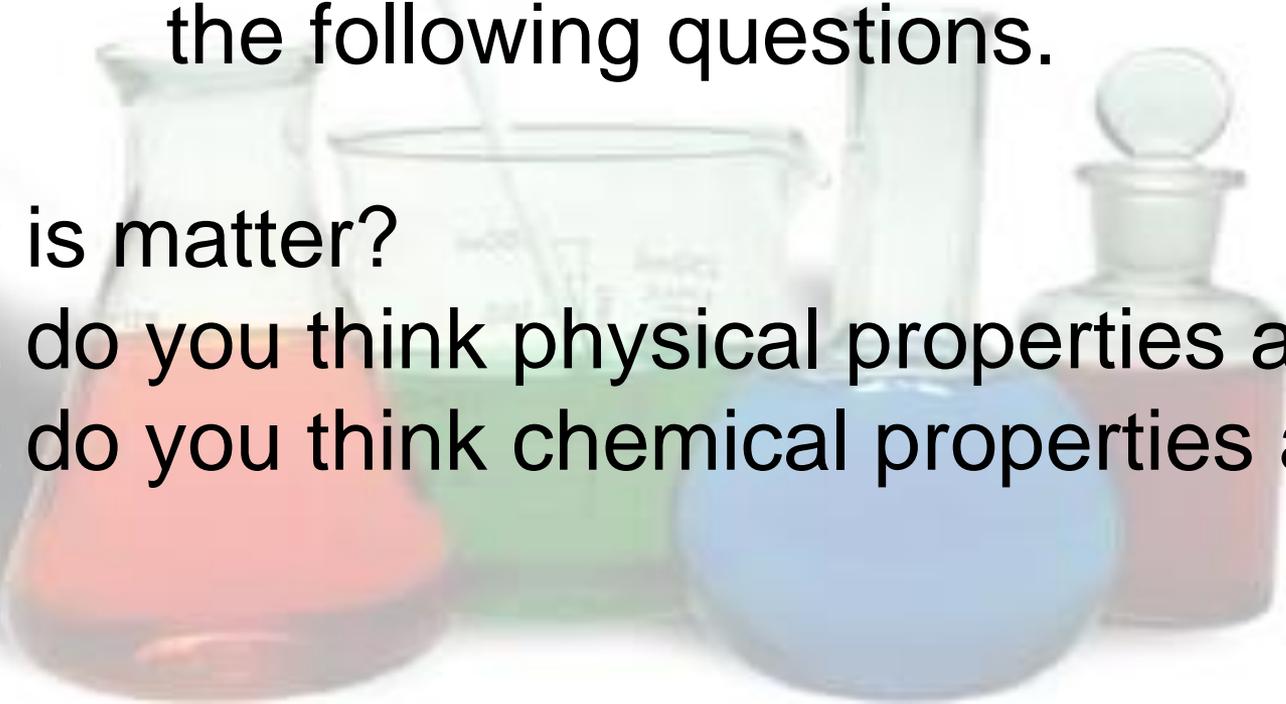


Physical and Chemical Properties of Matter

Please grab a sheet from the front and get out scissors. You will also need a glue stick and piece of construction paper. Think-Pair-Share on the following questions.

1. What is matter?
2. What do you think physical properties are?
3. What do you think chemical properties are?



What are properties?

- ▶ Matter has observable and measurable qualities. We can use the general properties to identify substances. These are independent of the amount of the substance and can be used to identify it.
- ▶ They fall into 2 different groups used to identify, describe and classify matter:
 1. Physical
 2. Chemical

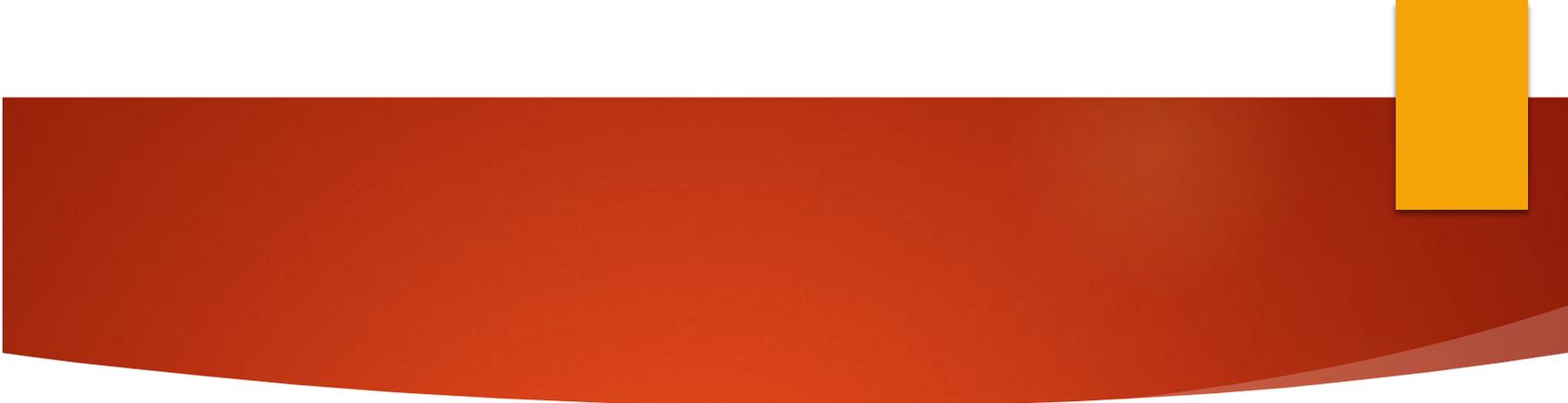


**CHEMICAL
PROPERTIES**

**PHYSICAL
PROPERTIES**

**CHEMICAL
CHANGE**

**PHYSICAL
CHANGE**



- ▶ <http://www.shmoop.com/video/chemistry-3-3-physical-and-chemical-properties?tag=6FDC1073429B473D9451D81983782473>



Physical Properties

Physical properties are used to identify, describe and classify matter. They are the characteristics of a substance that can be observed (using your senses) without changing the substance into something else.

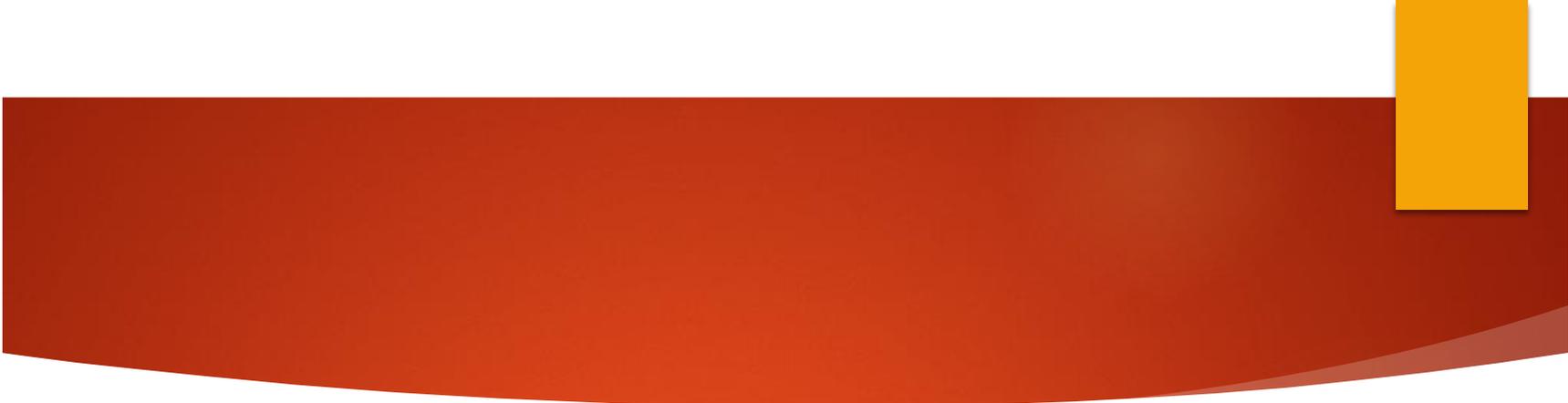
**Can be observed or measured
without changing it.**

**odor mass density
volume color state**

physical properties

Examples of Physical Properties:

- ▶ Freezing Point*
- ▶ Boiling Point*
- ▶ Melting Point*
- ▶ Solubility*
- ▶ Conductivity
- ▶ Hardness
- ▶ Luster
- ▶ Magnetism
- ▶ Solubility
- ▶ Ductility
- ▶ Malleability



- ▶ <http://www.shmoop.com/video/chemistry-3-7-density?tag=6FDC1073429B473D9451D81983782473>



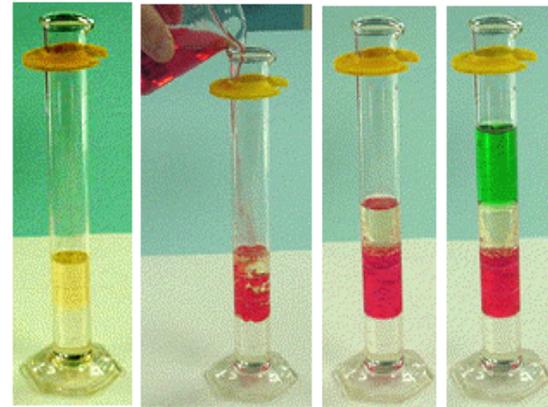
Density

A physical property that relates the mass and volume of an object or material.

$$D = M / V$$

Density = Mass/Volume

Layers of Liquids



oil
corn
syrup

red water
floats
under
oil

oil
red water
corn
syrup

green
alcohol
oil
red water
corn
syrup

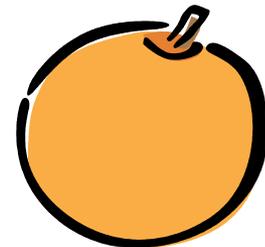
Units

- ▶ Mass is grams
- ▶ Volume is cubic centimeters written as cm³
- ▶ Density is written as g/cm³ when using a ruler
- ▶ Density is often expressed as grams per milliliter, or g/mL when using water displacement

**ALWAYS
REMEMBER
UNITS!**

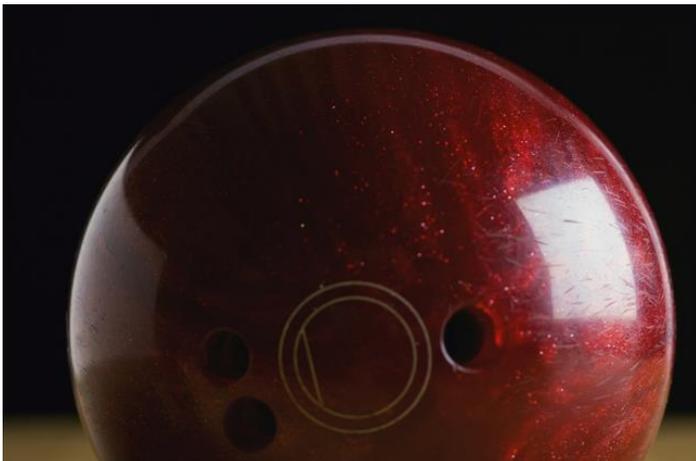
Mass

- ▶ The mass of an object is the measurement of how much matter it contains.
- ▶ What is it measured with?
 - ▶ Triple Beam Balance



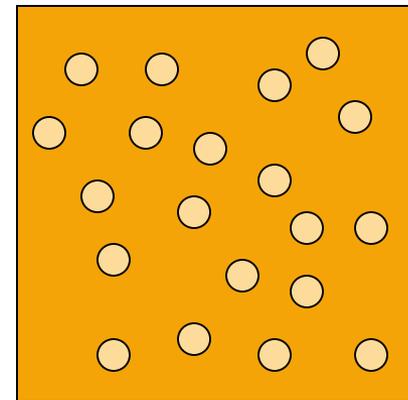
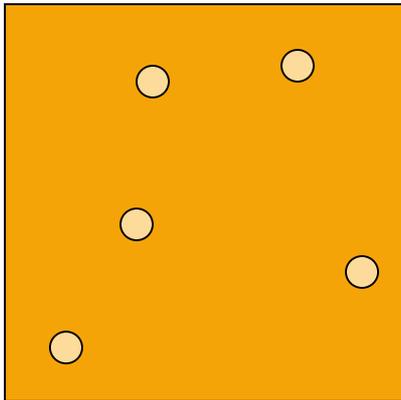
Physical Properties of Matter

- ▶ Density – The amount of matter within a certain amount of volume, g/cm^3 **Divide mass by volume $d = m/v$**
- ▶ Which has a greater density?
Bowling Ball or Soccer Ball

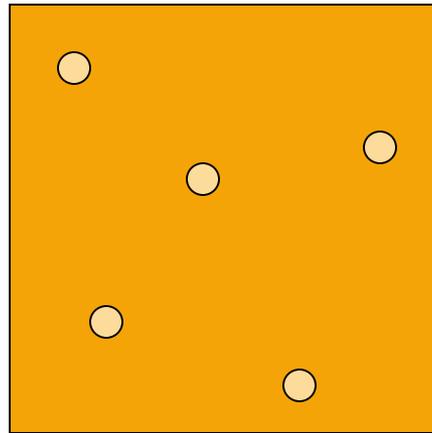
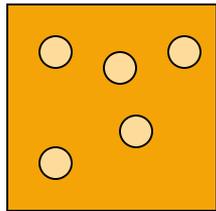


Which one is more dense?

- ▶ Demonstration: People in a square
- ▶ How about this: Which square is more dense?



Which one is more dense?



Density

Object	Mass/g	Vol/cm ³	Density g/cm ³	Sink or Float?
Aluminium sheet	50	18.52	2.70	Sink
Gold bracelet	150	7.89	19.0	Sink
Water	500	500	1	---
Ice	10	10.87	0.92	Float
Block of pinewood	800	1600	0.5	Float

Physical Properties of Matter

- ▶ Melting Point – The temperature at which solid matter turns to liquid
- ▶ Freezing Point – The temperature at which liquid matter turns to solid
- ▶ Phase change temperatures in general



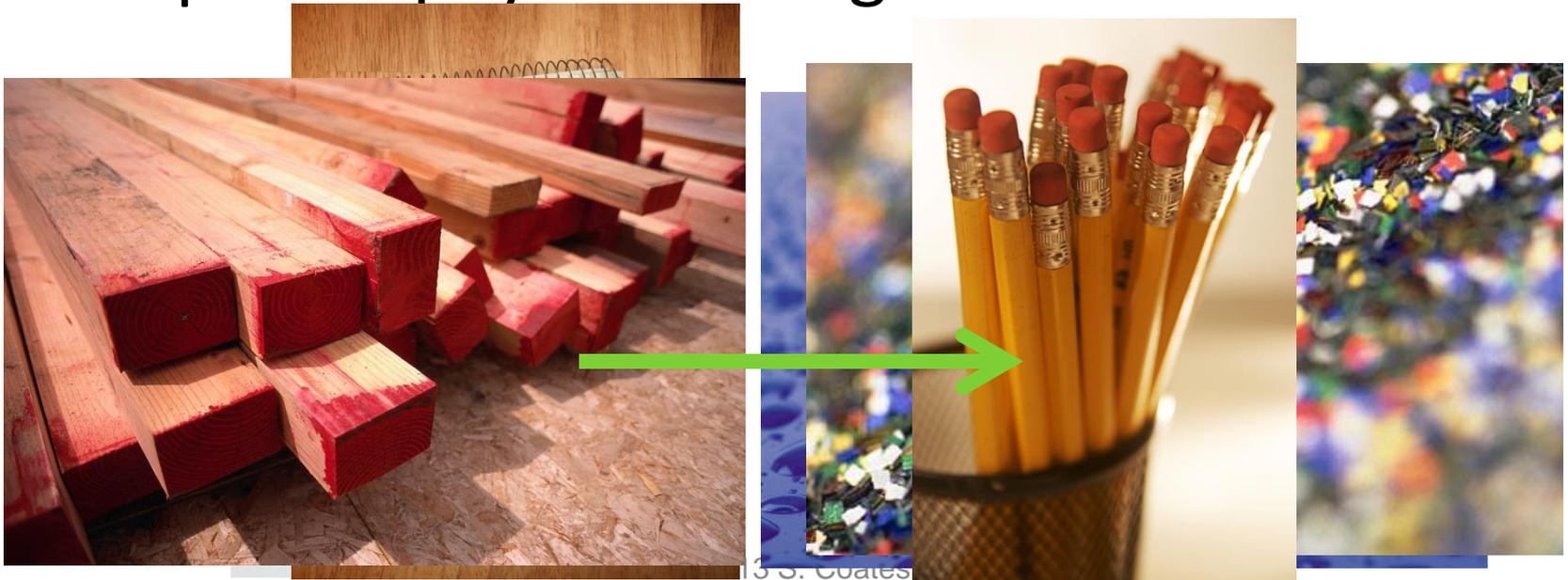
Physical Properties of Matter

- ▶ Solubility means the amount of solute that can be dissolved in a specific volume of solvent under certain conditions.
- ▶ A solute's solubility depends on the chemical nature of the solvent.
- ▶ Another important factor that influences solubility is the temperature of the system (the solute and the solvent).
- ▶ The most common solvent is water.

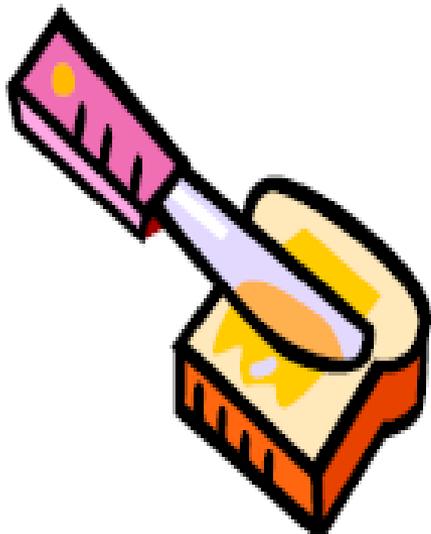


{ Physical Changes }

- Although some extensive properties (like shape, phase, etc.) of the material change, the material itself is the same before and after the change. The change can be usually be “undone.”
- Examples of physical changes include:



Does not form a new substance



physical change

{ Checkpoint }

Why is a change in state considered to be a physical change?

**Describes matter based on its ability to change
into new matter with different properties**

**These properties can only be observed
during a chemical reaction**

flammability

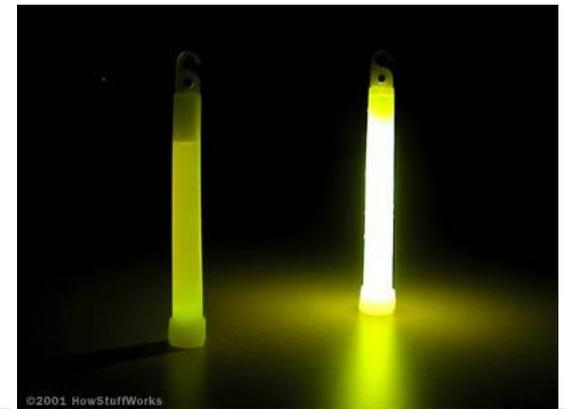
reactivity

chemical properties

Chemical Properties

A chemical property is observed when a substance interacts with another substance.

- Burning or flammability
- Rusting
- Tarnishing
- Whether an object will explode



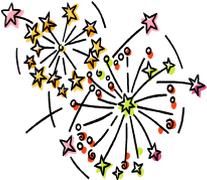
{Chemical Changes}

- Changes that create NEW materials
- The original materials are changed into something different.
- Cannot be undone
- Examples of chemical changes include:

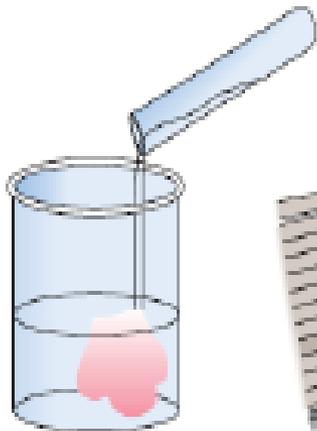


Coat

Evidence of Chemical Changes

Clue	Example	Description
Color change	Bread dough baking	Changes from white to brown 
Smell	Eggs rotting	Smells bad 
New matter created	Wood burning	Wood changes to ash 
Gas created	Baking soda added to vinegar	Creates carbon dioxide gas 
Heat or Light created	Fireworks	Burning chemicals create light and heat 

One or more substances are changed into new substances that have new and different properties



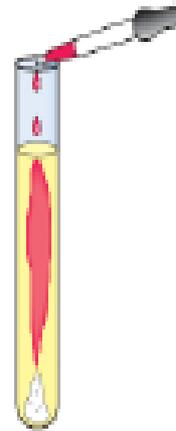
A new colour appears.



Heat, light, or sound is given off (or absorbed).



Bubbles of gas are formed. A new odour may be noticed.



A solid material (called a precipitate) forms in a liquid.



The change is difficult or impossible to reverse.

chemical change

Chemical Changes



The explosion of fireworks

NOT EASILY REVERSED

A half eaten apple turning brown



Leaves changing color

ODOR



Production of Gases or Solids



Energy being released or absorbed



Can be observed or measured without changing it.

**odor mass density
volume color state**

physical properties

Does not form a new substance



physical change

ANSWER KEY

Describes matter based on its ability to change into new matter with different properties

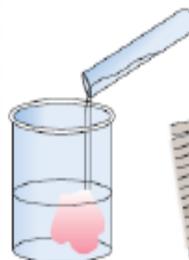
These properties can only be observed during a chemical reaction

flammability

reactivity

chemical properties

One or more substances are changed into new substances that have new and different properties



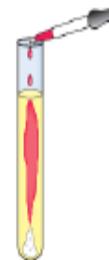
A new colour appears.



Heat, light, or sound is given off (or absorbed).



Bubbles of gas are formed. A new odour may be noticed.



A solid material (called a precipitate) forms in a liquid.



The change is difficult or impossible to reverse.

chemical change

Mass Conservation:

- ▶ Mass is neither created nor destroyed.
- ▶ What are the macroscopic and microscopic differences between physical and chemical changes?

	Macroscopic Definition	Microscopic Definition
Physical Change	The matter is the same. The original matter can be recovered.	The particles of the substance are rearranged.
Chemical Change	The matter is different. The old matter is no longer present. The original matter cannot be recovered.	The particles of the substance are broken apart, and the atoms are rearranged into new particles, forming a new substance.

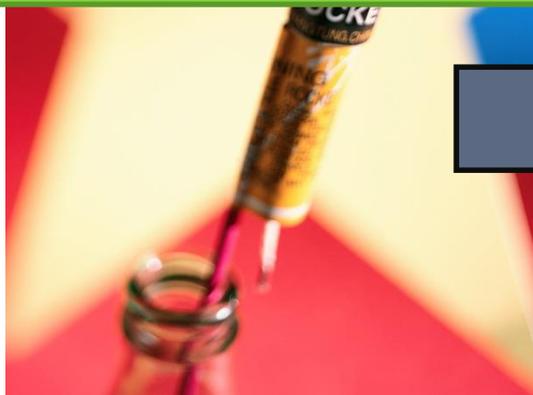
Physical and Chemical Changes Video

▶ <https://www.youtube.com/watch?v=yIJ2qnUOOwQ>

{ Phases of Matter }

Chemical

The bottle rocket is being turned into a new substance.



{ Phases of Matter }

Physical

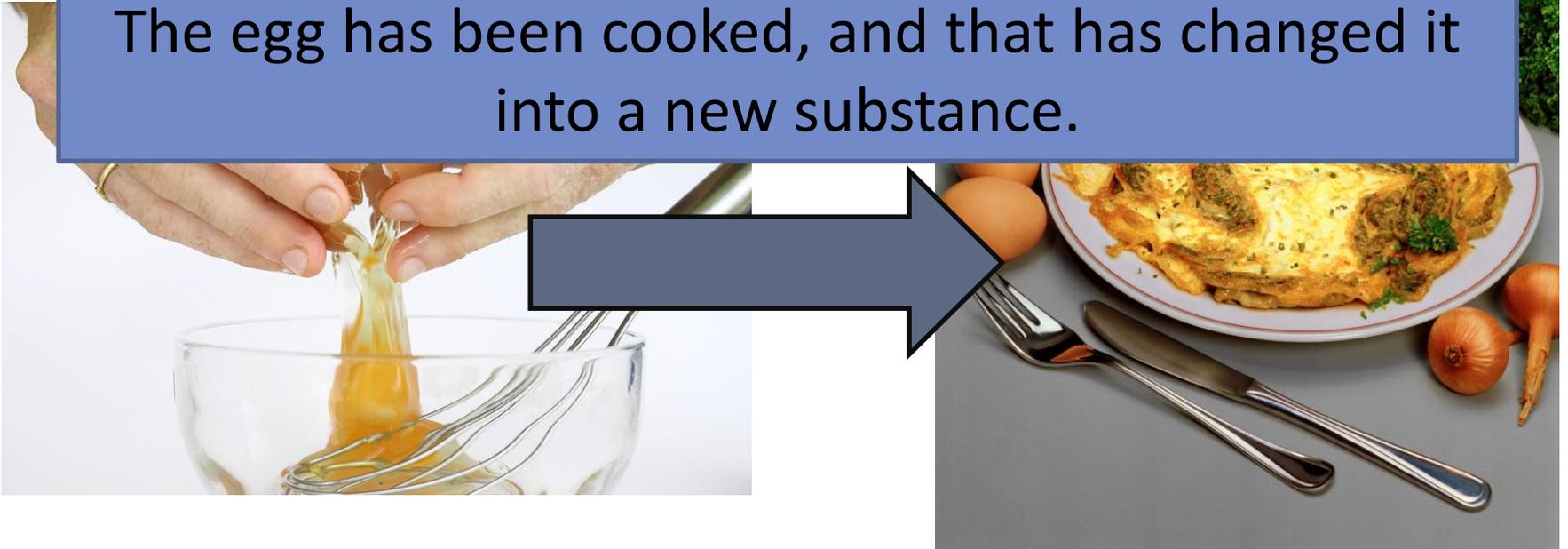
The ingredients for ice cream are mixed and cooled in a machine. The ice cream has the same chemical structure when it was a liquid as it does when it is a solid.



{ Phases of Matter }

Chemical

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



On your desk, place the “**Physical Change**” card to your left and the “**Chemical Change**” card to your right. Using what you know about physical and chemical changes, place each card into the correct category. Record your data in the chart below.

Physical Change	Chemical Change



Analysis:

- 1. Were there any cards you had trouble classifying? Why/Why not?**
- 2. Give an example of a physical change that was not listed above.**
- 3. Give an example of a chemical change that was not listed above.**

Conclusion: 2-3 complete sentences on what you learned.

- 
- ▶ Get out your t-chart from yesterday. Be ready to check your answers. Also, get the sheet from the desk and write your name on it.

Answers:

Physical Changes	Chemical Changes
Mowing the lawn	Toast
Cracking an Egg	Roasting Marshmallows
Boiling Water	Frying an Egg
Fresh Lemonade	Baking a Cake
Glass Breaking	Digesting Food
Ice Melting	Fireworks
Slicing Bread	Rusty Nails
	Lighting a Match

- 
- ▶ <http://studyjams.scholastic.com/studyjams/jams/science/matter/properties-of-matter.htm>



- Draw a picture of a physical change and a chemical change in the boxes below. Make sure your picture is not an example mentioned on this sheet. Under your pictures, describe what is happening and give reasons for your answers.

More Examples:

Physical Changes	Chemical Changes
[Redacted]	[Redacted]
[Redacted]	[Redacted]