Matter Lesson 2

<u>Learning Goal 2:</u> I can describe the differences between intensive physical properties, extensive physical properties, and chemical properties of matter.

<u>Learning Goal 3:</u> I can describe the differences between physical and chemical changes of matter.

Ask your teacher for the two handouts that accompany this lesson.

<u>Part 1: Physical and Chemical Change</u>

Vocabulary!

Matter is composed of small ***<u>particles</u>***.

Particles are composed of one or more ***<u>atoms.</u>***

Look at the handout titled "Physical and Chemical Changes".

This card illustrates several examples of physical and chemical changes.

☆ **The <u>atoms</u> in the particles are represented by different shapes.**

Compare the <u>structure</u> of the particles before and after each physical and chemical change.

? What do you think is the main difference between a physical change and a chemical change?

Indications of Chemical Change

<u>Chemical changes</u> usually exhibit one or more of the following indicators:

- Color change (Be careful! Color change can also occur in a physical change!)
- Temperature change

- Gas bubbles
- Odor change
- **<u>Precipitate</u> formation

Vocabulary!

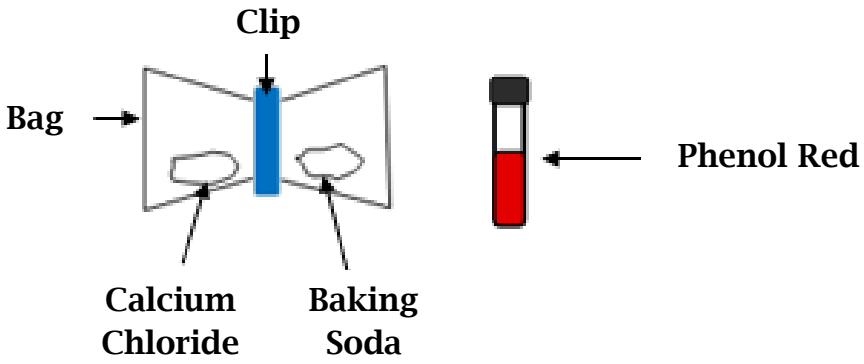
A *<u>precipitate</u>*** is an insoluble solid substance formed in a chemical reaction between solutions.

Look for indicators of chemical change as you carry out the chemical reactions described below.

Put on your goggles!

Ask your teacher for a vial containing phenol red solution and a baggie containing calcium chloride and baking soda.

The calcium chloride will be separated from the baking soda by a clip.



Remove the clip and pour the phenol red solution into the bag **Immediately seal the bag. Mix the contents thoroughly**.

Observe the contents of the bag. The solid substances will no longer be visible.

Place a check next to each indicator of chemical change that you observe.

☐ Color change ☐ Odor change

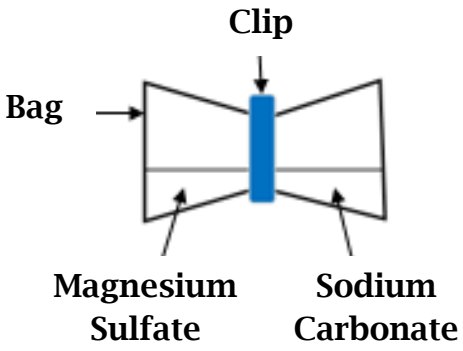
☐ Temperature change ☐ Precipitate formation
☐ Gas bubbles

Dispose of the baggie as directed by your teacher.

Your goggles should still be on!

Ask your teacher for a baggie containing solutions of magnesium sulfate and sodium carbonate.

The two solutions will be separated by a clip.



Remove the clip and mix the two solutions together.

Observe the mixture carefully.

Place a check next to each indicator of chemical change that you observe.

☐ Color change ☐ Odor change
☐ Temperature change ☐ Precipitate formation
☐ Gas bubbles

Dispose of the baggie as directed by your teacher.

A ***Physical Change*** occurs when a substance changes its appearance or form, but not its particle structure.

Examples

cutting, dissolving, compressing, mixing,

Vocabulary!

**all state changes

A ***Chemical Change*** occurs when a substance changes into another substance by changing its particle structure.

Examples

burning, digesting, **all chemical reactions**

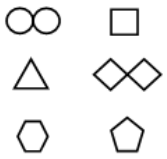
Vocabulary!

****State change*: a change between the solid, liquid, or gas state of a substance.

? *Using some or all of the particles shown below, illustrate three different examples of physical change.*

☆ **The atoms in the particles are represented by different shapes.**

Particles



Particles before the physical change:	Particles after the physical change:

Particles before the physical change:	Particles after the physical change:

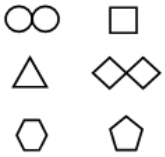
Particles <u>before</u> the physical change:		Particles <u>after</u> the physical change:
	⇨	

? *Using some or all of the particles shown below, illustrate three different examples of <u>chemical</u> change.*

(You will need to create some new particles with the same atoms.)

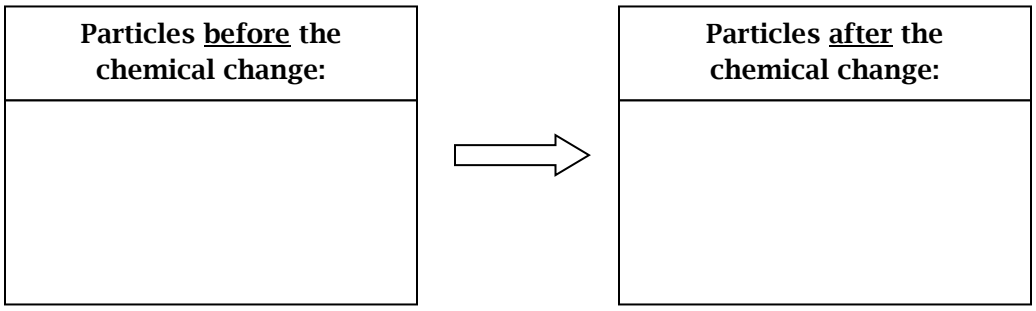
☆ **The <u>atoms</u> in the particles are represented by different shapes.**

<u>Particles</u>



Particles <u>before</u> the chemical change:		Particles <u>after</u> the chemical change:
	⇨	

Particles <u>before</u> the chemical change:		Particles <u>after</u> the chemical change:
	⇨	



Part 2: Physical and Chemical Properties

- ***Look for the handout titled "Physical and Chemical Properties".***

This handout shows how the particles of magnesium are affected when several of its properties are measured or observed.

? Determine whether measuring or observing each property does or does not change the particle structure of magnesium.

	Particle Structure Change	
Mass	Yes	No
Volume	Yes	No
Density	Yes	No
Flammability	Yes	No
Melting point	Yes	No
Reactivity with acid	Yes	No
Conductivity	Yes	No

Vocabulary!

Physical properties are properties that can be measured or observed without changing the particle structure of the substance.

Chemical properties are properties that

describe the ability of a substance to undergo a change (a change the particle structure).

? *Classify each of the properties that you investigated above as either physical or chemical.*

Physical Properties	Chemical Properties

Part 3: Intensive and Extensive Physical Properties

👁 *Your teacher has set up a demonstration for you to evaluate.*

- The demonstration consists of two graduated cylinders which have each been placed on a scale.
- The graduated cylinders contain different samples of water.
- The scales have been set to indicate only the masses of the water samples.

? For each sample of water, record the indicated physical properties in the table below.

	Sample A	Sample B
Mass (g)		
Volume (ml)		
Color		
Clarity		
***Density** (g/ml)		

***Calculate the density of each sample by dividing its mass by its volume.**

? Which physical properties of water changed when the amount of water changed?

? Which physical properties of water did not change when the amount of water changed?

Vocabulary!

Extensive Properties are properties that change when the amount of the substance is changed.

Intensive Properties: are properties that do not change change when the amount of the substance is changed.

? *Classify each of the physical properties that you investigated above as either extensive or intensive.*

Extensive Properties	Intensive Properties

Ask your teacher for the set of task cards titled "Matter – Set 2". You will also need a copy of the "Matter – Set 2 Task Card Answer Sheet".

? Record your answers on the Task Card Answer Sheet. Be sure that you indicate the color of your task cards.

Changes and Properties of Matter
Study Sheet – Page 1

Vocabulary

Particle: very small piece of matter; particles are composed of atoms

Atom: tiny pieces of matter that compose particles

Physical Change: occurs when a substance changes its appearance or form, but not its particle structure

Chemical Change: occurs when a substance changes into another substance by changing its particle structure

State Change: change between the solid, liquid, or gas state of a substance

melting: solid to liquid	evaporating: liquid to gas	sublimation: solid to gas
freezing: liquid to solid	condensing: gas to liquid	deposition: gas to solid

Precipitate: an insoluble solid substance formed in a chemical reaction between solutions

Physical Property: properties that can be measured or observed without changing the particle structure of the substance

Chemical Property: properties that describe the ability of a substance to undergo a chemical change (change in particle structure)

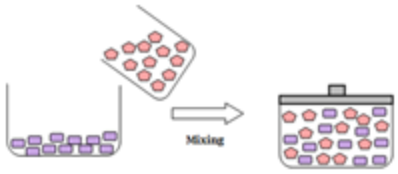
Intensive Property: physical properties that do not change when the amount of the substance changes

Extensive Property: physical properties that do change when the amount of the substance changes

Changes and Properties of Matter
Study Sheet – Page 2

Changes of Matter

Physical

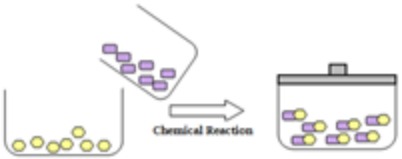


Examples

Cutting
Dissolving
Compressing
Mixing

State Changes
Melting
Freezing
Evaporation
Condensation
Sublimation
Deposition

Chemical

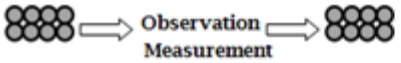


Examples

Burning
Digesting
Chemical Reactions

Properties of Matter

Physical



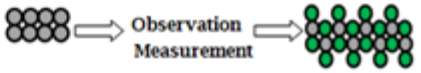
Extensive
Changes with the amount

Examples
Mass
Length
Volume

Intensive
Does not change with the amount

Examples
Density
Color
Clarity
Melting Point
Boiling Point
Hardness
Taste

Chemical



Examples

Flammability
Reactivity