Introduction

Reference:

General Chemistry
Principles and Modern Applications TENTH EDITION,
Pearson Canada
Toronto

Matter-Its Properties and Measurement

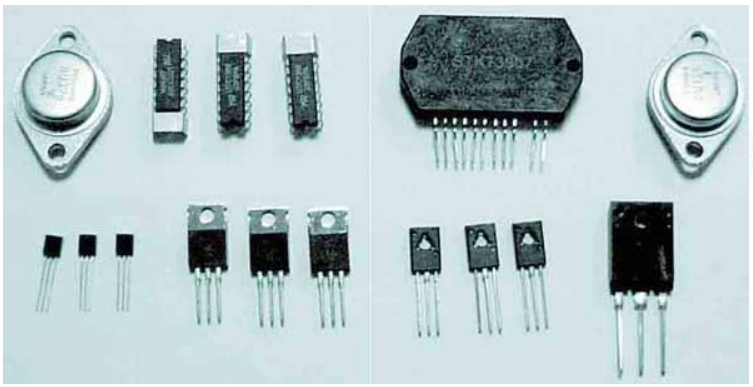
- The scope of Chemistry
- The Scientific Method
- Poperties of Matter
- Classification of Matter
- Measurement of Matter (SI Units)

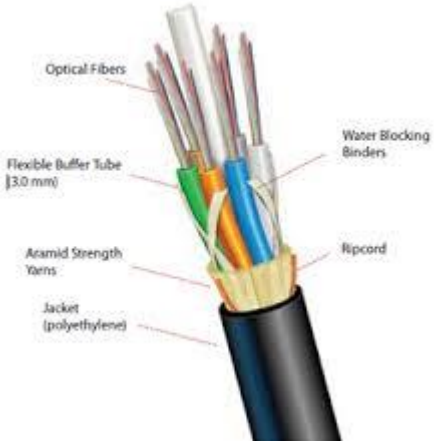
The Scope of Chemistry

- Everything is made up of chemicals, and much of what we do with things involve chemical reactions.
- The gasoline that fules our automobiles is a mixture of different chemicals. The burning of this mixture provides the energy that propels the automobile.

- Chemistry is sometimes called the “cental science” because it relates to many areas of human endeavor and curiosity.

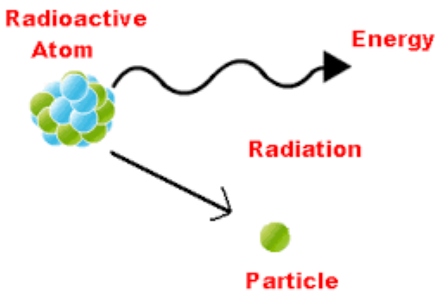
- Chemicals who develop new materials to improve electronic devices such as; solar cells, transistors, fiber optic cables work at the interfaces of chemistry with physics and engineering.





The Scientific Method

- Originated in 17th century with such people as Galileo, Francis Bacon, Isaac Newton.
- The scientific method is the combination of observations, experimentation and the formulations of laws, hypotheses and theories.
- Many discoveries (X-Ray, radioactivity, penicilin) have been made by accident.
- Such chance discoveries are referred to serendipity.



Properties of Matter

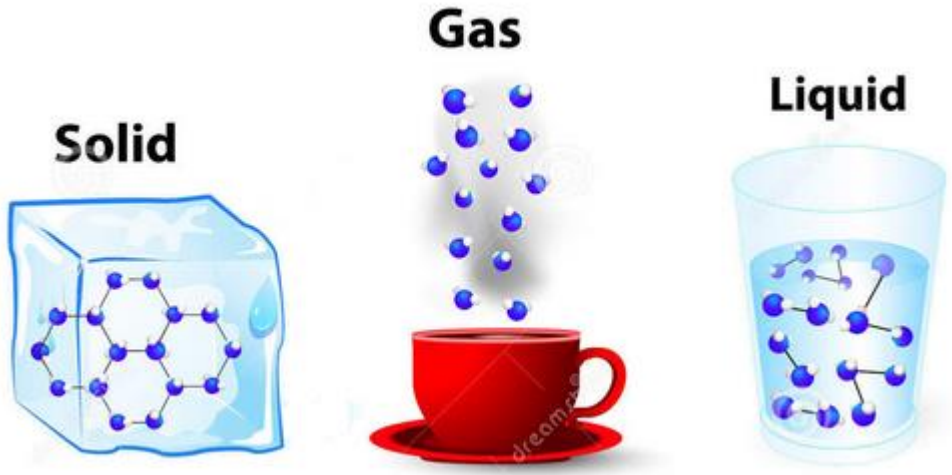
- Matter is anything that occupies space, displays a property known as mass and possesses inertia.
- Composition refers to the parts or components of a sample of matter and their relative proportions. Ordinary water is made up of two simpler substances ; hydrogen and oxygen.
- A chemist would say that the composition of water is 11.19% hydrogen and 88.81% oxygen by mass.

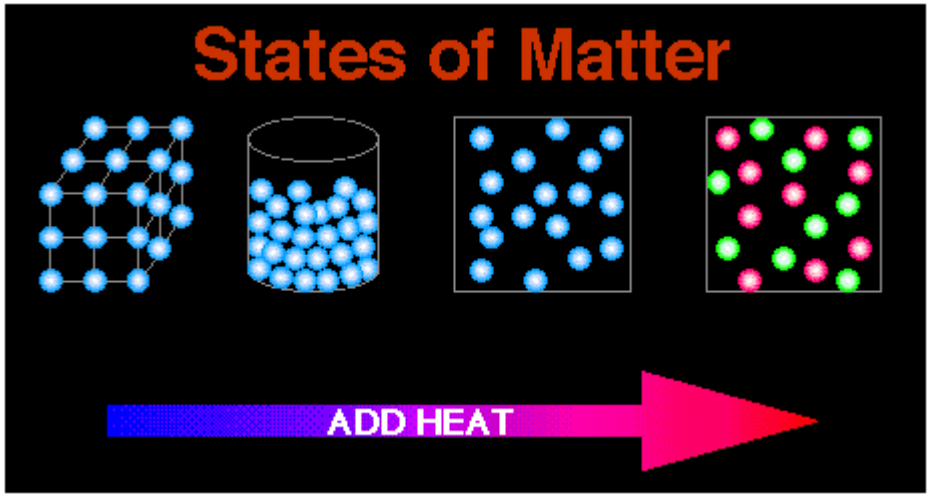
- Properties of matter are generally grouped into two broad categories: pyhsical and chemical.
- ***A physical property*** is one that a sample of mater displays without changing its composition. Copper can be hammered into thin sheet or foil.
- When liquid water freezes into solid water (ice), it certainly looks different in many ways it is different. But , it remains 11.19% hydrogen and 88.81% oxygen by mass.

- In a chemical change or chemical reaction, one or more samples of matter are converted to new samples with different compositions.
- The key to identifying chemical change, then, comes in observing a change in composition.
- The burning of paper involves a chemical change. Paper is a complex material, but its principal components are carbon, hydrogen and oxygen.
- The chief products of the combustion are two gases, carbon dioxide and water as stream.

Classification of Matter

- Matter is built up from very tiny unıts called atoms.
- A chemical element is a substance made up of only a single type of atom (118 known elements)
- Chemical compounds are substances in which atoms of different elements are combined with one another. (millions of different chemical compunds)
- A molecule is the smallest entitiy having the same proportions of the constituent atoms.
- Homegeneous mixtures are uniform in compositions and properties throughout a given sample, but the composition and properties may vary from one sample to another. (Seawater, cane sugar in water)


Gas
Solid
Liquid


States of Matter
ADD HEAT

Measurement of Matter : SI Units

Table 1.3.1: Commonly used physical quantities and units in SI

Physical quantity	Name of SI unit	Symbol
Length	metre	m
Area	square metre	m^2
Volume	cubic metre	m^3
Time	second	s
Velocity	metres per second	ms^{-1}
Acceleration	metres per square second	ms^{-2}
Concentration	moles per cubic metre	$mol\,m^{-3}$
Density	kilograms per cubic metre	$kg\,m^{-3}$
Temperature	kelvin	K
Pressure	pascal	Pa
Electric charge	coulomb	C
Electric current	ampere	A
Electric potential difference	volt	V
Electric field strength	volts per metre	$V\,m^{-1}$
Electric resistance	ohm	Ω
Electric capacitance	farad	F
Wavelength	metre	m

SI PREFIXES

Multiple or Submultiple	Prefix	Symbol
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto	h
10	deca	da
10^{-1}	deci	d
10^{-2}	centi	c
10^{-3}	milli	m
10^{-6}	micro	mu
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a