

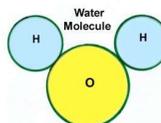
Bellringer:

1. What do you know about matter?
2. Physical Science contains physics and chemistry. Name 3 things in the room that need physics and/or chemistry to create.
3. STOTD

Properties and States of Matter



Chapters 2 and 3



Classifying Matter

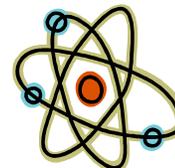
Matter

- Anything that has mass and takes up space
- Matter can be classified into 2 categories:
 1. **Pure Substances**
 - Always has the **exact same composition**
 - **Not easily separated**
 - Ex) Gold and Table Salt
 2. **Mixtures**
 - **Can change composition**
 - **Easily separated**
 - Ex) Salt Water and Sand

end

Classifying Matter-Pure Substance

- **Pure Substance**
 - Matter that always has the **exact same make-up**
 - Are either **Elements** or **Compounds**
 - Ex: water, gold



end

Classifying Matter- Pure Substance

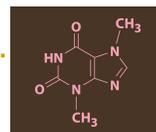
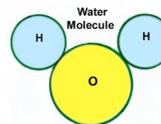
- **Element**
 - **Cannot be broken down** into simpler things
 - Made of the **Same Atoms**
 - On the Periodic Table
 - Ex: Gold (Au)



end

Classifying Matter- Pure Substance

- **Compound**
 - **Can be broken down** into simpler things
 - Made of **Different Atoms**
 - Atoms always combine the same way
 - Ex: Water (H₂O)



←Chocolate molecule, YUM!

end

Classifying Matter- Mixture

- Mixtures
 - **At least 2 elements** mixed in different amounts
 - Can be easily separated
- Mixtures can be categorized into 2 categories
 - Homogeneous
 - A mixture that looks the same throughout
 - Also called a solution
 - Heterogeneous
 - A mixture where you can see the differences
 - Sometimes separates into layers



end

Pure Substance vs. Mixture

- Classify the following as either a **Pure Substance** or a **Mixture**

| | | |
|-----------------|----------------|-------------|
| Sodium | Carbon Dioxide | Ice Cream |
| Water | Cake Batter | Nitrogen |
| Soil | Air | Eggs |
| Coffee | Soup | Blood |
| Oxygen | Iron | Table Salt |
| Rubbing Alcohol | Salt Water | Nail Polish |

end

Homogeneous vs. Heterogeneous

- Classify the following as either a **Homogeneous** or a **Heterogeneous** Mixture

| | | |
|--------------|----------------------|-----------------|
| Flat Soda | Rocky Road Ice cream | Salad Dressing |
| Sugar | Soil | Aluminum Foil |
| Black Coffee | Sugar Water | City Air |
| Paint | | stainless steel |
| Beach Sand | Pure Air | Salsa |

end

Bellringer:

1. Matter can be categorized into many different categories. Can you tell me what they are?
2. Classify the following as either a **Homogeneous** or a **Heterogeneous** Mixture
 - Flat Soda
 - Salad Dressing
 - Soil
 - Black Coffee
 - Sugar Water
 - City Air
 - Paint
 - Beach Sand
 - Salsa
3. STODT

Classifying Matter- Mixtures

- Suspension
 - **Separates** into layers over time
 - Ex: Salad Dressing, Paint
 - "Shake well before using"
- Colloid
 - **Does not separate** into layers
 - Ex: Milk (from the store), Fog

end

Separating Mixtures

- Filtration
 - Separates based on the size of their **particles**
 - Using a coffee filter
- Distillation
 - Separates a solution based on **boiling points**

end

Physical Properties

- Physical property
 - Something observed/measured **that Does NOT change the material**
 - 8 physical properties you need to know:

end

Physical Properties

1. Conductivity

Ability to allow heat/electricity to flow
Iron = good rubber = bad



2. Malleability

Solid's ability to be hammered without shattering
Gold = very glass = not



3. Ductility

Solid's ability to be drawn into a wire
Copper = very carbon = not

end

Physical Properties

4. Luster

How a substance reflects light
Aluminum = high Dirt = low



5. Melting Point

Temp. from a solid to a liquid

6. Boiling Point

Temp. from a liquid to a gas



end

Physical Properties

7. Density (D)

- How tightly packed atoms are in a substance

$$\text{Density (g/mL or g/cm}^3\text{)} \rightarrow D = \frac{m \text{ (g)}}{V \text{ (mL or cm}^3\text{)}}$$

- Units are either g/mL or g/cm³
 - Remember: 1 mL = 1 cm³ !!!
- Things that are **more dense** will sink, Things that are **less dense** will float

end

Chemical Properties

- Chemical property
 - Something observed/measured that **changes the substance into something else.**
 - 2 chemical properties you need to know
- 1. Flammability
 - Ability to burn in the presence of oxygen (**Make Fire!**)
 - Different Elements = Different Colors (**Fireworks!**)
- 2. Reactivity
 - How quickly a substance combines with another



end

Bellringer:

Classify the following types of matter (tell me everything you can):

- Sugar dissolved in water
- Potassium
- Dish soap
- Salad dressing
- Air
- **Safety tip of the day**

Physical vs. Chemical Changes

- Physical Change
 - Some properties change,
 - but **the substance is still the same**
 - Ex: Ripping Paper, Ice Melting
- Chemical Change
 - A reaction **forms new substances**
 - Ex: Burning Paper, Making Silly Putty



end

Physical vs. Chemical Changes

■ Evidence of a chemical change:

1. Change in color
Ex) Copper roof turns green
2. Production of a gas
Ex) See bubbles or starts to smell
3. Formation of a precipitate
-Forms a solid
4. Temperature change
5. Production of light



end

Behavior of Matter

- Kinetic Theory of Matter
 - All particles of matter are **in constant motion**
 - The **amount of motion** determines the State of Matter (Phase of Matter)
 - Solid, Liquid, Gas

end

States of Matter- Solids

- Solid
 - Has a **fixed shape** and a **fixed volume**
 - Particles are **extremely attracted** to each other
 - Particles are very close together and vibrate



end

States of Matter- Liquid



- Liquid
 - Has **No fixed shape** but has a **fixed volume**
 - Takes the shape of the container
 - Particles are free to move around, but are **slightly attracted to each other**

end

States of Matter- Gas

- Gas
 - Has **No fixed shape** and has **No fixed volume**
 - Takes the shape and volume of the container
 - Spreads out to fill all of the space
 - Particles move so fast that they are **not attracted to each other**



end

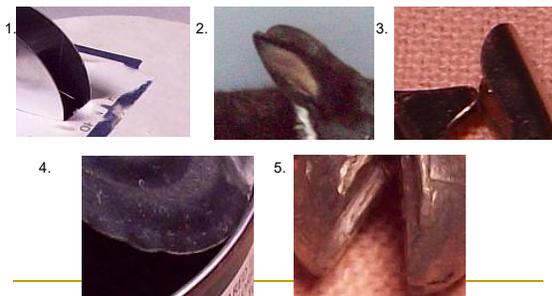
Categorizing Matter STATION Activity

Bellringer:

1. What are the 5 evidences of a chemical change?
2. How can you use the kinetic theory of matter to describe:
 - A. Solids
 - B. Liquids
 - C. Gases
3. STOTD

Bellringer: 10/21/2016

Number your paper 1-5 and with a partner see if you can determine what the following magnified photos are.



The Answers:



Classifying Matter Nature Walk PART 1

- We will visit 4 areas around the school.
- In each area you will do the following:
 1. Identify a piece of matter
 2. Classify the matter as Pure Substance or Mixture
 3. Further classify the matter as either: Element/Compound OR Homo/Hetero

Classifying Matter Nature Walk PART 2

1. Find an example of a CHEMICAL change and explain how you know the object is going through a chemical change.
2. Find an example of a PHYSICAL change and explain how you know the object is going through a chemical change.
3. Find 4 examples of a solid.
4. Find 4 examples of a liquid.
5. Find 2 examples of a gas.

How to collect the data:

| Matter | Location | Pure/Mixture | Element/Compound | Homo/Hetero |
|--------|----------|--------------|------------------|-------------|
| 1. | | | | |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |

| CHEMICAL Change Example w/ Explanation | PHYSICAL Change Example w/ Explanation | 4 Solids | 4 Liquids | 2 Gas |
|--|--|----------|-----------|-------|
| | | | | |

Bellringer: 10/24/2016

Can you unscramble all the words below?
Hint: They all start with the letter A.

- IDAC** 1. I have a pH less than 7.
- RAI** 2. I am composed mostly of nitrogen.
- MAOT** 3. I am made of protons, neutrons, and electrons.
- NUATRTOSA** 4. I like my space.
- MNSIALA** 5. Zoologists study us.

The answers are ...

- ACID** 1. I have a pH less than 7.
- AIR** 2. I am composed mostly of nitrogen.
- ATOM** 3. I am made of protons, neutrons, and electrons.
- ASTRONAUT** 4. I like my space.
- ANIMALS** 5. Zoologists study us.

Review of Matter and States of Matter

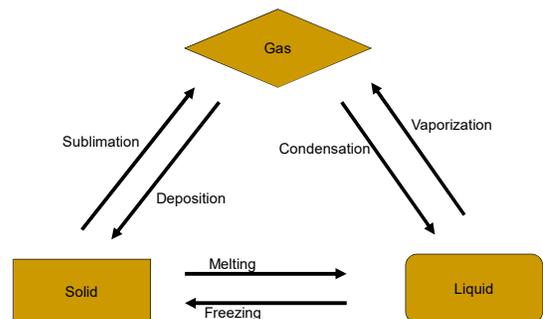
- What is Matter?
- Classifications of Matter
- Kinetic Theory of Matter
- Solids
- Liquids
- Gases

Changes of State (Phase Changes)

- Phase Change
 - A reversible physical change
 - A substance goes from 1 state of matter to another
 - 6 common phase changes

end

Changes of State (Phase Changes)



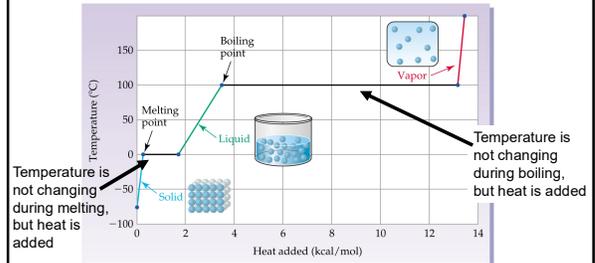
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Changes of State- Energy

- When you heat something up you give it energy
 - And the temp. goes up
- UNTIL it changes to another state!
 - During a phase change, **the temperature stays the same.**
 - The heat you add **breaks the attraction** between particles and **pushes them away** from each other

end

Changes of State- Energy



end

Changes of State- Energy

- If you have to **add energy**, the phase change was **endothermic**
 - Melting, Vaporization, Sublimation
- If you have to **take away energy**, the phase change was **exothermic**
 - Freezing, Condensation, Deposition

end

Bellringer:

1. What does endothermic mean?
2. Which of the 6 phase changes are endothermic?
3. STOD

States of Matter- Other

- Plasma
 - Exists at **high temperatures** and **high pressure**
 - Stars
- Bose-Einstein Condensate (BEC)
 - Exists near **absolute zero** at very **low pressures**
 - Solid acts as a single particle

end

Changes of State- Melting and Freezing

- Melting
 - **Some molecules** in a **solid**, **gain energy** to **overcome attractive forces** to become a **liquid**
- Freezing
 - **Some molecules** in a **liquid**, start to **slow down** and **become attracted** to each other as a **solid**



end

Changes of State- Vaporization and Condensation



- Vaporization
 - **Some molecules** in a **liquid**, **gain energy** to **overcome attractive forces** to become a **gas**
 - Heat of Vaporization
 - The amount of energy needed to move from a liquid to a gas
 - Evaporation
 - Changing a liquid to a gas at temperatures below the boiling point
 - Spilled water "disappears" after a few hours

end

Changes of State- Vaporization and Condensation

- Condensation
 - **Some molecules** in a **gas**, start to **slow down** and **become attracted** to each other as a **liquid**
 - The outside of your cold drink, on a hot day



end

Changes of State- Sublimation and Deposition

- Sublimation
 - **Some molecules** in a **solid**, **gain energy** to **overcome attractive forces** to go to a **gas**
 - Dry Ice (carbon dioxide)
- Deposition
 - **Some molecules** in a **gas**, start to **slow down** and **become attracted** to each other as a **solid**
 - Frost on cold windows



end