How are physical and chemical properties different?

S8P1d. Distinguish between physical and chemical properties of matter as physical (i.e., density, melting point, boiling point) or chemical (i.e., reactivity, combustibility)

Activating Strategy 1: An Accurate Description

Properties of a Cookie Activity

[Or Use Activating Strategy 2]

Activating Strategy 2: An Accurate Description

Display several objects that have differences in color, odor, texture, size, shape, and state.

Allow students to examine the objects. Then, ask them to describe each object in terms of its color, odor, texture, size, shape, and state.

Why it is important to use a variety of properties when describing objects?

Use the Physical and Chemical Properties of Matter Notes to record important information in the lesson

Physical & Chemical Properties of Matter Name _____ Date _____

1. A substance has _____ which are _____.

2. Properties can be classified as _____.

3. Physical properties of matter are _____
_____.

4. Some Physical Properties Include: _____
_____

5. Explain why changes in state of matter [melting, boiling, freezing, condensing] are considered physical properties. _____
_____

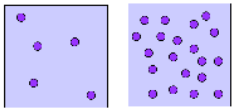
6. Describe the Physical Property of Solubility. _____
_____

7. Describe the Physical Property of Conductivity. _____
_____

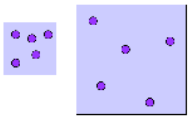
8. Density is _____.

9. Explain why a golf ball has a greater density than a table-tennis ball. _____
_____

10. Which square is more dense? Why?
_____
_____



11. Which square is more dense? Why?
_____
_____



Properties of Matter

- **The properties of a substance are those characteristics that are used to identify or describe it**
- A substance has characteristic properties which are independent of the amount of the sample [simply speaking, it doesn't matter how much of the substance you have, these properties are the same]
- Properties can be classified as Physical or Chemical

Physical Properties of Matter

- **Properties that are observable, measurable, and will keep the same composition (nothing new is created)**
- Some Physical Properties include:

Color	**Luster**	Solubility
Size	**Hardness**	Conductivity
Odor	**Condensing**	**Boiling point**
Density	**Melting point**	

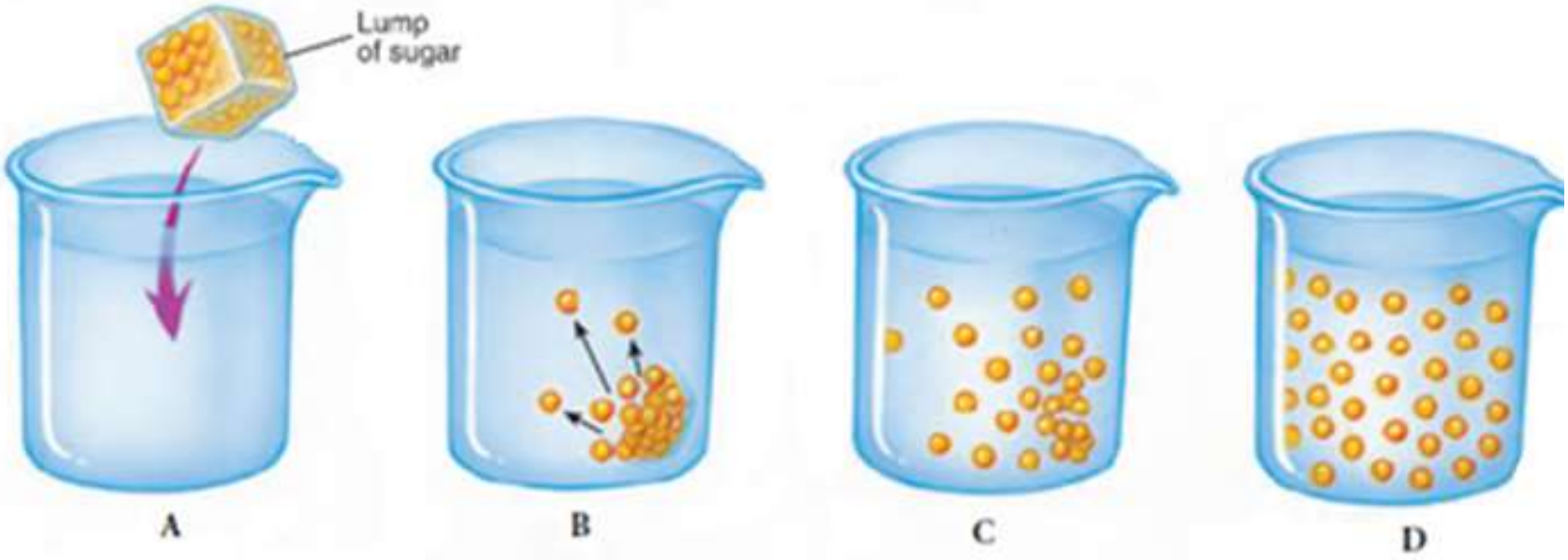
Physical Properties of Matter

- Some physical properties are easier to understand than others such as Color, Size, Odor, Luster (Shine), and Hardness

- Changes in state of matter such as melting, boiling, freezing, and condensing do not create a new substance and retain their original composition and is therefore a physical property

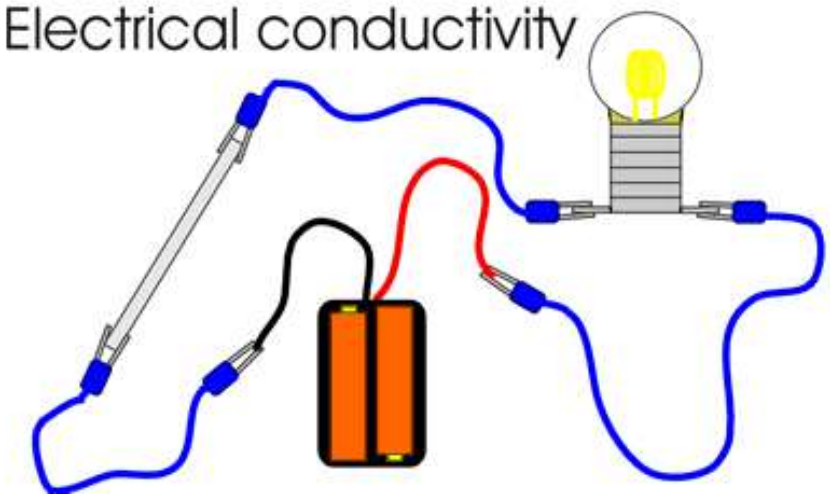
Physical Properties of Matter: Solubility

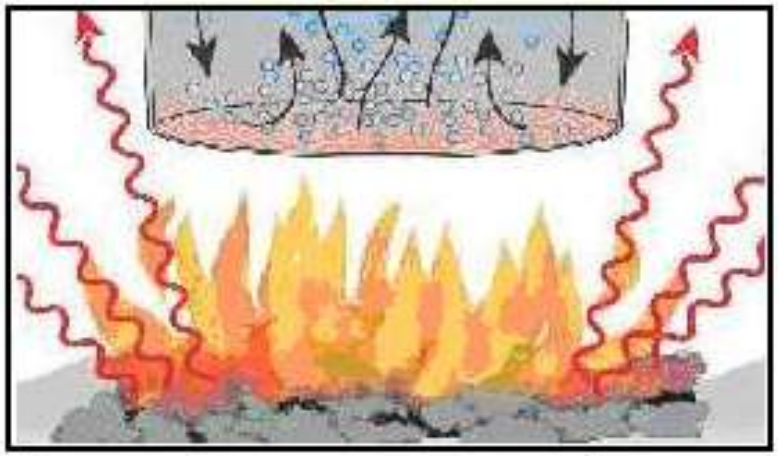
Solubility is **the ability of a substance to dissolve in another substance. Flavored drink mix dissolves in water.** Or, as the image shows, a **lump of sugar dissolving in water.**



Physical Properties of Matter: Conductivity

Conductivity is **the ability to conduct or transmit heat, electricity, or sound.**





Physical Properties of Matter: Density

- Density is **the amount of matter (mass) in a given space (volume)**
- Density equals Mass divided by Volume (**D=M/V**)
- For example, a golf ball and a table-tennis ball have similar volumes. But a golf ball has **more mass** than a table-tennis ball does. So, the golf ball has a **greater density**.

Physical Properties of Matter: Density of Solids

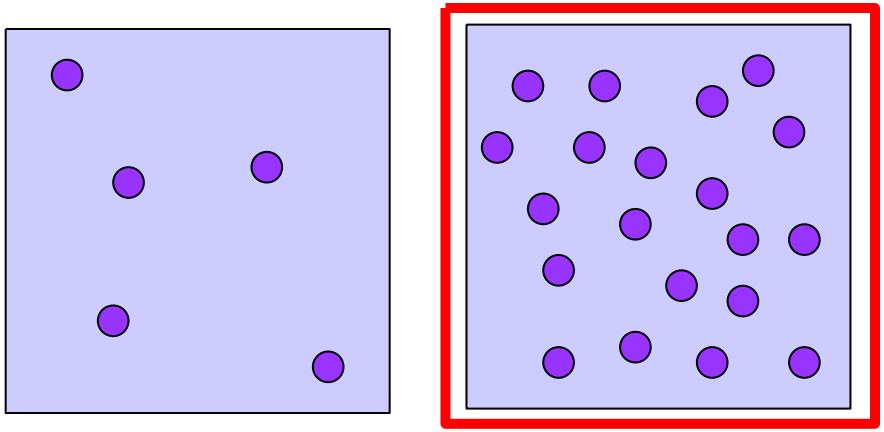
Which would you rather carry around all day: a kilogram of lead or a kilogram of feathers?

At first, you might say feathers. But both the feathers and the lead have the same mass. However, the lead would be less awkward to carry around than the feathers would. Why?

The feathers are much less dense than the lead. So, it takes a lot of feathers to equal the same mass of lead.

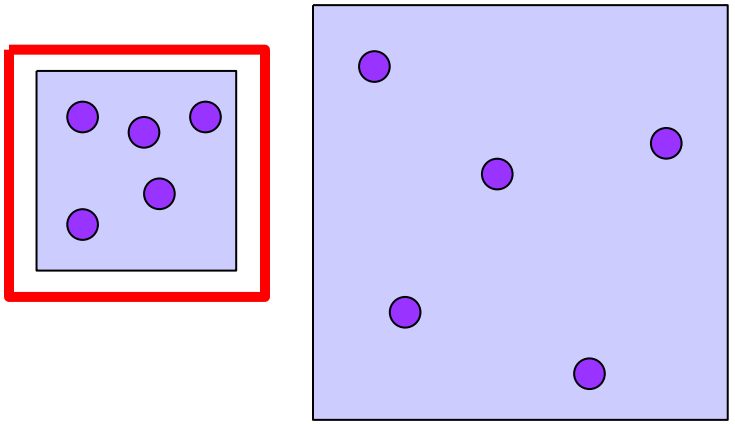
Physical Properties of Matter: Density of Solids

Which square is more dense? Why?



There are more particles (matter) for the same space (volume)

Which square is more dense? Why?



The smaller square has the same number of particles, but in a smaller space (volume)

Physical Properties of Matter: Density of Solids

- Knowing the density of a substance can also tell you if the substance will float or sink in water.
- **If the density of an object is less than the density of water (1), the object will float.** Likewise, a **solid object whose density is greater than the density of water will sink** when the object is placed in water.
- Explore the Density of Solids and Water using the PhET simulation on density and buoyancy

Physical Properties of Matter: Density of Liquids

- Like all substances, **liquids have different densities**
- It is easy to see the differences in the density of liquids because **more dense liquids will sink and less dense liquids will rise**
- **If you pour together liquids that don't mix and have different densities, they will form liquid layers.**
- Making Liquid Layers: http://www.youtube.com/watch?v=-CDkJuo_LYs

Physical Properties of Matter: Density of Liquids

- Check out this picture. Which layer has the highest density?
- Which layer has the lowest density?
- Imagine that the liquids have the following densities:

  $10 g/cm^3$ $3 g/cm^3$

  $6 g/cm^3$ $5 g/cm^3$

- Which number would go with which layer?

Physical Properties of Matter: Density of Liquids

Try with your neighbor!

- Which liquid has the highest density?
- Which liquid has the lowest density?
- Which liquid has the middle density?

Physical Properties of Matter: Density of Liquids

Try on your own!

- Imagine that the liquids on the right have the following densities:

  $15 g/cm^3$ $10 g/cm^3$

  $3 g/cm^3$ $9 g/cm^3$

  $7 g/cm^3$ $12 g/cm^3$

- Match the colors to the correct densities.

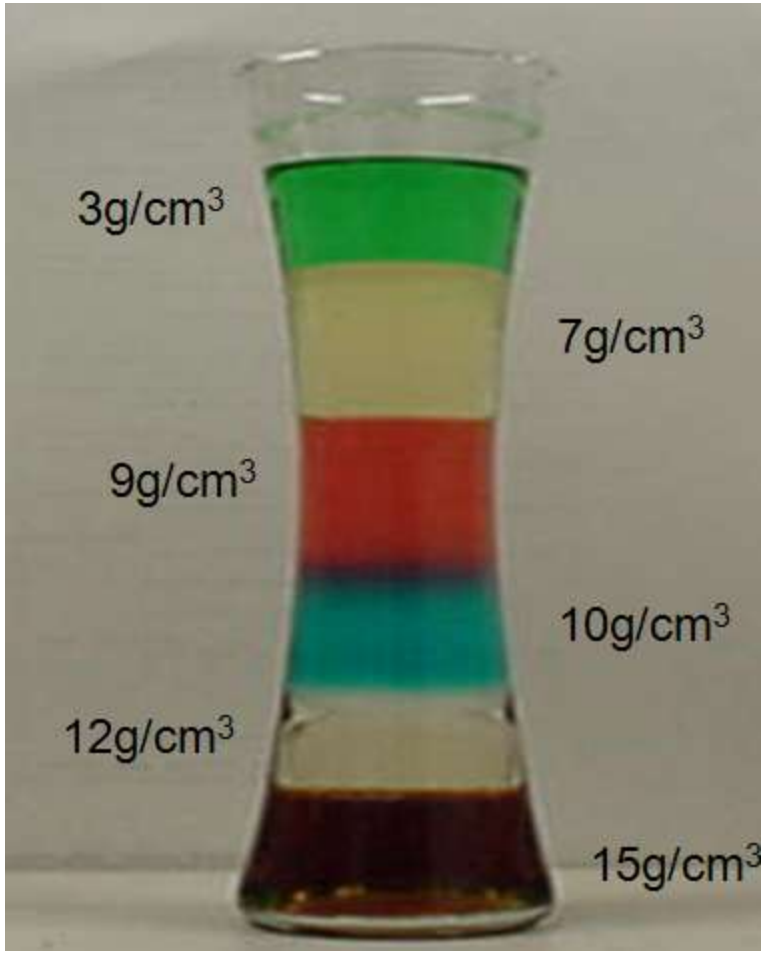
Physical Properties of Matter: Density of Liquids

Try on your own!

- Imagine that the liquids on the right have the following densities:

$15 g/cm^3$	$10 g/cm^3$
$3 g/cm^3$	$9 g/cm^3$
$7 g/cm^3$	$12 g/cm^3$

- Match the colors to the correct densities.



Physical Properties of Matter Lab(s)

[see resources for suggestions or use your own]

How would you describe a piece of wood before and after it is burned? Has it changed color? Does it have the same texture?

The original piece of wood changed, and physical properties alone cannot describe what happened to it.

Chemical Properties of Matter

- Chemical properties **are only observable during a chemical reaction and allows for change (something new is created)**
- The property is **the ability to change** whereas the change is the action itself
- Some chemical properties include: Reactivity, Combustibility, **Flammability**

Chemical Property of Matter: Reactivity

- Reactivity describes **how easily something reacts with something else**
- Reactivity can also be described as the **ability of a substance to combine with another substance and form a new substance**

Chemical Property of Matter: Combustibility

- Combustibility is **a substance or material that is able or likely to catch fire and burn**
- Flammability is often described as a chemical property as well. **Flammability occurs at a lower temp than combustibility**
- Video clip showing various combustion reactions
- Whoosh Bottle Combustion Reaction video clip

Distributed Summarizing:

Physical and Chemical Properties Sorting Activity

Summarizing Strategy

Physical and Chemical Properties of Matter Quad Clusters