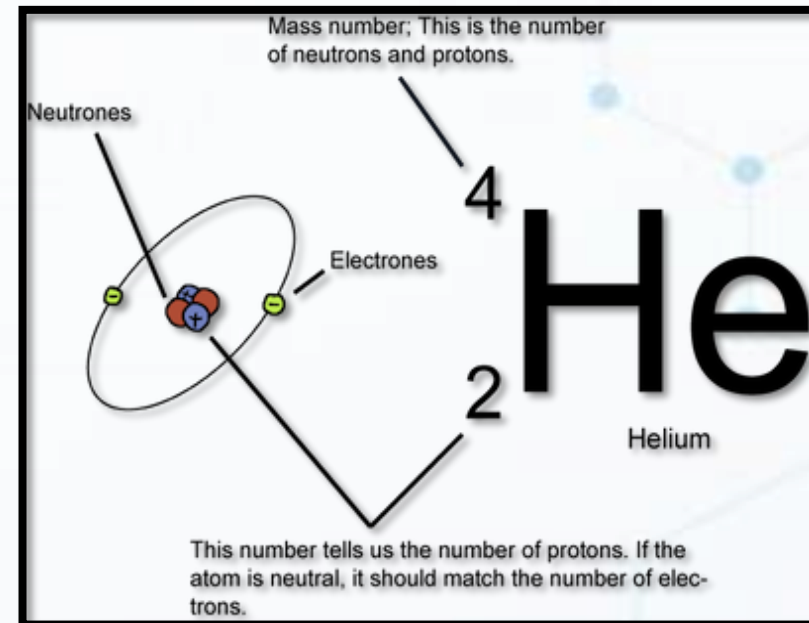
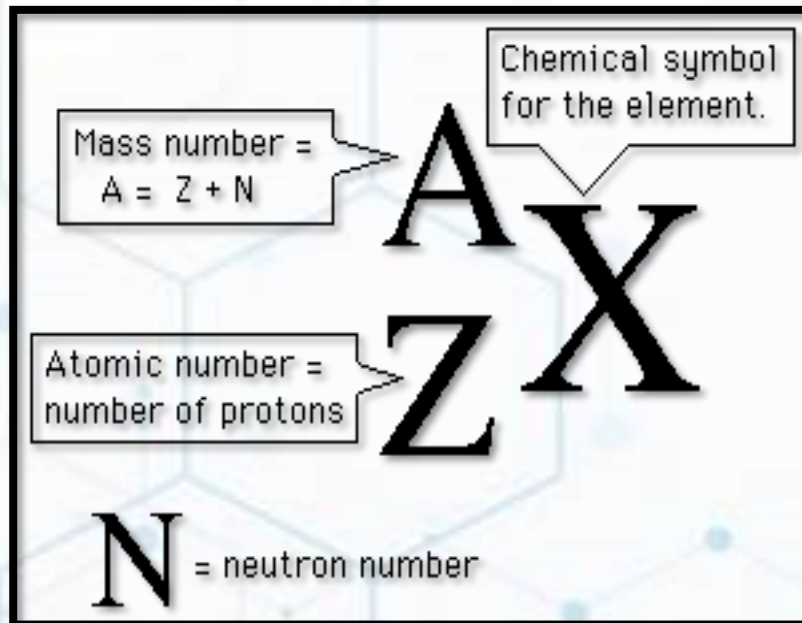


$$Z = \text{no. } P = \text{no. } E$$

# Elements

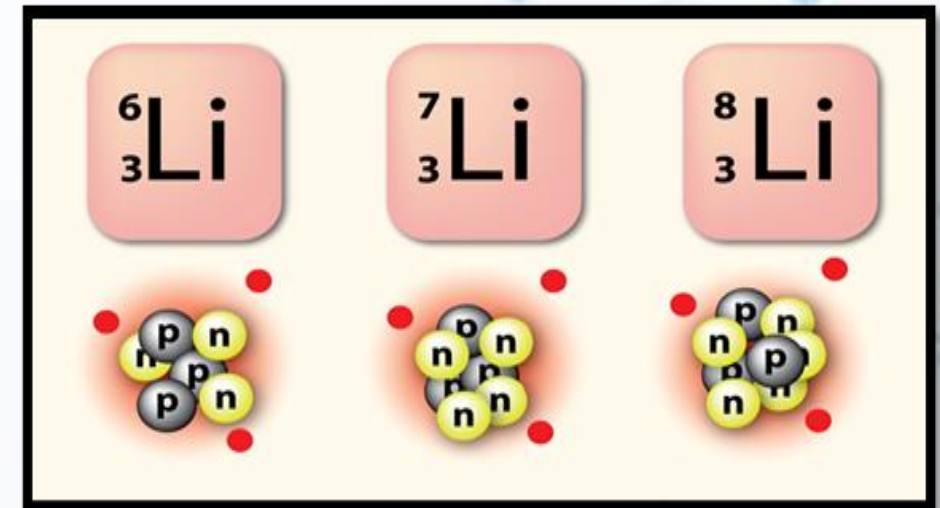
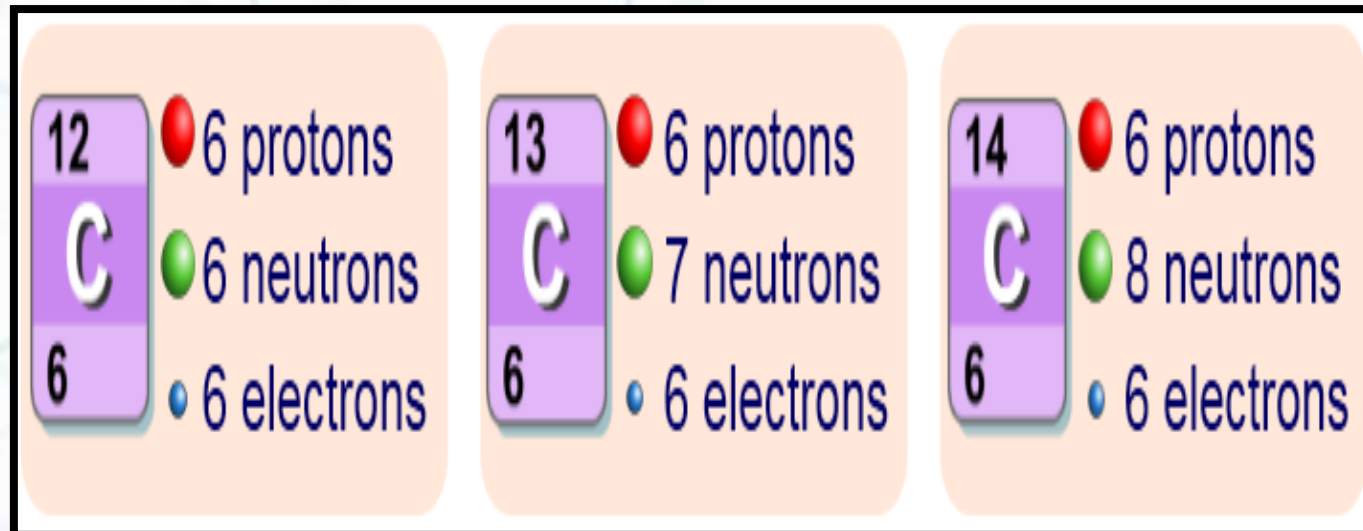
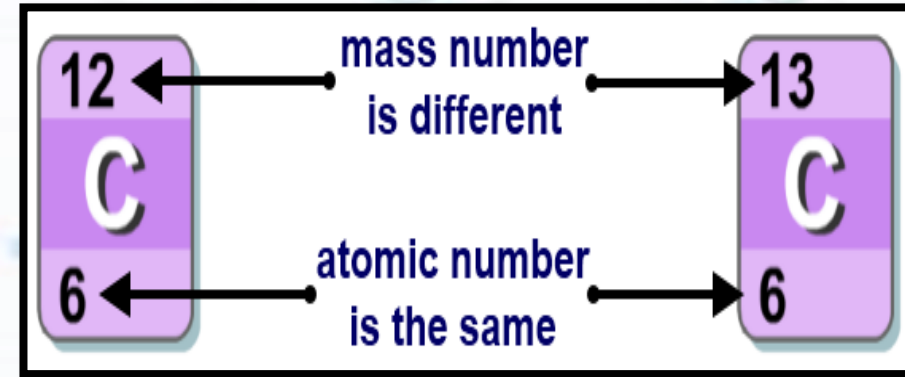
- **Mass number:** is the sum of protons and neutrons in the nucleus.

$$A = \text{no. } P + \text{no. } N$$



# Isotopes

- **Isotopes:** Atoms that have the **same number of protons** and **different number of neutrons**, (atoms with **same atomic number** and **different atomic weight**).

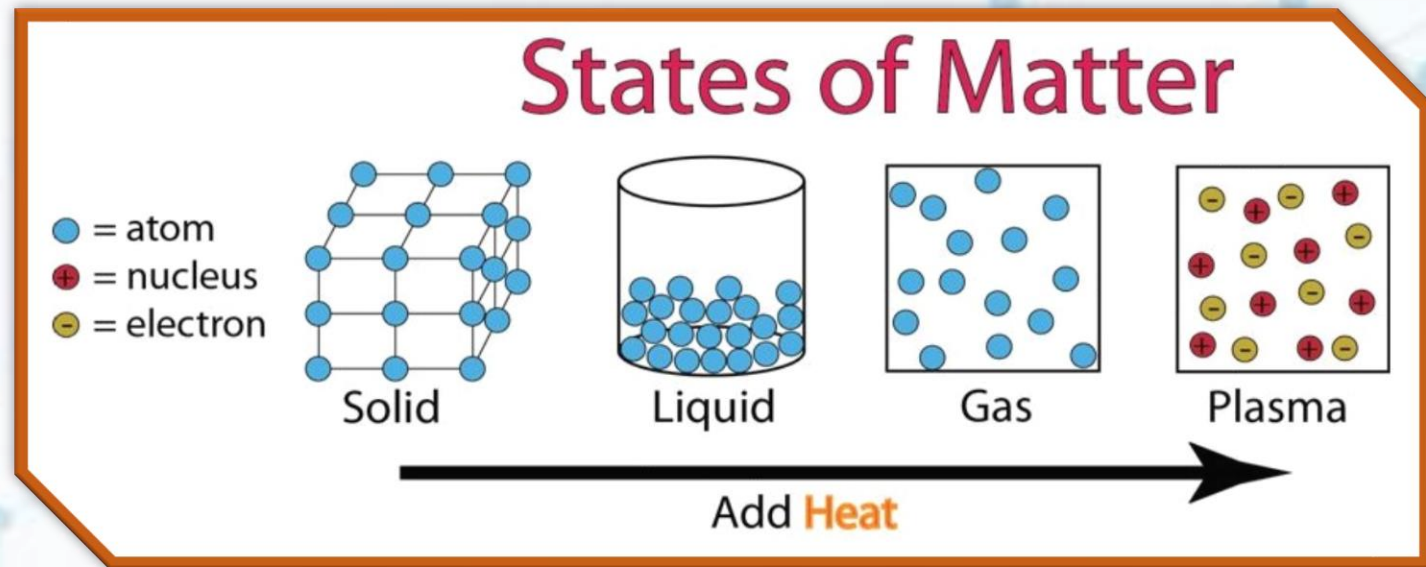




# Matter

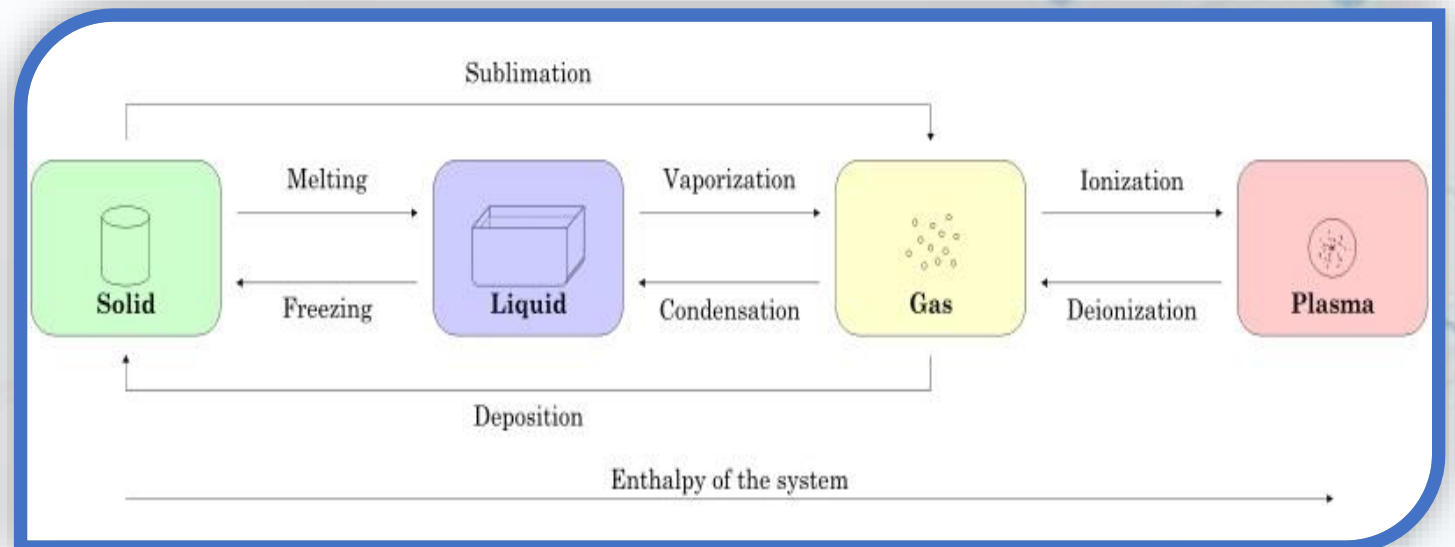
- **Matter:** Is anything that it can take place, or it is anything that has mass and volume.
- There are **four states of matter:**

- ✓ **Solid.**
- ✓ **Liquid.**
- ✓ **Gas.**
- ✓ **Plasma.**



# Matter

- ❑ **Solid:** a state of matter that has a **definite shape and volume**.
- ❑ **Liquid:** a state of matter that has **no definite shape but has a definite volume**.
- ❑ **Gas:** a state of matter that has **no definite shape or volume**.
- ❑ **Plasma:** a state of matter that are **gases** that have **so much energy** that **electrons** of an atom **cannot stay** in orbitals around one atomic nucleus. The atomic ions and free electrons mix around.



# Matter

➤ All **matter** classified to:

✓ Pure substance.

✓ Mixture.

➤ There are two types of a **pure substance**:

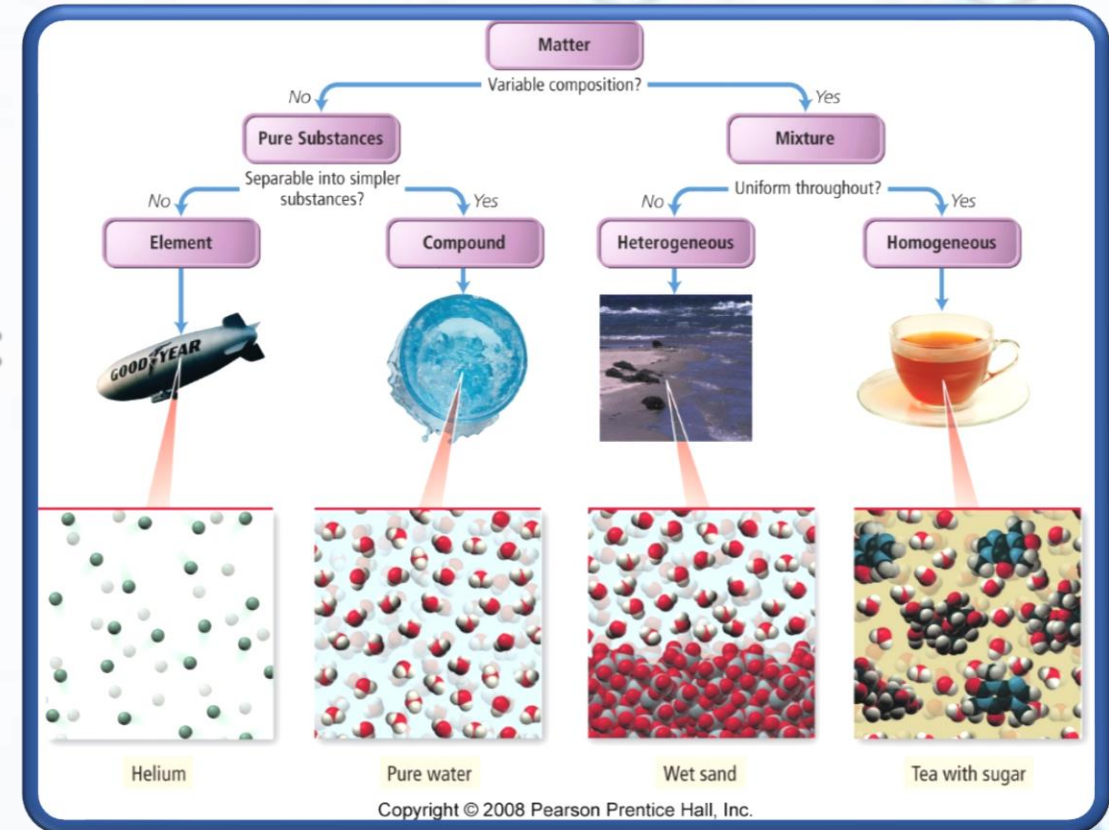
☐ Elements.

☐ Compounds.

➤ A **mixture** may be either:

❖ Homogenous mixture.

❖ Heterogeneous mixture.







Thank  
You