

Physical Science Unit 3

Does changing matter
really matter?

Physical Changes

- Physical Changes
 - **Alters the phase or look of a substance but does not become something new**
 - Most physical properties stay the same
 - Usually reversible
- Can you think of any of these?

Physical Change Examples

- Ice cube melting on a table
(water → water)
- Crumbling a piece of paper
- Mixing ice cream and hot fudge.
- **Write down one of these in your example box!!**

Chemical Changes

- Chemical Changes
(aka: chemical reactions)
 - **A change in the make-up of a substance to produce a new material**
 - Cannot be reversed
 - Examples?
 - Burning paper
 - Rusting
 - Baking a Cake
 - Baking Soda & Vinegar
 - **Pick one of these to write in your example box!**



Burning Paper

How do you know?

- Physical changes are observed without changing the substance.
- Four clues of a chemical change
 - transfer of heat
 - Change in color
 - Production of gas
 - Formation of a precipitate (a solid that forms and settles out of a liquid mixture)



Practice Problem

- Identify the following as:
 - Physical change
 - Chemical change
- 1. Iron rusting
Chem. Change
- 2. Melting ice cube
Phys. Change
- 3. Firework exploding
Chem. Change
- 4. Salt dissolving
Phys. Change



- What are the three phases (or states) of matter?
- Which phase of matter is the most energetic? In other words, the particles are moving the fastest.
- In which state/phase of matter are the particles the least energetic?
- In which state/phase of matter do the particles spread apart and fill all the space available to them?

Phase Changes

- Phase Change
 - the reversible physical change that occurs when a substance changes from one phase of matter to another
- Six Types
 - Melting
 - Freezing
 - Vaporization/Evaporation
 - Condensation
 - Sublimation
 - Deposition

Melting

- The process in which a **solid changes into a liquid**
- **Solid gains energy (heat).**
 - molecules vibrate more quickly
 - When enough energy(heat) is present, all molecules can move and melting is complete
- Example?
 - Heating wax
 - Ice cube on a table



Freezing

- **When a liquid changes to a solid**
- **Liquid loses energy**
 - The space between the particles decreases
- Example?
 - Making ice cream
 - Water in the Freezer



Evaporation

- **A liquid changing into a gas**
- **Liquid gains energy (heat)**
 - Molecules have enough energy(heat) to overcome the attraction of neighboring molecules.
 - They rise to the surface and escape the liquid(steam).
- Example?
 - Water to Steam
 - Nail polish remover on a table



Condensation

- **Gas changes to a liquid**
- **Gas loses energy**
 - The space between the particles decreases.
- Example?
 - Dew
 - Water showing up on your mirror during a warm shower



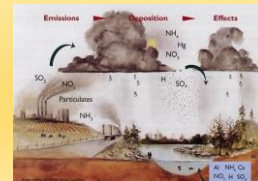
Sublimation

- When a solid changes directly to a gas
- Gaining Energy (Heat)
- Example?
 - Dry Ice

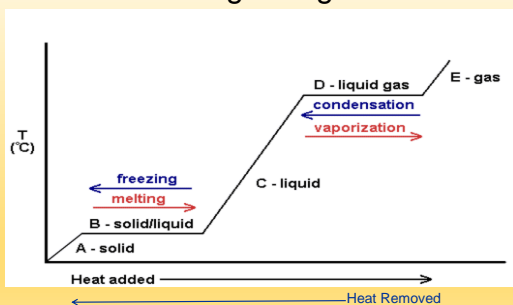


Deposition

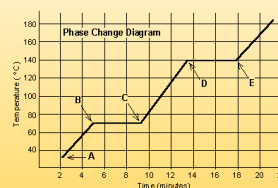
- When a gas changes directly into a solid, without going through the liquid state
- Losing Energy (Heat)
- Example?
 - Air Pollution



Phase Change Diagrams



Practice Problem



- Which letters represent phase changes? **BD**
- Which letters represent a state of matter? **ACE**

[Physical Properties]

- Characteristics we observe without changing the makeup of the substance.
- Important ones:
 - Appearance, melting and boiling point, density, heat and electrical conductivity, solubility
 - Physical state under normal conditions.

[Chemical Properties]

- Characteristic of a pure substance that describes its ability to change into a different substance.
ex) Sodium (Na) reacts with H_2O to produce Hydrogen gas ($H_{2(g)}$)

The periodic table is organized by the elements' chemical properties.

Elements, Compounds, and Mixtures

- Element
 - The simplest form of matter that has a unique set of properties
 - Examples?
 - Can only be broken down by nuclear reactions



Classifying Matter - Compounds

- The next type of matter is a compound.
 - Compounds are two or more elements chemically bonded together.
 - Compounds can only be separated by chemical reactions.

Classifying Matter - Compounds



Classifying Matter- Mixtures

- Mixtures
 - When substances *physically* combine
 - Examples:
 - Cinnamon and sugar, French fries and ketchup



Classifying Matter- Mixtures

- 2 kinds of Mixtures:
 - Heterogeneous
 - A mixture in which the parts can be seen
 - Looks different throughout
 - Homogeneous
 - A mixture in which the parts can NOT be seen
 - Looks the same throughout
 - AKA- solutions



Separating Homogeneous Mixtures

- Homogeneous mixtures can only be separated by their physical properties.



Flour and Baking Soda



Bronze = Copper and Zinc

Separating Heterogeneous Mixtures

- Heterogeneous mixtures can be separated by sight.



Practice Problem

- Identify the following as:
 - 1. Beef and Vegetable Soup
Het. Mixture
 - 2. Calcium chloride
Compound
 - 3. Krypton
Element
 - 4. Chocolate milk (well stirred)
Hom. Mixture
- Element
- Compound
- Heterogeneous mixture
- Homogeneous mixture

Classifying Matter – Solutions

- A homogeneous mixture with very small particles in a liquid is called a Solution.
- Examples?
- Solutions can be separated by boiling point.



Solutions

- A solution is when one substance dissolves into another.
 - Example: sugar water
- There are two main parts of a solution:
 - SOLUTE= the dissolved material
 - Example: sugar, salt
 - SOLVENT= the substance that is doing the dissolving (usually a liquid)
 - Example: Water, ethanol

Supersaturated in Slow Motion



Solutions

- Solubility – Dissolvability – how easy it is to dissolve something.
- Saturated – Full
 - A saturated sponge is FULL of water, it can't hold any more.
 - A saturated solution is full of solute, it can't hold any more.

Solution Concentrations

- Unsaturated solution
 - Add more solute and it will dissolve
- Saturated solution
 - Add more solute and it will fall to the bottom
- Supersaturated solution
 - Add more solute and it fills the container with crystals



Classifying Matter - Suspension

- We classify mixtures in a liquid, a little differently.
- A heterogeneous mixture with big particles in a liquid is called a Suspension.
- Suspensions can be separated by settling.



Classifying Matter - Colloid

- A homogeneous mixture with small particles in a liquid is called a Colloid.
- Colloids can also be separated by settling.

