NBI- August 19

- **Create a picture that shows the following about matter.**

1. The FOUR states of matter

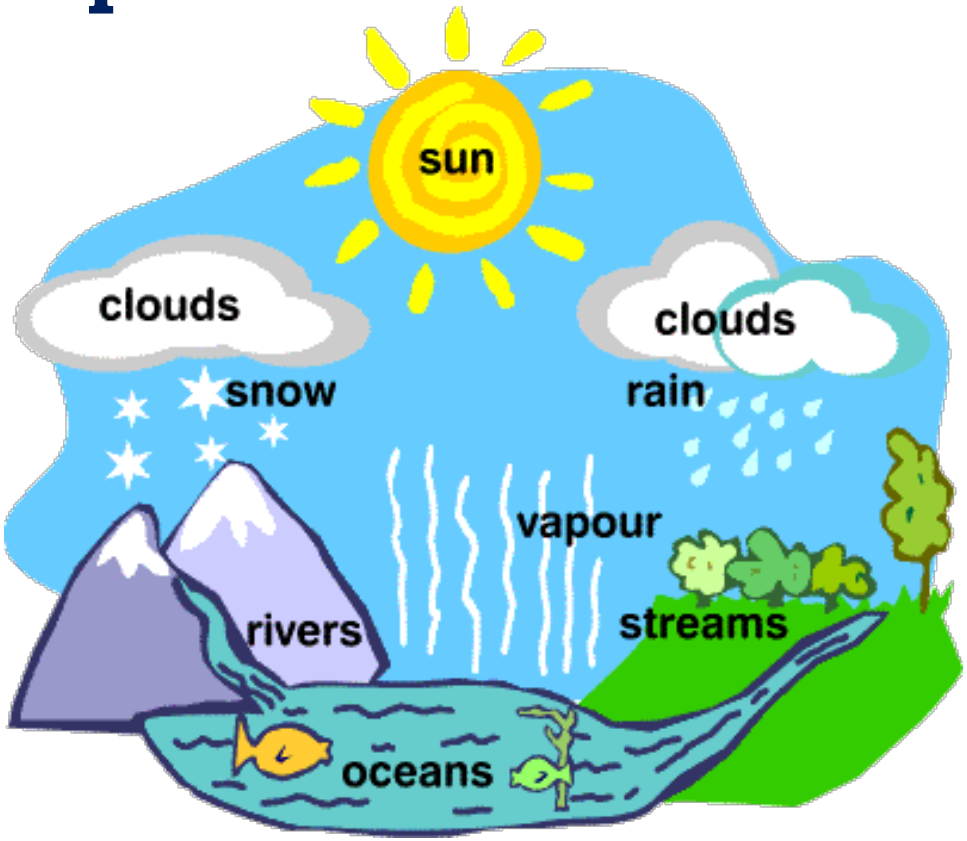
2. Particle Arrangement: use small circles

3. Tell if each state has a definite shape and volume

4. Give examples of the FOUR states of matter.

NBI- August 19

- **Create an anchor chart that illustrates the states of matter and their changes through the example of Olaf or the Water Cycle.**



Closure and Homework

Student Essay: Use your knowledge of the Water Cycle to address Olaf's misconceptions of the state of matter.

ALL ABOUT ME

56	6	7
Ba	Co	N
Barium	Cobalt	Nitrogen
137.237	12.001	14.007

August 17th 2015 page3

DO: I will be able to explain the scientific view of the nature of matter by illustrating the movements of particles in solids, liquids, gases, and plasma states.

EQ:

~What is Olaf's misconception about temperature effects particle arrangement in the states of matter?

~What are the states of matter?

~How does temperature impact the state of matter?

~Why is the molecular structure of matter different?

August 17th 2015

What do you know:

Can you fill in the table?

Matter	**Draw space *between* particles**	**Draw the *movement* of particles**
SOLID		
LIQUID		
GAS		

My Thoughts

page2

- **What are Olaf's misconceptions about the states of matter and heat?**

Phases of Matter

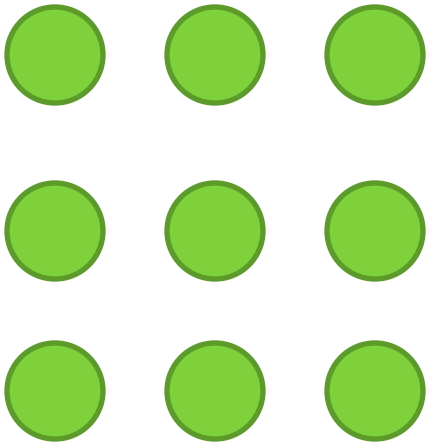
Self-Check

1. I can **describe** how atoms move in a solid, liquid, and gas
2. I can **describe** the speed/energy of the atoms in a solid, liquid, and gas.
3. I can **explain** how the distance between atoms is related to the states of matter.
4. I can **indicate** whether or not each state of matter has a definite shape and volume
5. I can **explain** how the volume of a gas is changed by a change in pressure.
6. I can **explain** how the volume of a gas is changed by a change in temperature.

YES	NO

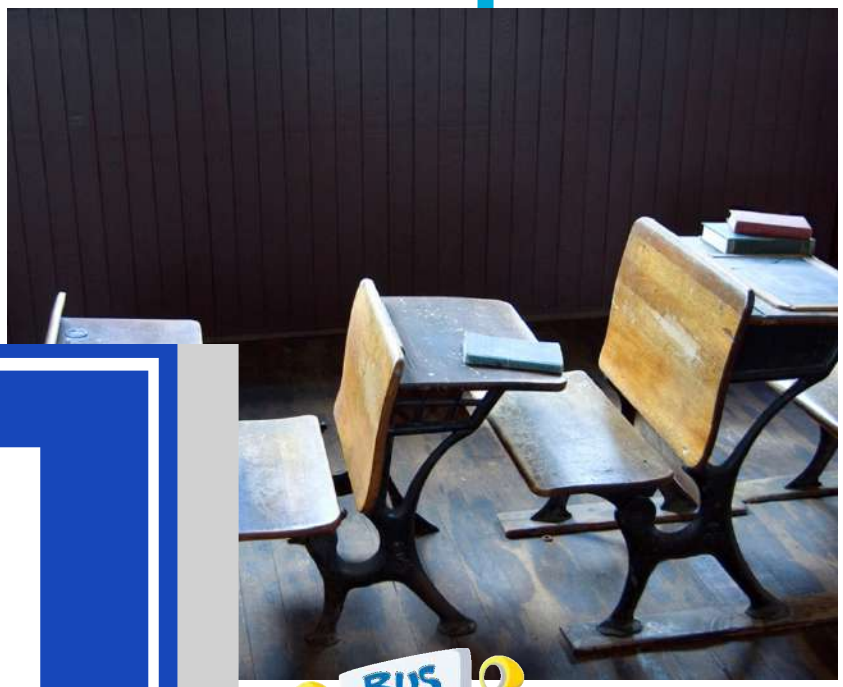
Phases of Matter

- **Solids**: Particles are tightly packed together and DO NOT move past each other. They vibrate in place.



Phases of Matter

- Examples of Solids:



Phases of Matter

- Solids have a definite **SHAPE**
- Solids have a definite **VOLUME**

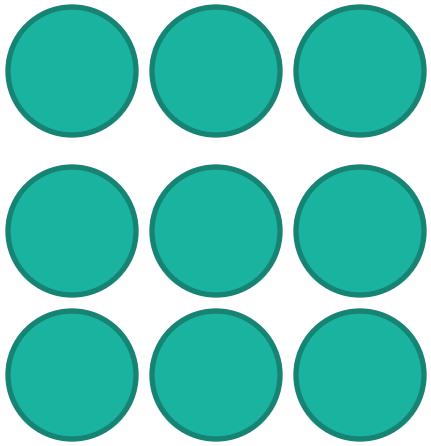
Example—Marble

Shape = Sphere

Volume = can be found using water displacement

Phases of Matter

- **Liquids**: Particles are still tightly packed together and they SLIDE move past each other.



Phases of Matter

- Examples of Liquids:

Phases of Matter

- Liquids **DO NOT** have a definite **SHAPE,** they take the shape of their container.
- Liquids have a definite **VOLUME**

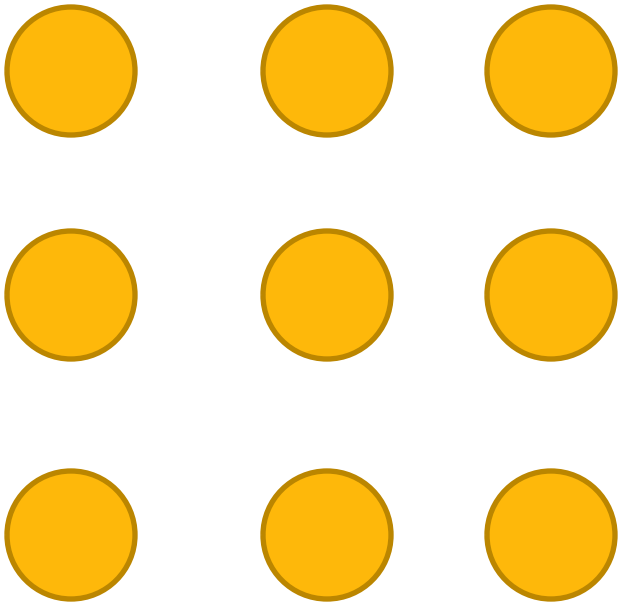
Example—Orange Juice

Shape = None, it takes the shape of the glass.

Volume = can be found using a beaker or graduated cylinder.

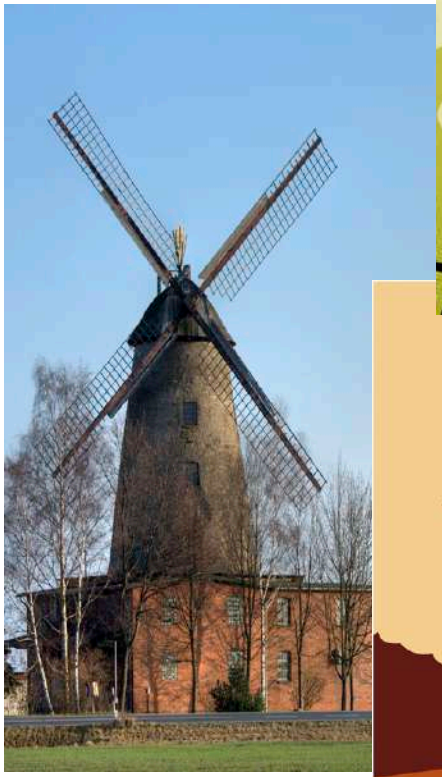
Phases of Matter

- **Gases**: Particles are not tightly packed together, and have so much energy they slip past each other quickly.



Phases of Matter

- Examples of Gases:



Phases of Matter

- Gases **DO NOT** have a definite **SHAPE**
- Gases **DO NOT** have a definite **VOLUME**

Example—Smoke

Shape = Not definite.

Volume = Not definite.

Gases are usually always expanding.

August 18th 2015 page5

DO: I will be able to explain the scientific view of the nature of matter by illustrating the movements of particles in solids, liquids, gases, and plasma states.(the same as 8-17)

EQ:

~What is Olaf's misconception about temperature effects particle arrangement in the states of matter?

Why is the molecular structure of matter different?

How do the particles of cold water differ to those in hot water?

How would a gas be described by its shape and volume?

Think on it...

1. A piece of solid wax is place in a pan and heated on a stove. After a while, the solid becomes a liquid. This occurs because of...

a. Some of the wax molecules get smaller

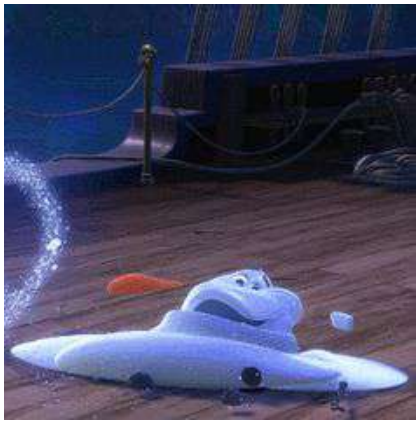
b. Some of the wax molecules get destroyed

c. The wax molecules change into water molecules

d. The wax molecules are more loosely connected.

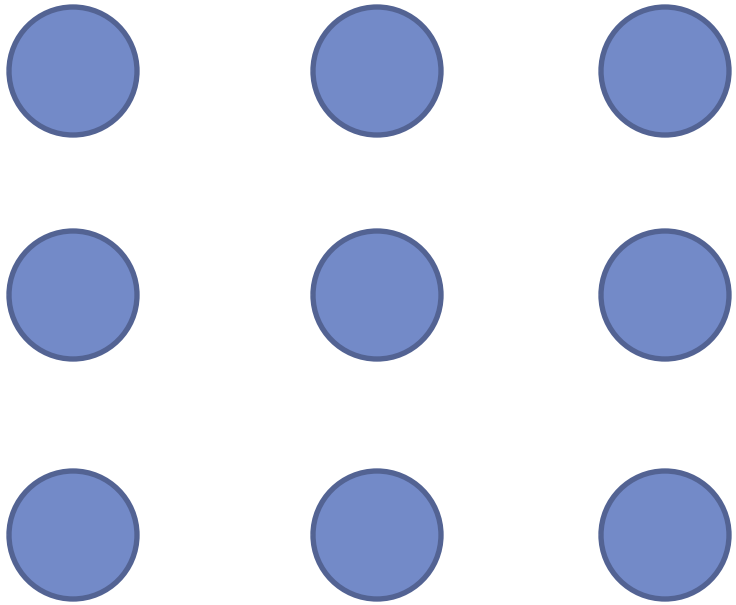
Agenda

- Olaf~ Write a quick explanation of the phases of matter using Olaf's in Summer as an example or draw a comic strip.



Phases of Matter

- **Plasma**: Particles are moving so quickly it is hard to see what they are actually doing.



Phases of Matter

- Examples of Plasma **on Earth**:

Phases of Matter

- Two "laws" about gases…

1. Charles' Law

- Volume (of gas) and Temperature
- When temperature goes **up**, volume goes up
- When temperature goes **down**, volume goes down

Gas + Heat

= Expansion!

http://www.usaballoon.com/fly.htm

http://www.coloradoguy.com/balloona-vista/hotairballoons-buenavista-co.htm

Phases of Matter

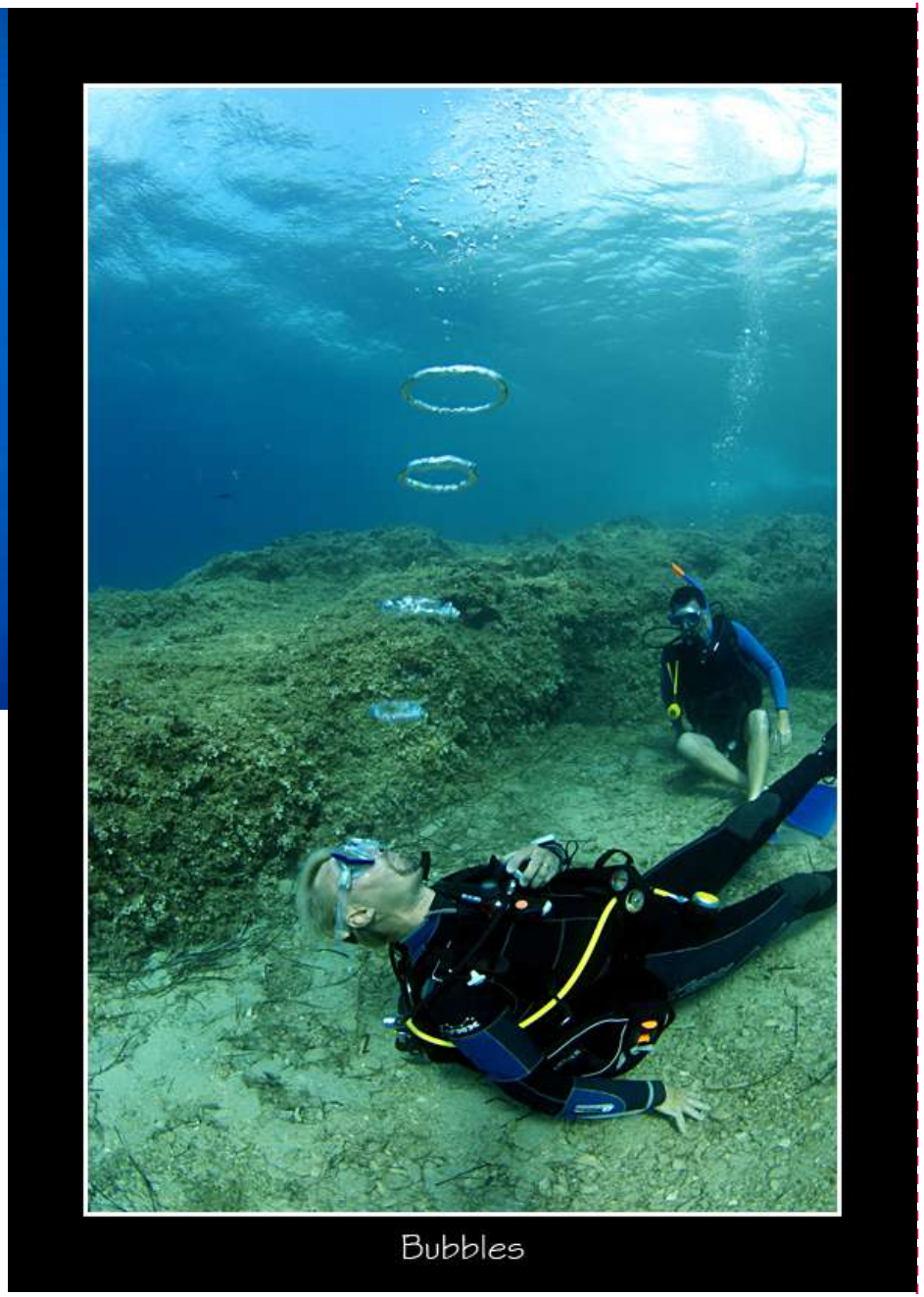
- Two "laws" about gases…

Backwards

2. Boyles' Law

- Volume (of gas) and Pressure
- When pressure goes **up**, volume goes down
- When pressure goes **down**, volume goes up

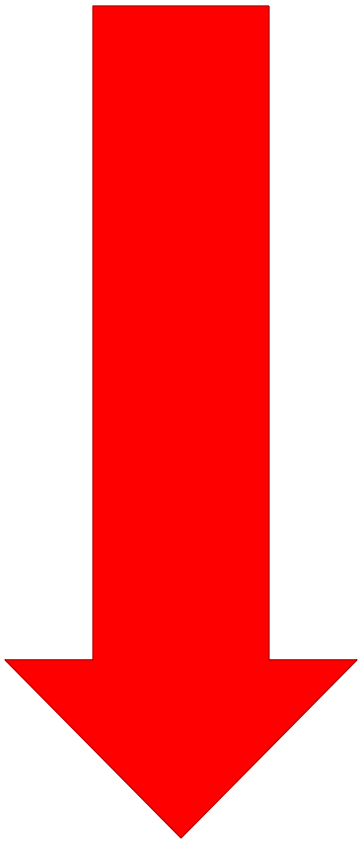
The amount of water pressure determines the size of bubbles in the water.



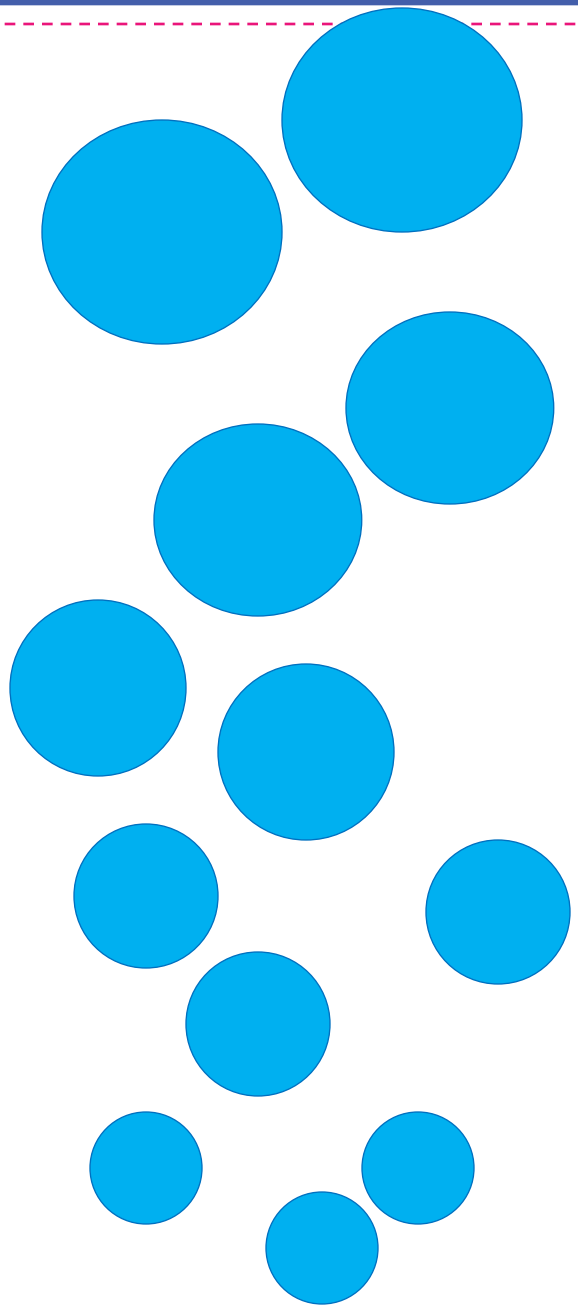
http://www.gettyimages.com/detail/91300130/Photographers-Choice

http://gallery.photo.net/photo/9734756-lg.jpg

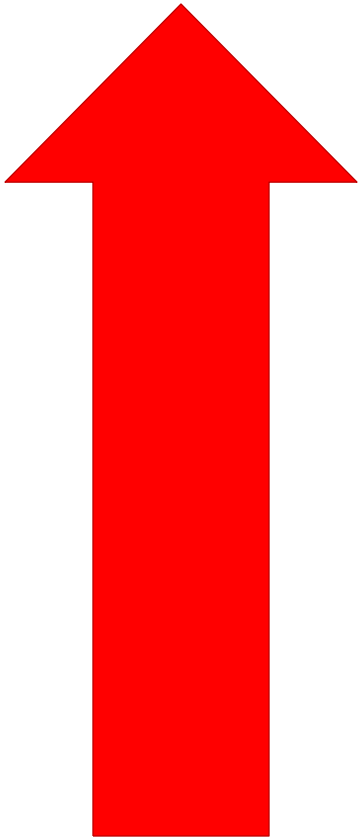
Low pressure



High pressure



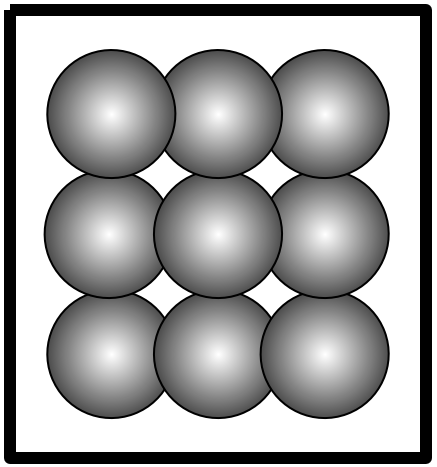
Large Volume



Small Volume

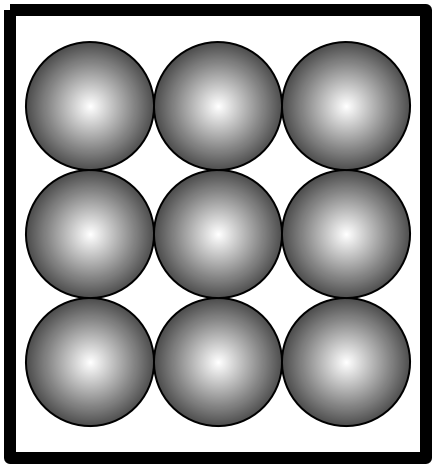
Bose-Einstein Condensate

- Exist at extremely cold temperatures (around absolute zero or -460 °F)
- Particles are super unexcited
- Particles lock or "clump" together so firmly that they move as a single unit
- Definite shape and volume (?)



Solid

- Particles are tightly compact
- Very Dense (thick)
- Particles **vibrate** without the ability to move freely
- Definite (exact) shape and volume
- Solid Animation



Discussion: Cyclical processes and phase changes.

*make other connections between transitions and cyclical changes as compared to the phase changes observed in matter.

Closure and Homework

Student Essay: Use your knowledge of the Water Cycle to address Olaf's misconceptions of the state of matter.

August 21st 2015

DO: I will be able to identify and explain the differences in the physical and chemical properties of matter and the chemical and physical changes of matter.

EQ:

What is the difference between physical and chemical change?

What are some of the unique physical and chemical properties of each state of matter?

What are some of the properties of a substance as it undergoes different physical and chemical changes?

Think on it...

1.Characteristics that can only be seen when the material changes and new materials are formed.

a. Chemical properties

b. Physical properties

c. Chemical changes

d. Physical changes

Phases of Matter

- ADDED

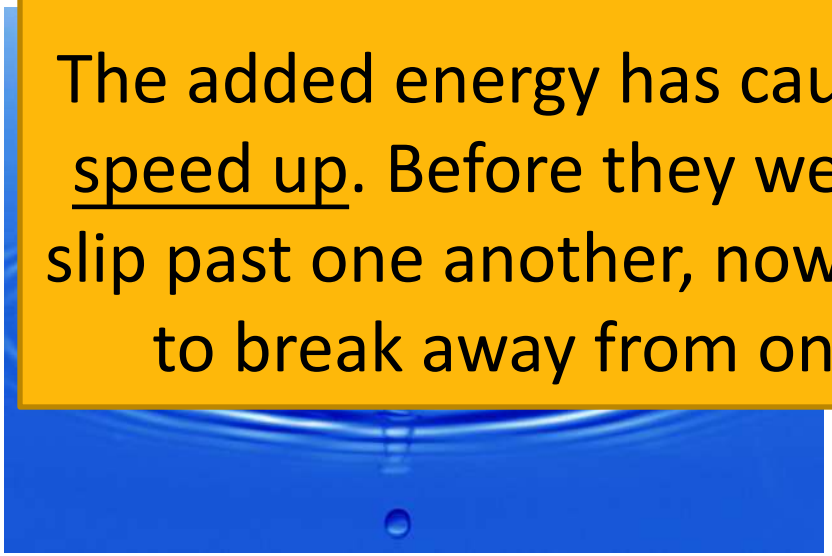
The added energy has caused the chocolate particles to speed up. Before they were vibrating in place, now they are moving fast enough to slip past one another.

Solid **Liquid**

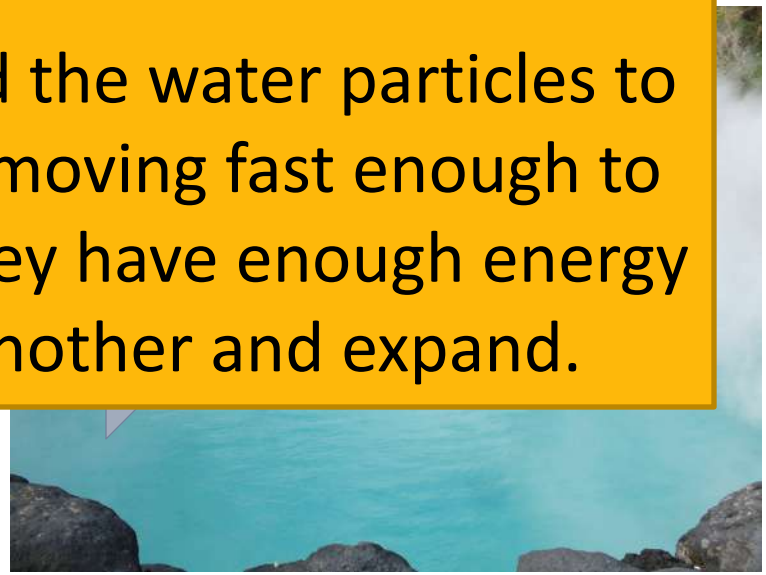
Phases of Matter

- **ADDED**

The added energy has caused the water particles to speed up. Before they were moving fast enough to slip past one another, now they have enough energy to break away from one another and expand.



Liquid



Gas

Phases of Matter

Taken Away

Taking away energy from a rain drop slows the water molecules down so that they no longer slide past one another.

Liquid **Solid**

Matter

- Anything that has mass and takes up space (volume)
  - Examples:
    - A brick(a solid) has mass and takes up space
    - A desk has mass and takes up space
    - A pencil has mass and takes up space
    - Air (a gas) has mass and takes up space
    - Gasoline (a liquid) has mass and takes up space

All of the above examples are considered matter because they have mass and take up space. Can you think of anything that would not be considered matter?

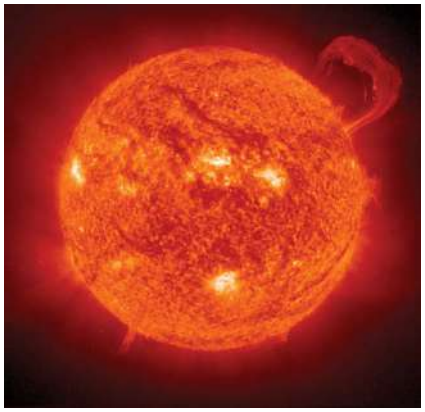
Matter

- Yes! Fire is NOT an example of matter

WHY

Fire is NOT an example of matter

When a gas is heated by many thousands of degrees, the individual atoms collide with enough violence to knock electrons free, resulting in a collection of positively charged ions and free, negatively charged electrons. The gas is said to be ionized, and when a sizable number of the atoms become ionized, the gas is called a plasma.

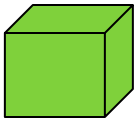


Photograph: The interaction of the Sun's magnetic field with the motions of the plasma in and around the Sun … The interaction of the Sun's magnetic field with the motions of the plasma in and around the Sun … NASA

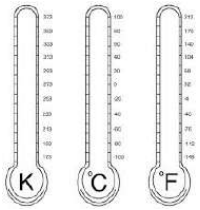
Fire while hot does not ionize with enough particles under pressure to be considered a traditional plasma or for that matter… MATTER; it is considered by most scientists to be a chemical reaction.

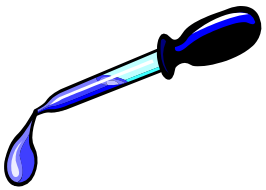
Physical Properties of Matter

- Any property of matter that can be observed or measured without changing the identity of the matter
- **Examples**



temperature
color
shape
taste
state/phase
density





$$D = \frac{m}{V}$$

Phases of Matter

- **Physical Changes**: only the phase changes, the substance does not.
- Physical changes usually change the size or shape of the substance.
- Exampl chan

Chemical Properties of Matter

- any property of matter that describes a substance based on its ability to change into a new substance
- **Examples**

flammability

reactivity with vinegar

reactivity with oxygen

Iron + Oxygen → Iron oxide (rust)

$2Fe + 3O_2 \rightarrow Fe_2O_3$

Phases of Matter

- **Chemical Changes**: changes that create NEW materials.
- The original materials are changed into something different.
- Examples of chemical changes include:

Chemical or Physical Property?

1. Paper is white

2. Boiling point of H_2O is 100°C

3. Zinc reacts with hydrochloric acid and creates hydrogen gas

4. Nitrogen does <u>not</u> burn

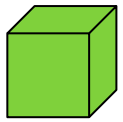
5. Sulfur smells like rotten eggs

Comparing Physical and Chemical Properties

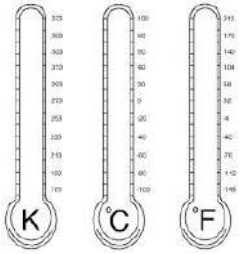
Substance/Matter	Physical Property	Chemical Property
Helium	Less dense than air	Nonflammable
Wood	Grainy texture	Flammable
Baking soda	White powder	Reacts with vinegar to produce bubbles
Powdered sugar	White powder	Does not react with vinegar
Rubbing alcohol	Clear liquid	Flammable
Red food coloring	Red color	Reacts with bleach and loses color
Iron	Malleable	Reacts with oxygen

Physical Properties of Matter

- Any property of matter that can be observed or measured without changing the identity of the matter
- **Examples**



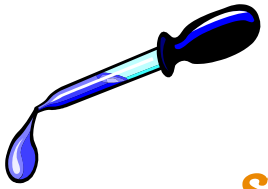
temperature



color

shape

taste



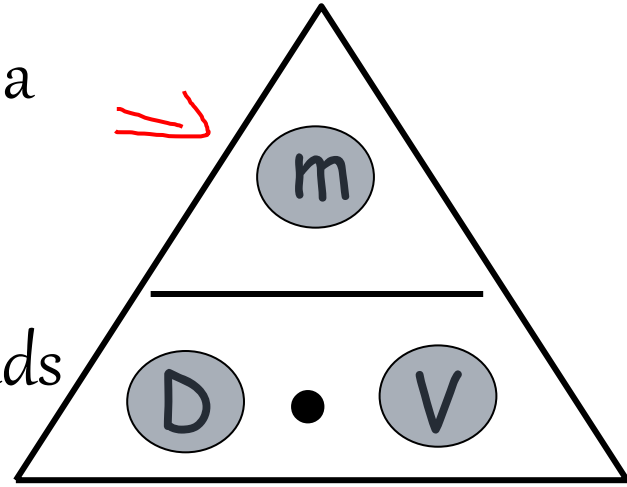
$D = \frac{m}{V}$

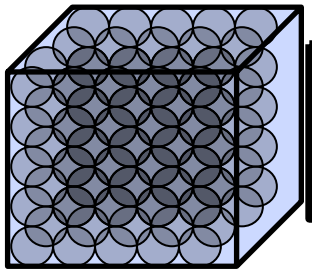
state/phase

density

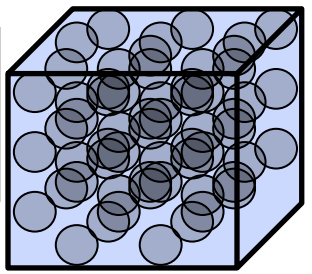
Density

- a measure of the amount of matter present in a given volume of a substance
- typically expressed in the following units:
  - grams per cubic centimeter (g/cm^3) for solids
  - grams per milliliter (g/ml) for liquids
- can change as temperature and pressure change
- does not depend on how much of a substance you have (intrinsic property) – in other words, the density of a gold bar would be the same as the density of a gold flake



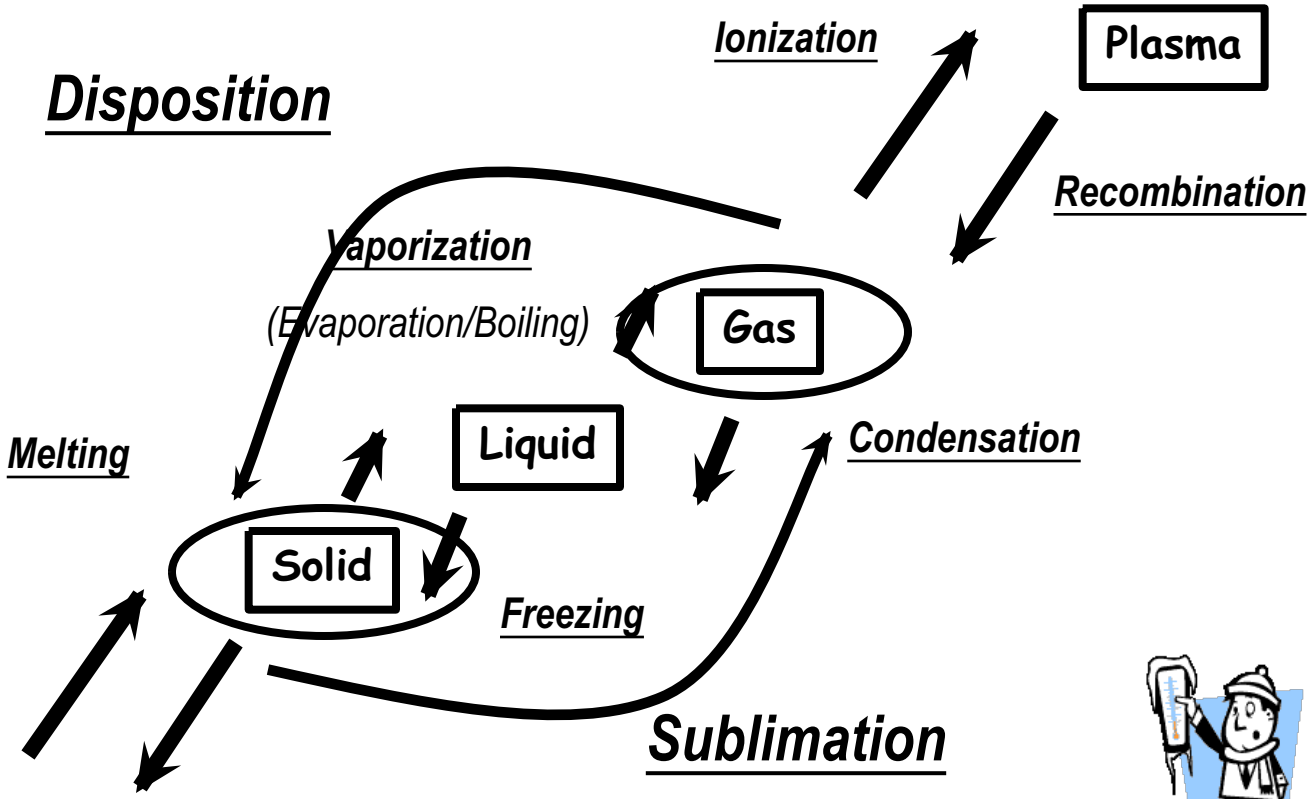


Which do you think is more dense? Why?



Why do you think Bose-Einstein and plasma are not equally distanced from the other three states of matter?

Disposition

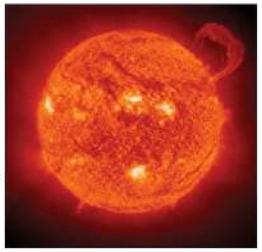


Bose-Einstein

All changes in state require a change in energy

Changes in States

Physical Changes



Plasma

Disposition

Ionization

Recombination

Vaporization

(Evaporation/Boiling)

Gas

Condensation

Liquid

Melting

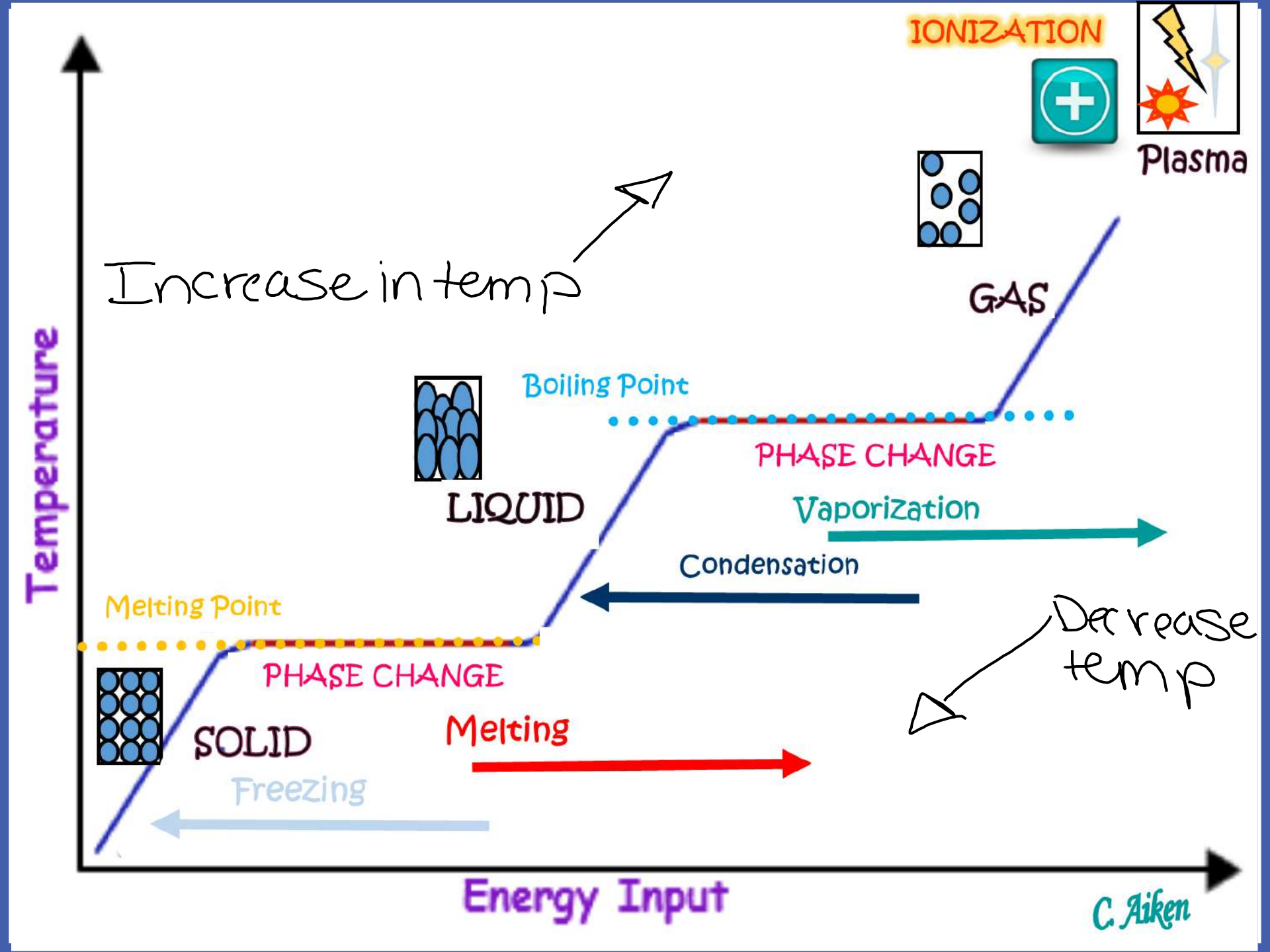
Freezing

Solid

Sublimation

Bose-Einstein

All changes in state require a change in energy


IONIZATION
Plasma
Increase in temp
GAS
Boiling Point
PHASE CHANGE
LIQUID
Vaporization
Condensation
Melting Point
PHASE CHANGE
Decrease temp
SOLID
Melting
Freezing
Temperature
Energy Input
C. Aiken

Chemical or Physical Change?

1. **Bending a Paper Clip**

Physical Change

2. **Baking a cake**

Chemical Change

3. **The sublimation of carbon dioxide**

Physical Change

4. **Crushing an aluminum can**

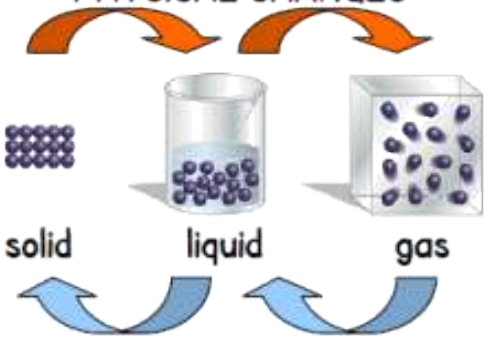
Physical Change

5. **Vinegar and baking soda combining to create salt and water**

Chemical Change

EXOTHERMIC	ENDOTHERMIC
Exothermic- the word describes a process that releases energy in the form of heat. Forming a chemical bond releases energy and therefore is an exothermic process. **Exothermic reactions usually feel hot because it is giving heat to you.**	Endothermic - a process or reaction that absorbs energy in the form of heat. Breaking a chemical bond requires energy and therefore is Endothermic. **Endothermic reactions usually feel cold because it is taking heat away from you.**

PHYSICAL CHANGES



Changing state from **solid** to **liquid** to **gas** and back again is a **reversible change.**

Heating is the process of **increasing the temperature.** **Cooling** is the opposite process where **temperature is decreased.** We use a **thermometer** to measure temperature.

A **wind turbine** helps to generate electricity from **renewable** sources.

When chocolate is **melted** it can **solidify** again. The change is **reversible.**

Cooking eggs, by frying, boiling, scrambling, poaching etc., is always an **irreversible** change.

When oil, vinegar and egg yolks are mixed together they make a **precipitate** called mayonnaise. This change is **irreversible.**

Dissolving sugar in water is a reversible change. When the water is **evaporated** it leaves the sugar behind.

When vitamin tablets **effervesce** (fizz) a gas is produced. This is an **irreversible** change.

Any **reaction,** such as burning, that causes new **substances** to be formed is called a **CHEMICAL CHANGE. These** changes are **irreversible.**

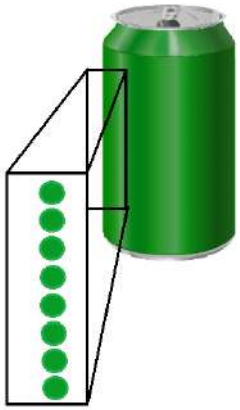
fuel **oxygen** **flame**

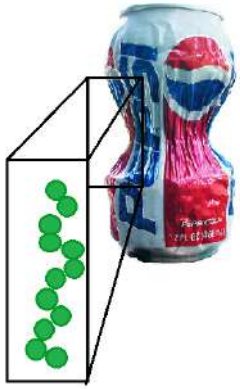
ash **smoke** **heat**

Coal, gas and oil are all **fossil fuels.** They **non-renewable** energy sources.

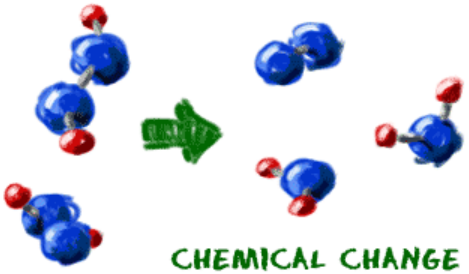
Law of Conservation of Matter

- Matter cannot be created or destroyed. Either it is changed physically or chemical changes allow for atoms to break and establish new bonds creating different substances with the same molecules.





PHYSICAL CHANGE
OF WATER INTO ICE



CHEMICAL CHANGE
OF HYDROGEN PEROXIDE
INTO WATER

Mass vs. Weight

Mass

- a measure of how much matter an object is made of
- does not change, regardless of where something or someone is

Weight

- the force of gravity on an object
- equal to the mass of the body times the local acceleration of gravity

Mass = 59 kg

Weight = 579 N

Why do you think the person's weight is less on the moon?

Mass = 59 kg

Weight = 96 N

http://www.exploratorium.edu/ronh/weight/index.html

REVIEW

5 Physical States of Matter

- Bose-Einstein
- Solid
- Liquid
- Gas
- Plasma

Phases of Matter

- Matter can change phases permanently or temporarily.
- Temporary changes are called PHYSICAL changes.
- Permanent changes are called CHEMICAL changes.

Phases of Matter

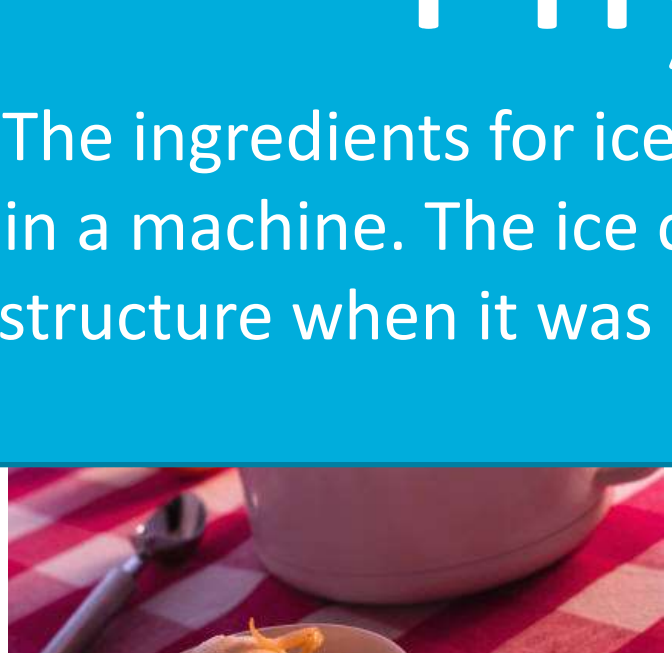
- **Chemical**

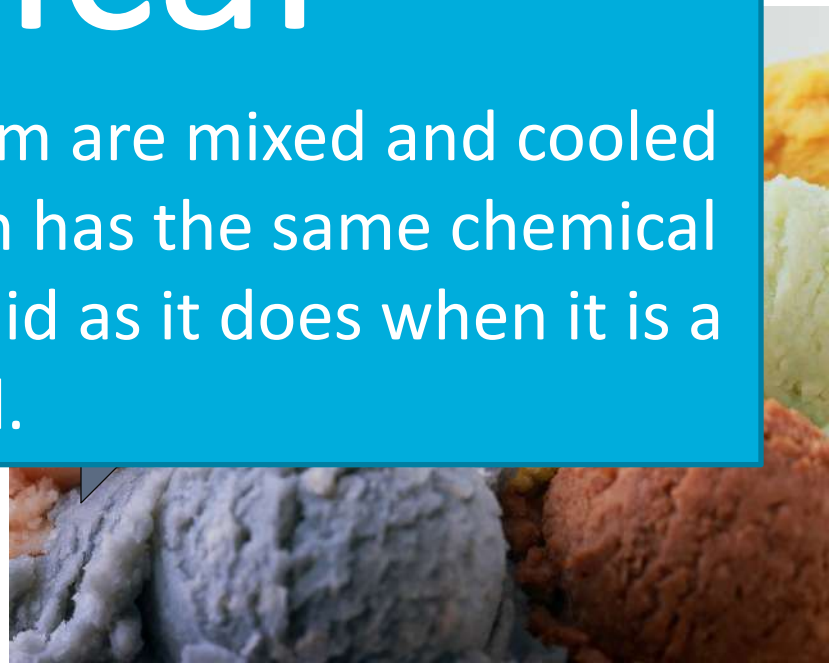
The bottle rocket is being turned into a new substance.

Phases of Matter

- ## Physical

The ingredients for ice cream are mixed and cooled in a machine. The ice cream has the same chemical structure when it was a liquid as it does when it is a solid.

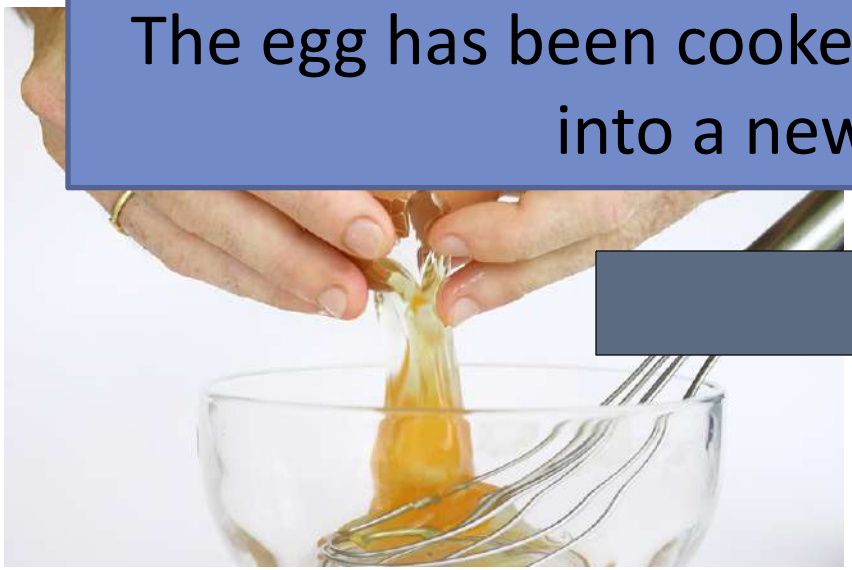




Phases of Matter

- **Chemical**

The egg has been cooked, and that has changed it into a new substance.



Phases of Matter

- Let's summarize:

Phase	Motion of Particles	Speed of Particles
Solid	Particles vibrate in place	Slow
Liquid	Particles are close, but can slide past one another	Medium
Gas	Particles are constantly expanding	Fast
Plasma	Unknown	Faster than we can see

Phases of Matter

- Let's summarize:

Phase	Definite Shape?	Definite Volume?
Solid	YES	YES
Liquid	NO	YES
Gas	NO	NO
Plasma		

Self-Check

1. I can **describe** how atoms move in a solid, liquid, and gas
2. I can **describe** the speed/energy of the atoms in a solid, liquid, and gas.
3. I can **explain** how the distance between atoms is related to the states of matter.
4. I can **indicate** whether or not each state of matter has a definite shape and volume
5. I can **explain** how the volume of a gas is changed by a change in pressure.
6. I can **explain** how the volume of a gas is changed by a change in temperature.

YES	NO