**Chapter 2 – Classifying Matter (Pages 36-64)**

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***Section 2.1 – Classifying Matter(pages 38-44)***

*Key Concepts:*

* Why are elements and compounds classified as pure substances?
* How do mixtures differ from pure substances?
* What is the main difference among solutions, suspensions, and colloids?

*Vocabulary:*

1. Pure substance
2. Element
3. Atom
4. Compound
5. Heterogeneous mixture
6. Homogeneous mixture
7. Solution
8. Suspension
9. Colloid

*In need of volunteers:*

* Each piece of clothing has a care label, which lists recommended cleaning methods for the clothing.
* If you can locate your shirts label (appropriately, of course!), read it and identify what material your shirt is made of and the specific care instructions.
* Why is it necessary to put care instructions on a label?

*Composition*

* Cotton, wool, polyester, nylon, etc. all have different properties requiring different care instructions.
* Based upon their composition (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_), materials can be divided into two categories: pure substances and mixtures.

*Pure Substances*

* **Pure substance (or simply a substance): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Every sample of a given substance has the same properties because a substance has a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Every pinch of salt tastes equally salty just like each pinch of table sugar tastes equally sweet.
* Substances can be classified into two categories (elements and compounds):
  + Elements
    - Although there are millions of known substances, there are only \_\_\_\_\_\_\_\_\_\_\_ known elements.
    - An **element** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * An element has a fixed composition because it contains only one type of **atom:** \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * No two elements contain the same type of atom
        + Oxygen only contains oxygen atoms, copper only contains copper atoms, helium only contains helium atoms
    - Examples of elements:
      * At room temperature, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ including thinks such as carbon and aluminum.
      * Some elements are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ such as oxygen and nitrogen.
      * Only two elements are liquids at room temperature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Symbols for elements:
      * In 1813, Jons Berzelius, a Swedish chemist, suggested that chemists use symbols to represent each element.
      * Each symbol has either \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with the first letter always being capitalized. The second letter is always lowercase.
      * Some symbols are easy to understand, others are not.
        + Carbon – \_\_\_\_\_\_\_\_\_
        + Aluminum – \_\_\_\_\_\_\_\_\_\_\_\_
        + Gold – \_\_\_\_\_\_\_\_\_\_\_\_ (Latin name: Aurum)
      * Symbols allow scientists who speak different languages to communicate without confusion.
        + World-wide the symbol for nitrogen is \_\_\_\_\_\_\_\_\_\_
        + However, what we know in English as nitrogen is known as:

Azote in France

Stickstoff in Germany

Nitrógeno in Mexico

* + Compounds
    - **Compound:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - The properties of a compound differ from those of the substances from which it is made.
      * Example: Water – composed of elements hydrogen and oxygen
        + Hydrogen – \_\_\_\_\_\_\_\_\_\_\_\_\_ at room temperature, fuel for a fire
        + Oxygen – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at room temperature, fuel for a fire
        + Water – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at room temperature, does not burn, can extinguish a fire
    - A compound always contains two or more elements joined together in a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Water or H2O – always two hydrogen atoms with one oxygen atom

*Mixtures*

* Recipe Example
* The properties of a mixture can vary because the composition of a mixture is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
  + Mixtures tend to retain some of the properties of their individual substances; however, the properties of the mixture are less constant than the properties of the individual substances.
  + Mixture can be classified by how well the parts of the mixture are distributed throughout the mixture.
  + Two classifications of mixtures: heterogeneous and homogeneous
    - **Heterogeneous mixtures:**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Examples: salsa, sand, dirt, Italian salad dressing, salad
    - **Homogeneous mixtures:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Appear to contain only one substance.
      * Examples: Stainless steel, tap water, kool-aid, swimming pool water
  + The size of the particles in a mixture has an effect on the properties of the mixture.
    - Based on the size of its largest particles, a mixture can be classified as a solution, suspension, or a colloid.
    - **Solutions:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * The particles in a solution are too small to settle out of the solution, be trapped by a filter, or scatter light.
        + Liquid solutions are easy to recognize – they do not separate into distinct layers over time.
        + If you poor a liquid solution through a filter, none of the substances in the solution are trapped in the filter.
        + You can see through solutions that are liquids because light passes through them without being scattered in all directions.
    - **Suspensions:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * The particles in a suspension settle out of the liquid, can be filtered, and are large enough to scatter light – think of a mixture of sand and water.
        + “Shake well before using” indicates that over time the larger particles will separate out over time.
        + The larger particles can be trapped by a filter while the liquid portion can pass through.
        + Because larger particles can scatter light in all directions, suspensions are cloudy.
    - **Colloids:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Like solutions, colloids do not separate into layers and you cannot use a filter to separate the parts of a colloid.
      * Like suspensions, colloids particles are large enough to scatter light.
      * Examples: Fresh cow’s milk vs. homogenized milk
      * Example: Fog

***Section 2.2 – Physical Properties (pages 45-51)***

*Key Concepts:*

* What are some examples of physical properties?
* How can knowing the physical properties of matter be useful?
* What processes are used to separate mixtures?
* When does a physical change occur?

*Vocabulary:*

1. Physical property
2. Viscosity
3. Conductivity
4. Malleability
5. Melting point
6. Boiling point
7. Filtration
8. Distillation
9. Physical change

*Examples of Physical Properties*

* **Physical property:**  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Examples include:
  + **Viscosity:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - The greater the viscosity, the slower the liquid will flow.
    - Liquids like honey and corn syrup have a high viscosity while liquids like water and vinegar have low viscosity.
    - The viscosity of a liquid usually decreases when it is heated – cooking oil in a frying pan.
  + **Conductivity:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Material’s that have high conductivity (metals) are called conductors.
    - If a material is a good conductor of heat, it is also usually a good conductor of electricity.
  + **Malleability:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Most metals are malleable and can be easily shaped without shattering, unlike items that are made out of glass that are brittle (shatter when struck)
  + **Hardness:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Example: a stainless steel kitchen knife can scratch a copper sheet because the stainless steel is harder than the copper.
    - Diamond is the hardest known material and is typically used on the edges of grinding wheels.
  + **Melting Point:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + **Boiling Point:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |
| --- | --- | --- |
| **Substance** | **Melting Point (°C)** | **Boiling Point (°C)** |
| **Hydrogen** | -259.3 | -252.9 |
| **Nitrogen** | -210.0 | -195.8 |
| **Ammonia** | -77.7 | -33.3 |
| **Octane** | -56.8 | 125.6 |
| **Water** | 0.0 | 100.0 |
| **Acetic Acid (Vinegar)** | 16.6 | 117.9 |
| **Table Salt** | 800.7 | 1465 |
| **Gold** | 1064.2 | 2856 |

* + **Density:** can be used to test the purity of a substance (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_).
    - The density of a substance at room temperature is a constant value.
      * Gold Crown Example

*Using Physical Properties*

* Physical properties are used to identify a material, to choose a material for a specific purpose, or to separate the substances in a mixture.
* Using Properties to Identify Mixtures:
  + The steps used to identify a material are similar to the steps used to test for purity.
    - Step one: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Step two: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Step three: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Examples of usefulness: Page 48: Solving a Crime
* Using Properties to Choose Materials:
  + Properties determine which materials are chosen for which uses.
  + Material for shoelaces – would you want wooden shoelaces?

*Using Properties to Separate Mixtures*

* Filtration and Distillation are two common separation methods for mixtures
  + **Filtration**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* + - Particles of smaller size are able to pass through the holes of the filter while the larger particles are caught in the filter.
    - Examples: Coffee filter, brewed tea, food strainer
  + **Distillation:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - Typically used when the particles in the mixture are too small and all (or a majority of) pass through a filter.
    - One practical application: purification of drinking water

*Recognizing Physical Changes*

* A **physical change** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Phase changes (solid to liquid to gas) are physical changes. The substances have simply changed form.
  + Other examples include slicing (cutting) or crumpling something like paper. The size or shape may change but the composition of the material does not.
  + Some physical changes can be reversed.
    - Phase changes are reversible.
    - Braided hair can be straightened
    - A wrinkled shirt can be ironed.
  + Some physical changes cannot be reversed.
    - Cutting of hair
    - Slicing a tomato
    - Peeling an orange.

***Section 2.3 – Chemical Properties (Pages 54-58)***

*Key Concepts:*

* When can chemical properties be observed?
* What observation might indicate that a chemical change has occurred?
* What is the difference between chemical and physical changes?

*Vocabulary:*

1. Chemical property
2. Flammability
3. Reactivity
4. Chemical change
5. Precipitate

*Making Observations:*

* Make as many observations that you can about the burning candle in the front of the room within 1 minute. Write down anything that you think is an observation. Remember every detail of an observation is important in science. Make observations using your 5 senses. Make observations about the materials that are used and what those materials are doing.
* Now identify which of the properties you listed are physical properties.
* The observations that you were unable to identify as physical properties are what type of properties?

*Observing Chemical Properties:*

* **Chemical Property:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Chemical properties can be observed only when the substances in the sample of matter are changing into different substances.
  + Two common chemical changes: Flammability and reactivity
    - **Flammability**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Materials that have this property (or the ability to burn) can be used as fuel.
        + Examples: gasoline, paper, wood
      * Sometimes flammability is not a desirable property
        + Examples: fabric (children’s fabric must have low flammability), housing materials
        + Items that are listed as “Flame Resistant” are typically difficult to ignite. If they are ignited, they will burn slowly.
    - **Reactivity:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Let’s look at two very common gases and their reactivity: Oxygen vs. Nitrogen
        + Oxygen: makes up roughly 22% of the air we breathe

Reacts very easily with other elements

Common reaction between oxygen with iron and water: \_\_\_\_\_\_\_\_\_\_\_\_

Rust weakens the iron it is formed on.

* + - * + Nitrogen: makes up roughly 78% of the air we breathe

Very low reactivity

Seawater stored in steel tanks – page 55

*Recognizing Chemical Changes*

* **Chemical change**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + \*Three common types of evidence for a chemical change are a change in color, the production of a gas, and the formation of a precipitate.
    - A change in color:
      * A change in color is a clue that a chemical change has produced at least one new substance
      * Examples: silver tarnishing, iron rusting, copper changing colors, food changing color when cooked.
    - Production of a gas:
      * When certain chemicals are combined together, a gas may be a product
      * Examples: vinegar and baking soda, baking powder in a cake recipe
      * What about boiling water? Is a gas being produced? Is this chemical or physical?
    - Formation of a precipitate:
      * **Precipitate: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
      * The chemical change alters the structure of some of the substances and causes them to stick together in clumps.
      * Examples: curdling of milk, cottage cheese

*Is a Change Chemical or Physical?*

* Before you decide whether or not a chemical change has occurred, ask yourself this question: *Are different substances present after the change takes place?*
* When matter undergoes a chemical change, the composition of the matter \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* When matter undergoes a physical change, the composition of the matter \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_