

Chapter 1

Chemistry: Study of Matter

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Chemistry

- Study of matter
- Matter is anything that has volume (occupies space) and has mass
- History of Chemistry:
 - Old name: alchemy but later became chemistry
 - Chemistry has always been around whether it was the iron age, bronze age, herbal medicine, discovery of antibiotics, discovery of new elements etc.
 - Chemistry was branched into Organic, Inorganic and Physical initially. Organic has to do with study of chemicals based on carbon, inorganic is everything but carbon, and physical chemistry studies the physical properties of substances.
 - Later chemistry branched out further into analytical (analysis of compounds or mixtures), biochemistry (works on the interface of chemistry and biology), nuclear chemistry (all about radioactivity) etc.
 - Links: [Chemical Heritage Foundation](#)

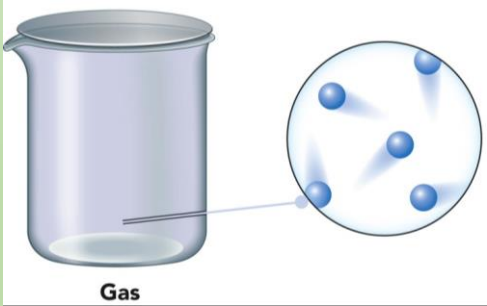
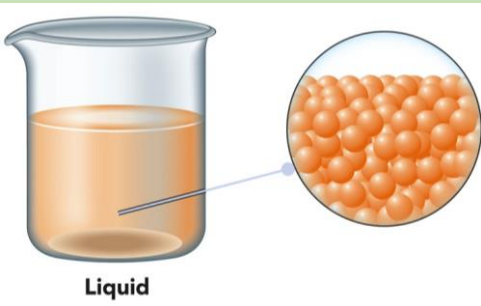
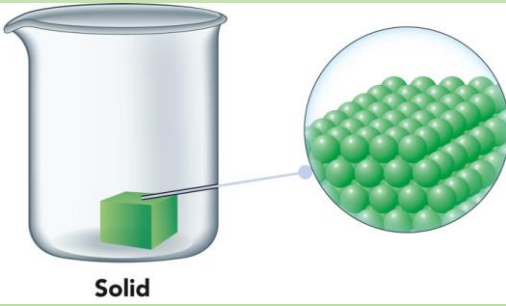
Scientific Method

- In order to do good science it is important to follow certain guidelines.
 - **Observation** – observe a phenomenon that needs further study.
 - **Hypothesis** – come up with an idea of what might be happening and what can be done to get results.
 - **Experimentation** – try out your ideas by designing experiments to prove your hypothesis. This is the longest part of scientific method. Experiments have to be verified by peers and be duplicated to make sure they work.
 - **Theory** – once the experiment proves the hypothesis then come up with a theory that explains your observation.
 - **Law** – if the theory stands the test of time then it becomes a law.

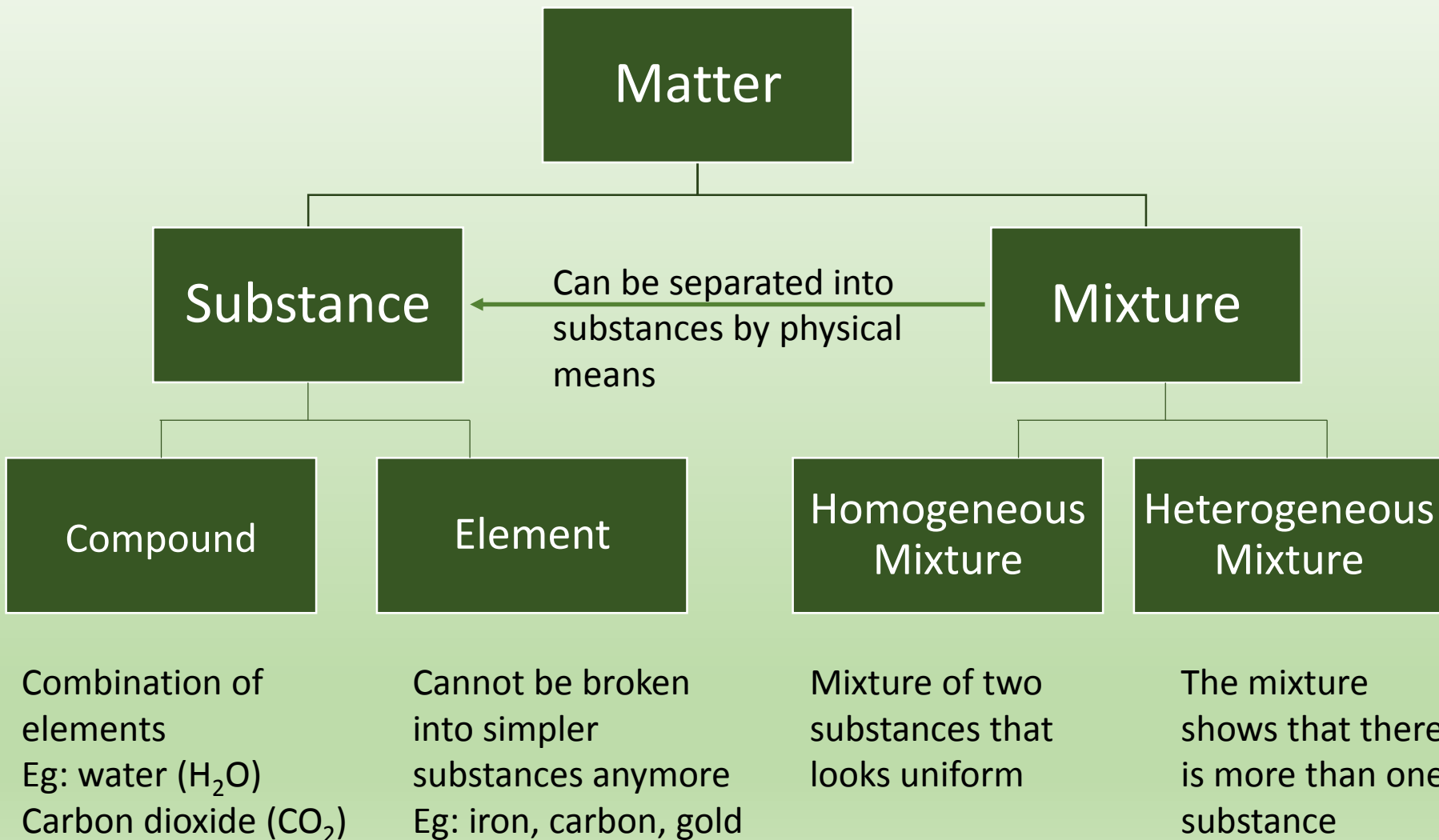
Theory and Laws can be challenged and changed in light of new information

Matter

Matter can be classified in three phases.

Gas	Liquid	Solid
Particles are far apart	Particles are closer	Particles are packed
Particles are always in motion	Particles are in motion but slower than gas	Particles are quite static
Gases take the shape of the container	Liquids take the shape of the container	Solids can be molded into shapes
 Gas	 Liquid	 Solid

Classification of Matter



Properties of Matter

Physical Property

Study of a property without changing its chemical identity.

E.g.: Physical state, Boiling point, Color

Chemical Property

How chemicals change on reaction with other chemicals.

E.g.: Ability to react with oxygen, Ability to react with fluorine

Changes of Matter

Physical Change

A change that does not change the chemical – and is usually reversible.

E.g.: melting, freezing

Chemical Change

Changes the chemical into something new. Usually reversible only be another chemical change.

E.g.: rusting, burning something in oxygen

Properties of Matter

- ***Quantitative***: expressed using *numbers*
- ***Qualitative***: expressed using *properties*
- ***Extensive property***: depends on amount of matter – e.g. mass, length
- ***Intensive property***: does not depend on amount – e.g. - density, temperature, color

Key Words/Concepts

- Scientific Method
- Matter
- Hetero and homogeneous mixtures
- Phases of matter: solid, liquid and gases
- Chemical and physical properties
- Chemical and physical change
- Intensive and extensive properties
- Qualitative and quantitative analysis