

# UNIT 1: FROM STRUCTURES TO PROPERTIES

## CLASSIFICATION OF MATTER

\*Properties of Matter: Chapter 2, pages 38 – 52.

The Periodic Table: Chapter 6.1 – 6.2, pages 154 - 169

# UNIT 1: LEARNING TARGETS

I can...

- define and classify matter according to its composition (pure substances or mixtures).
- define and distinguish between, chemical and physical properties.
- define and classify matter as elements and compounds, and as heterogeneous mixtures and solutions.
- use the periodic law as illustrated by the periodic table to identify and distinguish metals and non-metals, periods and groups, representative and transition elements, and families.
- describe the factors which contribute to the unique position of hydrogen on the periodic table.
- identify the elements that are most prevalent in living systems.
- research ingredients and additives in consumer products.
- identify consumer products and investigate the claims made by companies about the products.

## CH. 2.1: PROPERTIES OF MATTER

- Matter is anything that: a) has mass, and b) takes up space
- Mass = a measure of the amount of “stuff” (or material) the object contains (don’t confuse this with weight, a measure of gravity)
- Volume = a measure of the space occupied by the object

# DESCRIBING MATTER

- Properties used to describe matter can be classified as:
  - 1) Extensive – depends on the *amount* of matter in the sample
    - Mass, volume, calories are examples
  - 2) Intensive – depends on the *type* of matter, not the amount present
    - Hardness, Density, Boiling Point

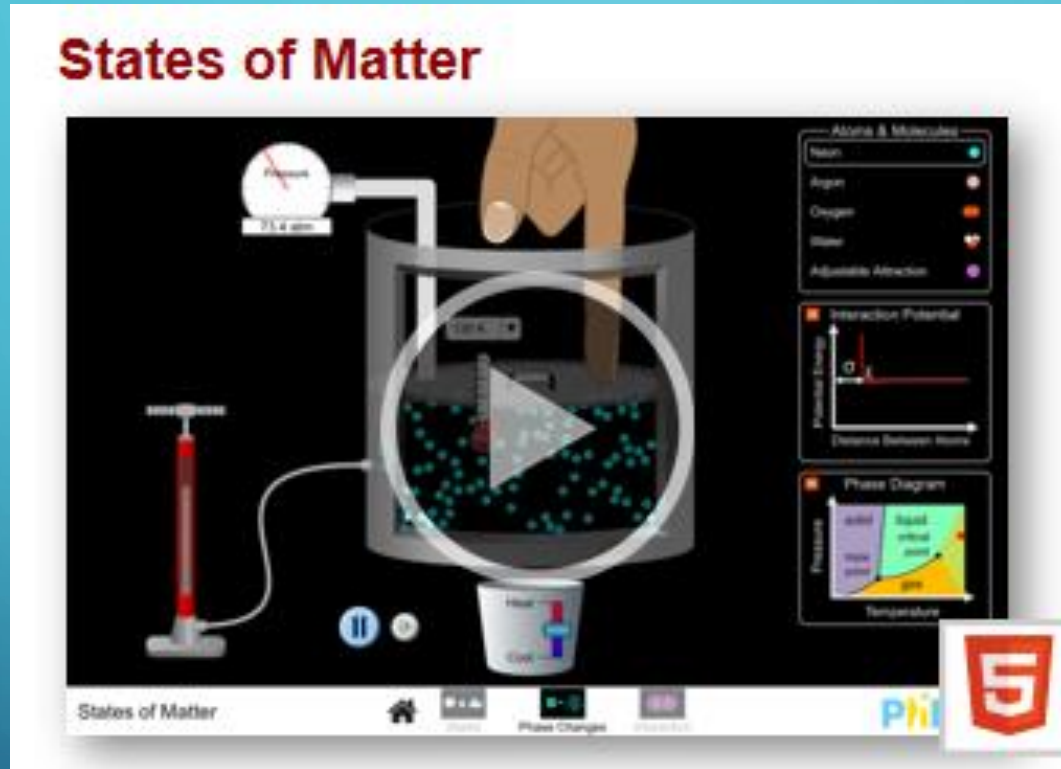
# PROPERTIES ARE...

- Physical Properties- a property that can be observed and measured without changing the material's composition.
- Examples- color, hardness, m.p., b.p.
- Chemical Properties- a property that can only be observed by changing the composition of the material.
- Examples- ability to burn, decompose, ferment, react with, etc.

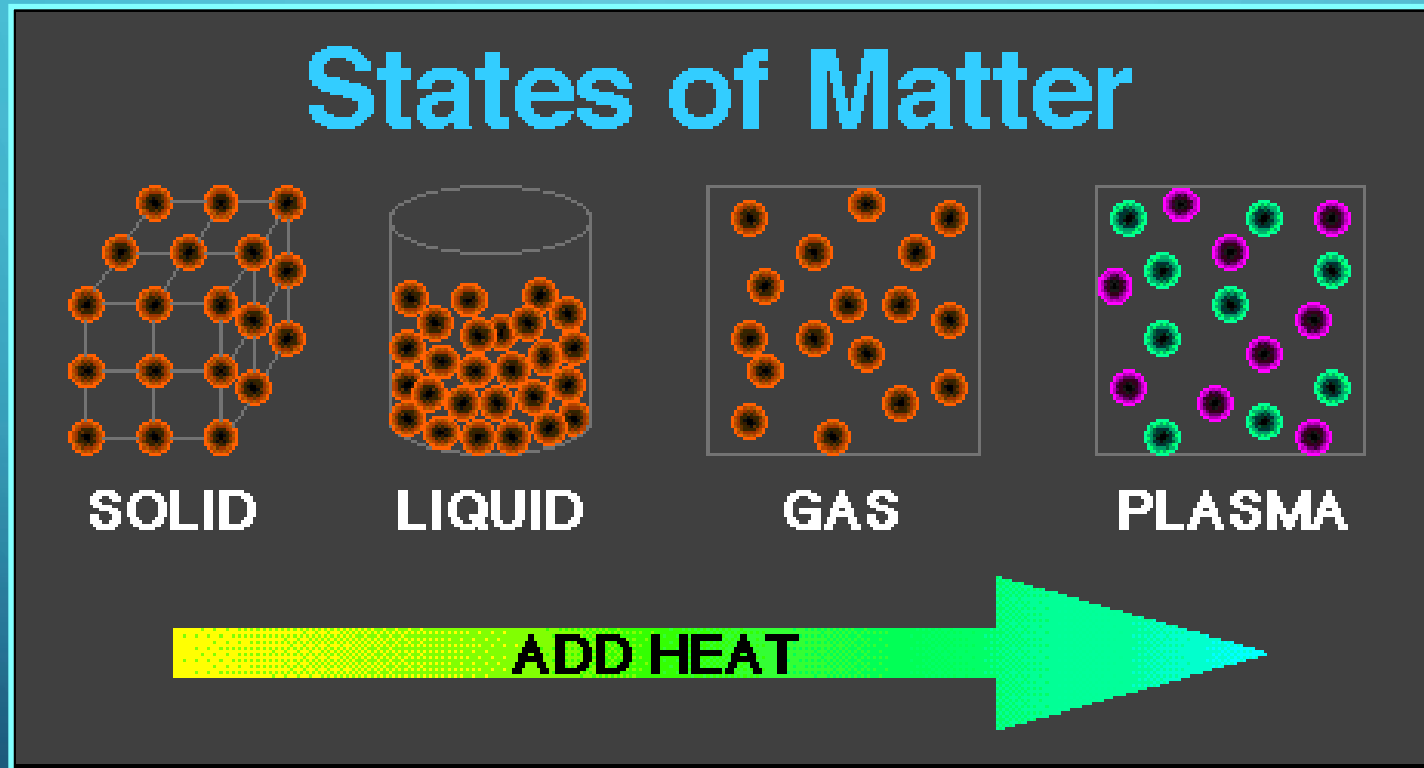
# STATES OF MATTER

- 1) Solid- matter that can not flow (definite shape) and has definite volume.
- 2) Liquid- definite volume but takes the shape of its container (flows).
- 3) Gas- a substance without definite volume or shape and can flow.
  - Vapor- a substance that is currently a gas, but normally is a liquid or solid at room temperature. (Which is correct: “water gas”, or “water vapor”?)

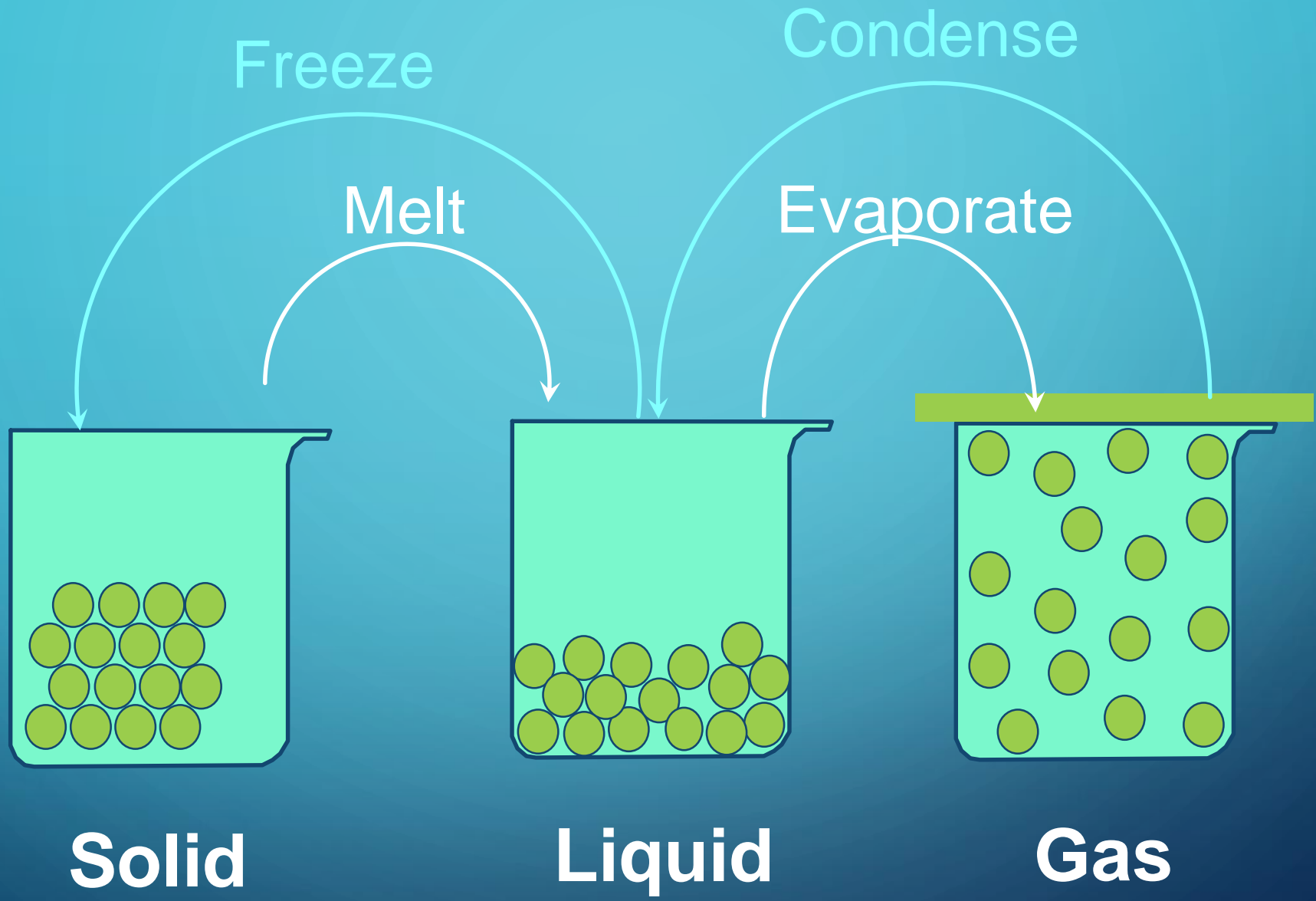
# STATES OF MATTER – SIMULATION



4<sup>TH</sup> STATE: **PLASMA** - FORMED AT HIGH TEMPERATURES; IONIZED PHASE OF MATTER AS FOUND IN THE SUN







**Solid**

**Liquid**

**Gas**

# PHYSICAL VS. CHEMICAL CHANGE

- Physical change will change the visible appearance, without changing the composition of the material.
  - Boil, melt, cut, bend, split, crack
- Can be **reversible**, or **irreversible**
- Chemical change - a change where a new form of matter is formed.
  - Rust, burn, decompose, ferment

# CHAPTER 2 GUIDED READING

- Work through questions 1 – 18.

## CH. 2.2: MIXTURES

- Mixtures are a physical blend of at least two substances; have variable composition. They can be either:
  - 1) Heterogeneous – the mixture is not uniform in composition
    - Chocolate chip cookie, gravel, soil.
  - 2) Homogeneous - same composition throughout; called “solutions”
    - Kool-aid, air, salt water
- Every part keeps it's own properties.

# SOLUTIONS ARE HOMOGENEOUS MIXTURES

- Mixed molecule by molecule, thus too small to see the different parts.
- Can occur between any state of matter: gas in gas; liquid in gas; gas in liquid; solid in liquid; solid in solid (alloys), etc.
- Thus, based on the distribution of their components, mixtures are called homogeneous or heterogeneous.

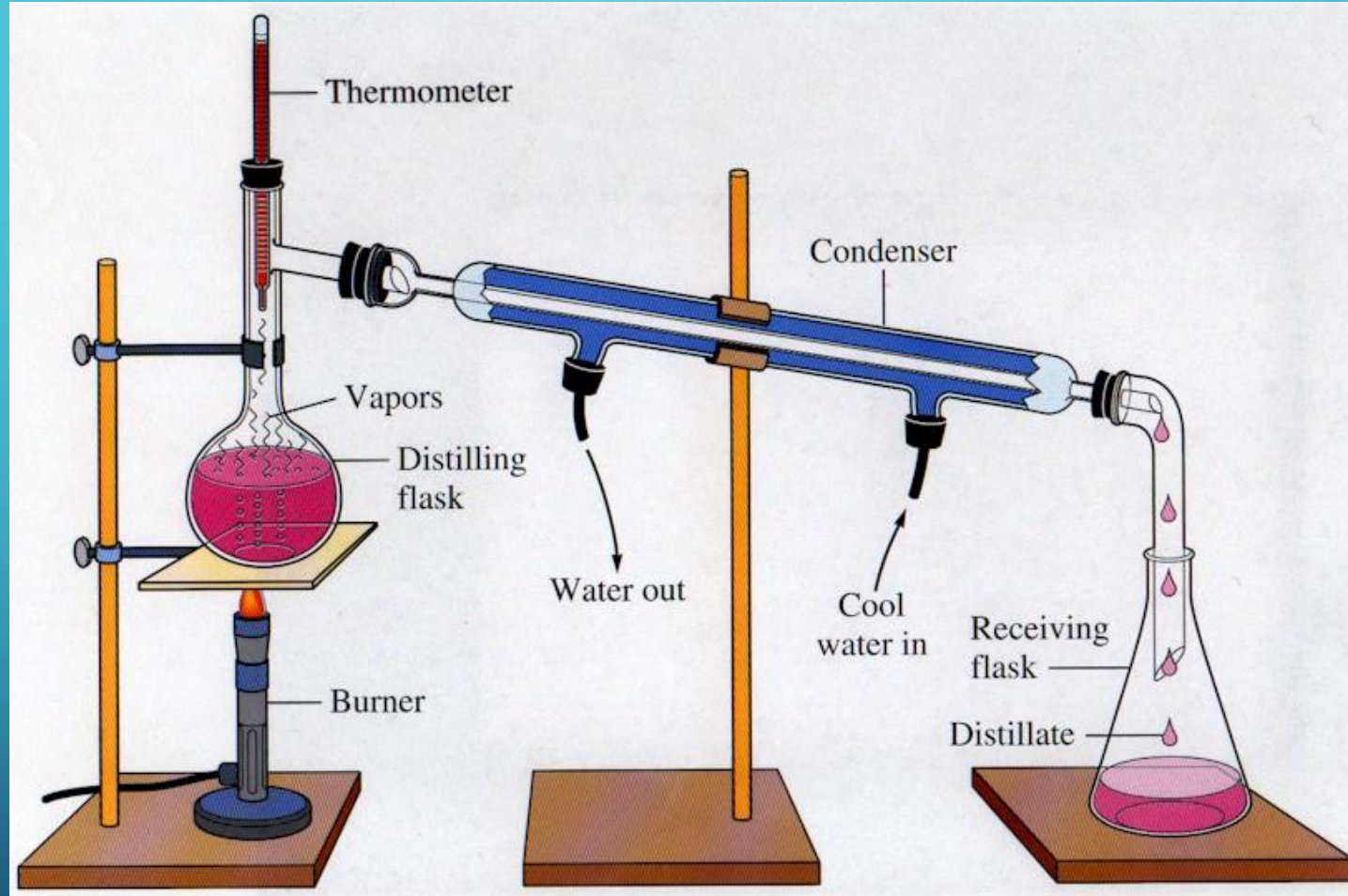
# PHASE

- The term “phase” is used to describe any part of a sample with uniform composition of properties.
- A homogeneous mixture consists of a single phase.
- A heterogeneous mixture consists of two or more phases.
- Note Figure 2.6, page 45

# SEPARATING MIXTURES

- Some can be separated easily by physical means: rocks and marbles, iron filings and sulfur (use magnet)
- Differences in physical properties can be used to separate mixtures.
- Filtration - separates a solid from the liquid in a heterogeneous mixture (by size) – Figure 2.7, page 46

# SEPARATION OF A MIXTURE





# CHAPTER 2 WORKSHEETS

- Section 2.2 #s 1 - 19

## CH. 2.3 ELEMENTS AND COMPOUNDS

**Substances** are either:

- a) elements, or
- b) compounds

# SUBSTANCES: ELEMENT OR COMPOUND

- Elements- simplest kind of matter
  - cannot be broken down any simpler and still have properties of that element!
  - all one kind of atom.
- Compounds are substances that can be broken down only by chemical methods
  - when broken down, the pieces have completely different properties than the original compound.
  - made of two or more atoms, chemically combined (not just a physical blend!)

# COMPOUND VS. MIXTURE

Compound	Mixture
Made of one kind of material	Made of more than one kind of material
Made by a chemical change	Made by a physical change
Definite composition	Variable composition

# ELEMENTS VS. COMPOUNDS

- Compounds can be broken down into simpler substances by chemical means, but elements cannot.
- A “*chemical change*” is a change that produces matter with a different composition than the original matter.
- $\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow \text{NaCH}_3\text{COO} + \text{CO}_2 + \text{H}_2\text{O}$

# CHEMICAL CHANGE

- A change in which one or more substances are converted into different substances.

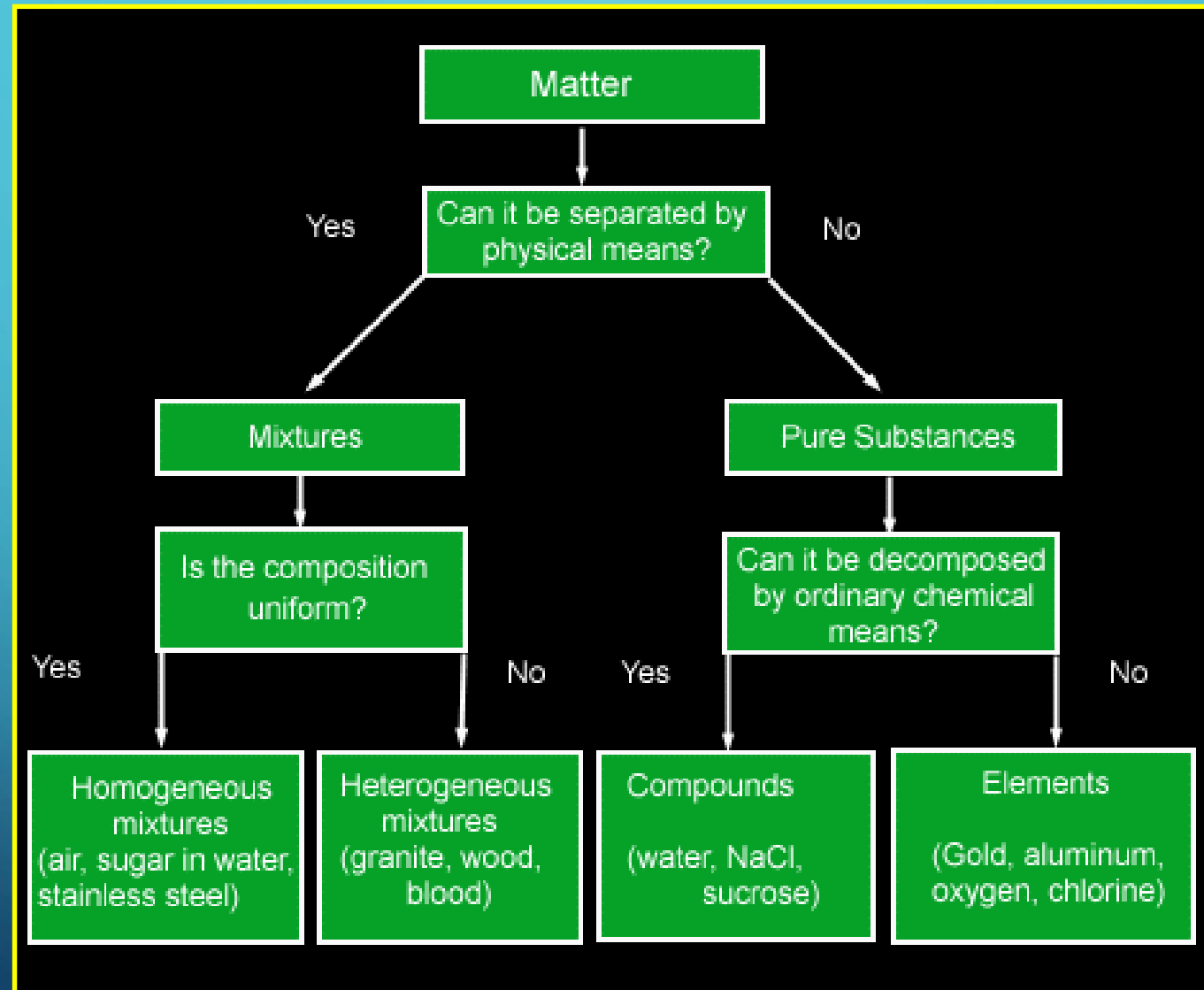


*Heat* and *light* are often evidence of a chemical change.

# PROPERTIES OF COMPOUNDS

- Quite different properties than their component elements.
- Due to a **CHEMICAL CHANGE**, the resulting compound has new and different properties:
  - Table sugar – carbon, hydrogen, oxygen
  - Sodium chloride – sodium, chlorine
  - Water – hydrogen, oxygen

# CLASSIFICATION OF MATTER





# SYMBOLS & FORMULAS

- Currently, there are **118** elements
- Elements have a 1 or two letter symbol, and compounds have a **formula**.
- An element's first letter always capitalized; if there is a second letter, it is written lowercase: B, Ba, C, Ca, H, He

# CHAPTER 2 WORKSHEET

- Section 2.3 #s 1 - 13

# CLASSIFICATION OF MATTER TEST REVIEW

Learning Target	Description	Pages	Questions
CMLT1	define and classify matter according to its composition (pure substances or mixtures).	58-60	35, 49, 58
CMLT2	define and distinguish between, chemical and physical properties.	58-60	37, 41, 43, 64, 67
CMLT3	define and classify matter as elements and compounds, and as heterogeneous mixtures and solutions.	58-60	44, 46, 48
CMLT4	use the periodic law as illustrated by the periodic table to identify and distinguish metals and non-metals, periods and groups, representative and transition elements, and families.	181	24, 26 - 29