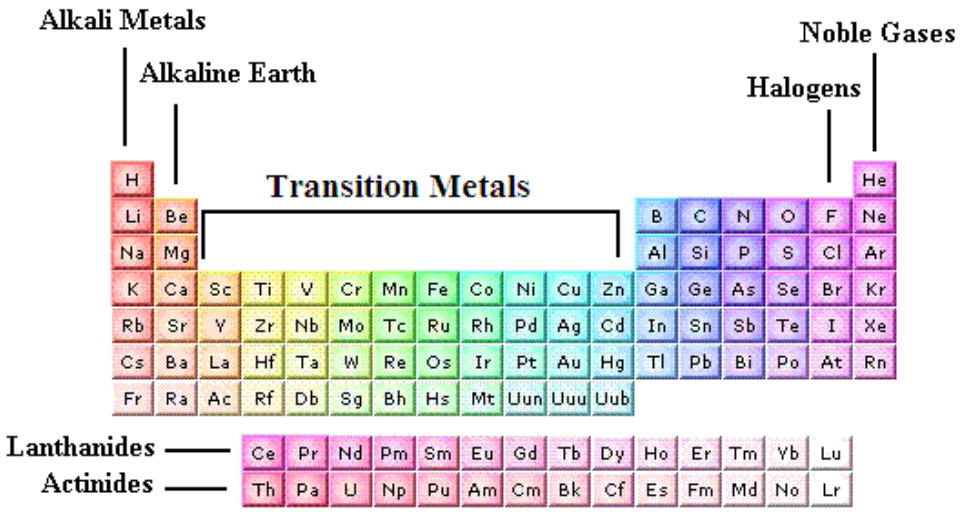
Unit 1 review slides

2016

What is matter?



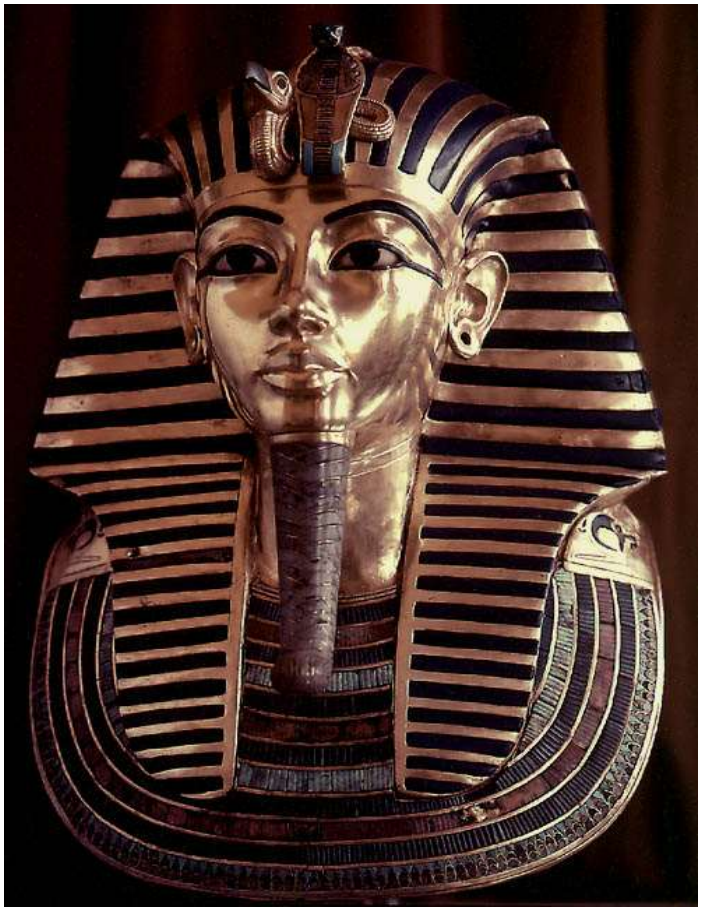
- Everything that has mass and volume is called matter
- Can be simple as in elements on the Periodic Table
- or complex molecules as atoms combine

Three Major Classes of Elements

- Metals- located on the left of the Periodic Table- most of the elements : Sodium , Calcium, Silver
- Non-Metals- located on the right of the Periodic Table: Oxygen, Neon, Chlorine
- Metalloids- on the zigzag line between Metals and Nonmetals- have properties that are skewed- ie…Silicon is conductive
- *You will have to memorize the symbol and element name for approximately 40 common elements*

Properties of Metals

- Metals are good conductors of heat and electricity
- Metals are malleable *(can be shaped)*
- Metals are ductile *(can be drawn into wires)*
- Metals have high tensile strength
- Metals have luster *(shiny)*



Properties of Nonmetals

Carbon, the graphite in "pencil lead" is a great example of a nonmetallic element.

- Nonmetals are poor conductors of heat and Electricity
- Nonmetals tend to be brittle
- Many nonmetals are gases at room temperature

Atoms Unite To Form Compounds

- Chemical Formula indicates number and type of atoms within the molecule The formula to the left is the molecule for indigo:

$C_{16}H_{10}N_2O_2$.

What type of atoms and how many are there in one molecule?

Characteristics of Pure Substances

- Fixed composition
- Cannot be separated into simpler substances by physical methods (physical changes)
- Can only be changed in identity and properties by chemical methods
- Properties do not vary- Unique Density, Constant Boiling and Melting Points

What is a pure substance?

Elements

- Cannot be decomposed into simpler substances by chemical changes

Compounds

- Chemically joined elements- Can be decomposed into simpler substances by chemical changes, always in a definite ratio

Characteristics of Mixtures

- Variable composition
- Components **retain** their characteristic properties
- **May be separated into pure substances by physical methods sifting, evaporation, magnetism, etc…**
- Mixtures of different compositions may have widely different properties
- Do NOT have definite boiling/melting points

Homogenous Mixtures

Homogenous mixtures look the same throughout but can be separated by physical means

Examples: salt water, soda

Indicators of Homogenous Mixtures

- Have the same composition throughout
- Components are indistinguishable
- Can exist between all phases of matter: air (gases) brass (alloy- blend of multiple metals -solids)

  soda (gas, solid, liquid)

Adding Liquids Together

- **Miscible-** will mix- water and alcohol

Homogeneous Mixture

- **Immiscible-** wont mix water and oil

Heterogeneous Mixture

What are solutions?

Solutions are homogenous mixtures that do not scatter light. These mixtures are created when something is completely dissolved in a solvent. Therefore, they are easily separated by distillation or evaporation. Appear in one phase of matter

Examples: sugar water, salt water

Parts of a solution

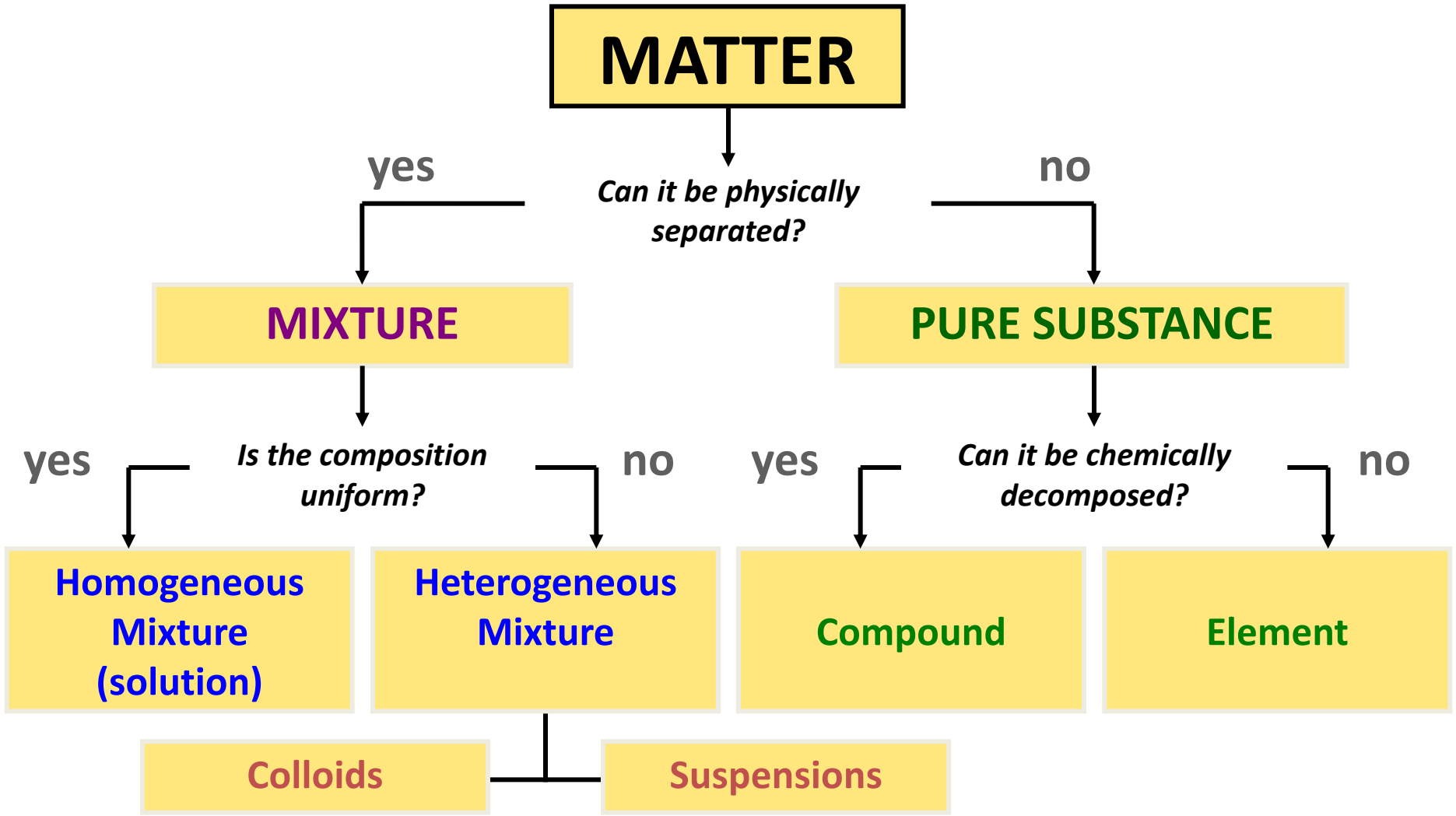
- Solvent- part that does the dissolving- water is our universal solvent
- Solute- part that was dissolved (salt)

Heterogenous Mixtures

Heterogeneous mixtures are composed of large pieces that are separated by physical means (ie. density, polarity, metallic properties, size).

Pond Water, Vegetable Soup- Suspensions Visible particles

Starch Water: invisible to the eye :colloid



Courtesy Christy Johannesson www.nisd.net/communicationsarts/pages/chem

<u>Physical Properties</u> – Observable traits of a material that may be measured without altering the substance

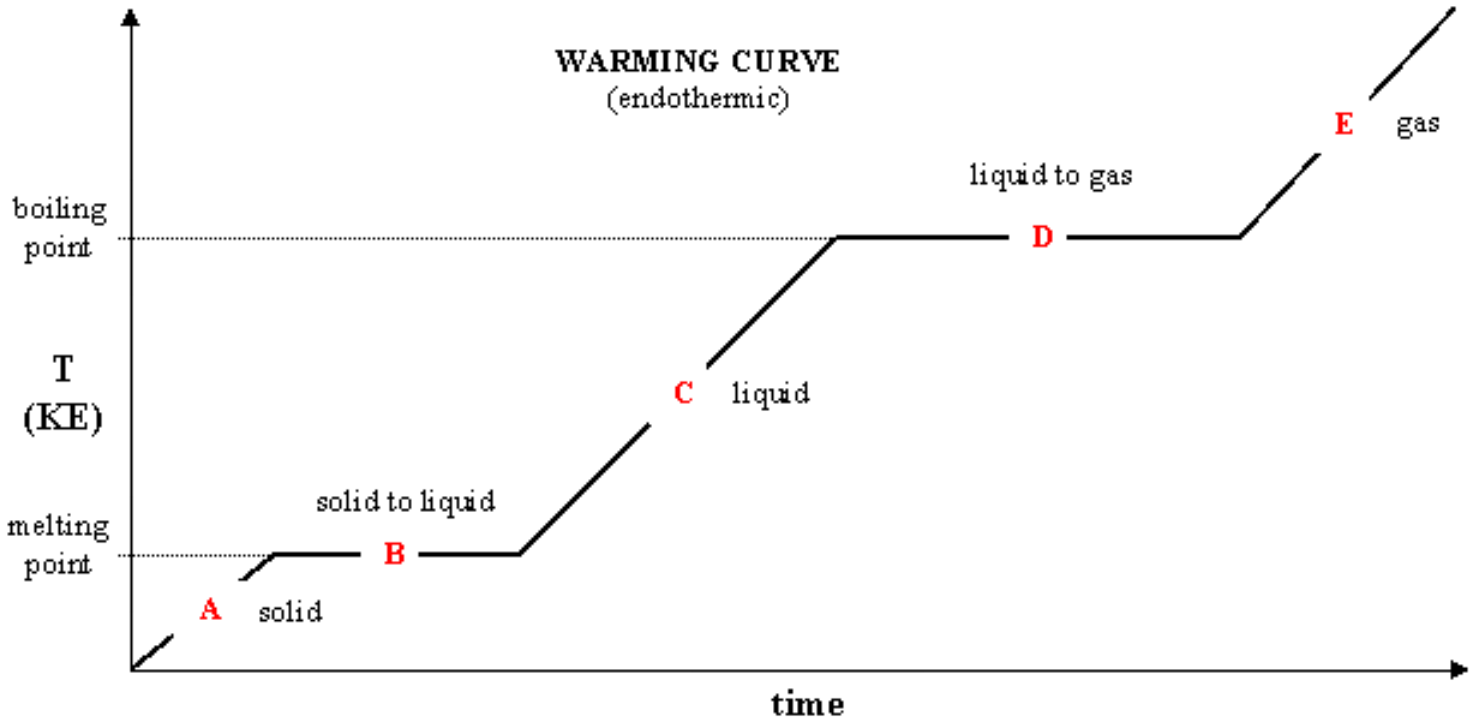
Examples: Mass, Color, Melting Point, Boiling Point, Density, Specific Heat

What is a physical change?

A physical change occurs when the substance changes state but does not change its chemical composition. It is not permanent and is reversible!

Example Phase Changes!

Do you notice what happens when phase change occurs?



What are chemical properties?

- Chemical properties describe the way a substance can change or react to form other substances.
- These properties, then, must be determined using a process that changes the identity of the substance of interest.

Indications of A Chemical Reaction

- Bubbles- gas given off
- Change in energy- becomes warm- exothermic

  becomes cool- endothermic

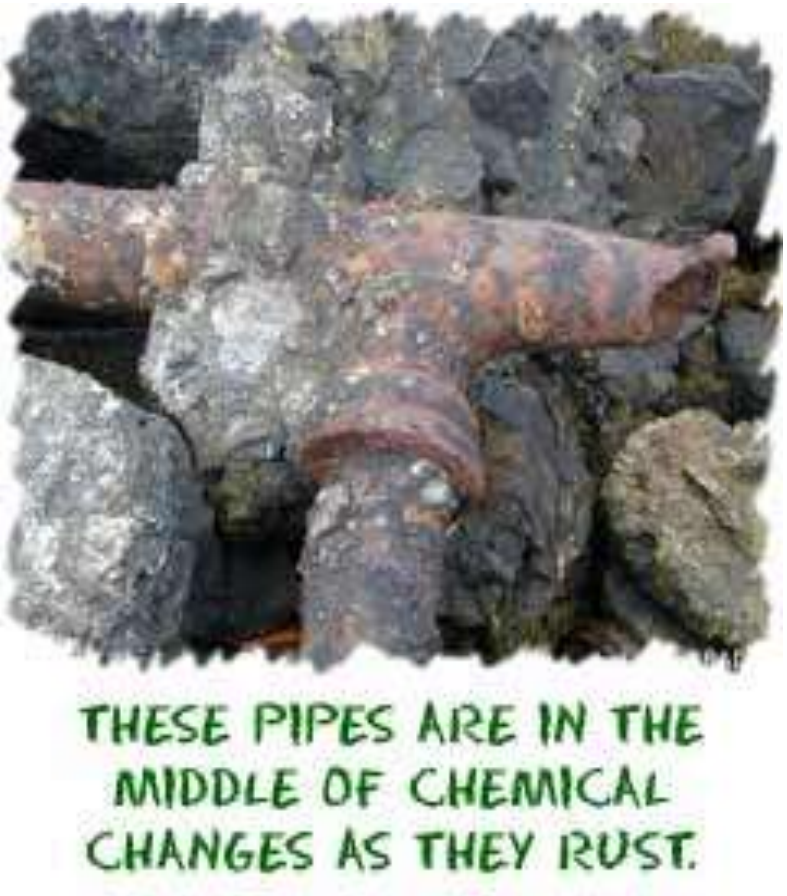
  light is given off
- A precipitate (solid) forms
- Sometimes a change in color-

Chemical Change-
an irreversible change that changes the identity and make up of the material

Examples:

Rusting

Burning



What are intensive properties?

- Intensive properties such as density, color, and boiling point do not depend on the size of the sample of matter and can be used to identify substances.
- What is *IN*side

What are extensive properties?

- Extensive properties such as mass and volume do depend on the quantity of the sample.
- How far EXtend

States of Matter

& The Kinetic Molecular Theory

- All matter is made of atom and molecules that act as tiny particles
- These particles are always in motion (yes even in solids)
- The higher the temperature the faster the particles move-
- Kinetic energy is directly proportional to Kelvin Temperature (bigger particles move slower)

Solids

- Have a definite shape
- Have a definite volume

Kinetic Molecular Theory

Molecules are held close together and there is very little movement between them. Vibrational motion.

HIGH attraction between particles

Liquids

- Have an indefinite shape
- Have a definite volume

Kinetic Molecular Theory:

Atoms and molecules have more space between them than a solid does, but less than a gas (ie. It is more "fluid".) Has 2 dimensional motion- can slide past each other- small attraction between particles

Gases

- Have an indefinite shape
- Have an indefinite volume

Kinetic Molecular Theory:

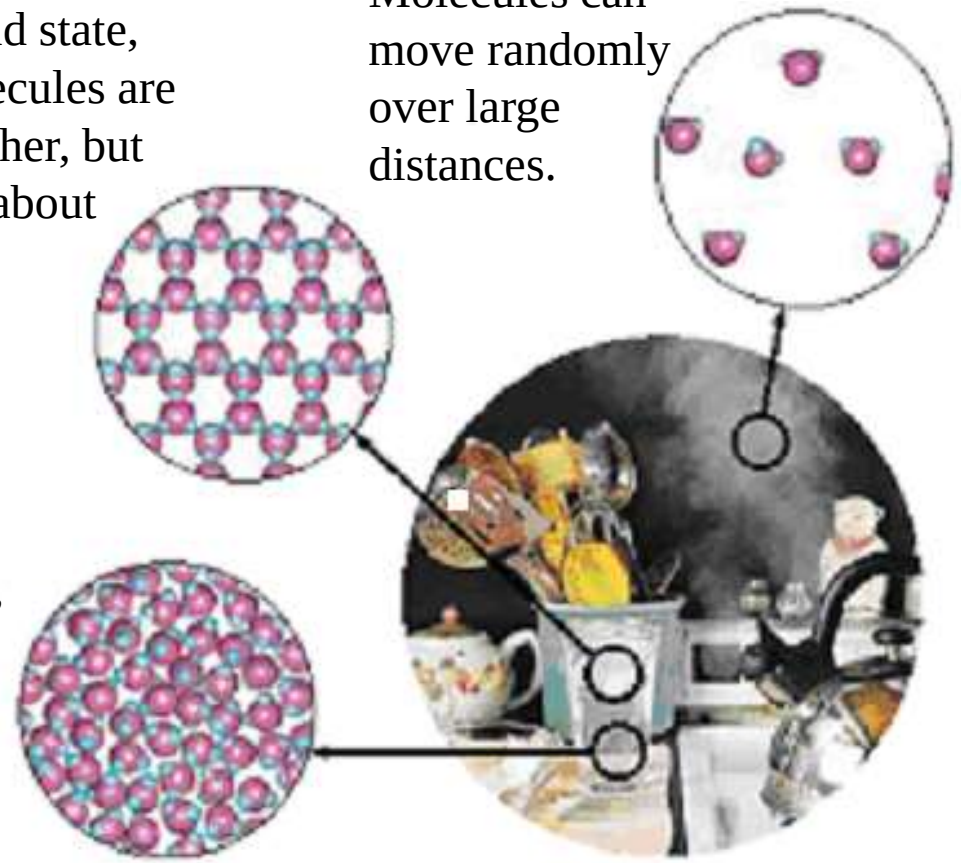
Molecules are moving in random patterns with varying amounts of distance between the particles.

VERY LITTLE attraction between particles

Kinetic Molecular Model of Water

At 100°C, water becomes water vapor, a gas. Molecules can move randomly over large distances.

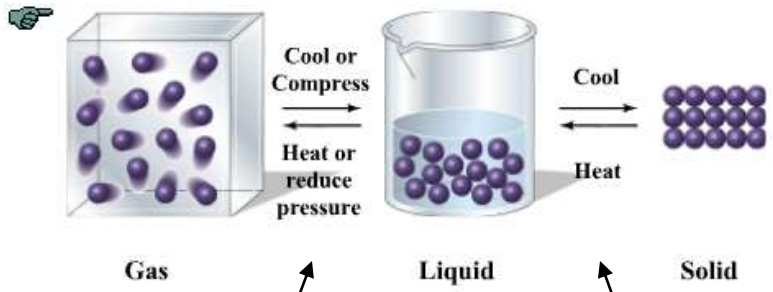
Between 0°C and 100 °C, water is a liquid. In the liquid state, water molecules are close together, but can move about freely.



Below 0°C, water solidifies to become ice. In the solid state, water molecules are held together in a rigid structure.

Changing States

Changing states requires energy in either the form of heat. Changing states may also be due to the change in pressure in a system.



Heat of formation, H_f. Heat of vaporization, H_v