

Chemical & Physical Properties

PS 3.1 Distinguish chemical
properties of matter from physical
properties of matter.

Physical Property

- What is a physical property?
- Name some physical properties of a classmate in the room?
- What would be a physical property of this seagull?



Physical Property

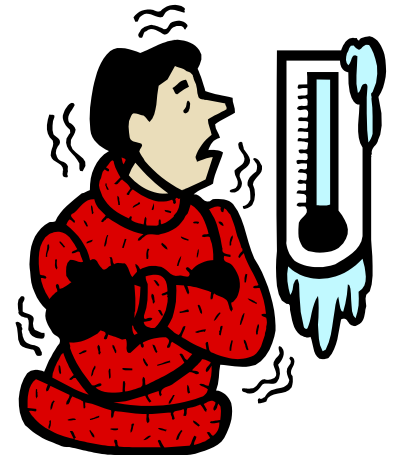
- Characteristic of the substance that can be observed directly or measured with a tool without **changing the composition of the substance.**
- Can you name a physical property?

Types of Physical Properties

1. Boiling Pt., Freezing pt., Melting Pt.
2. Density
3. Solubility
4. Viscosity
5. Conductivity

Boiling Point, Freezing Point, Melting Point

- A **measurement of temperature** in which these changes occur.
- Composition does not change
 - When the phase change occurs
 - Ex: water freezing to ice
 - When temperature is measured



Density

- Mass of a substance per unit volume.
 - Density is always the same no matter how big or small your sample is
 - Ex. The density of ice is the same whether you have a small amount or large amount

Density

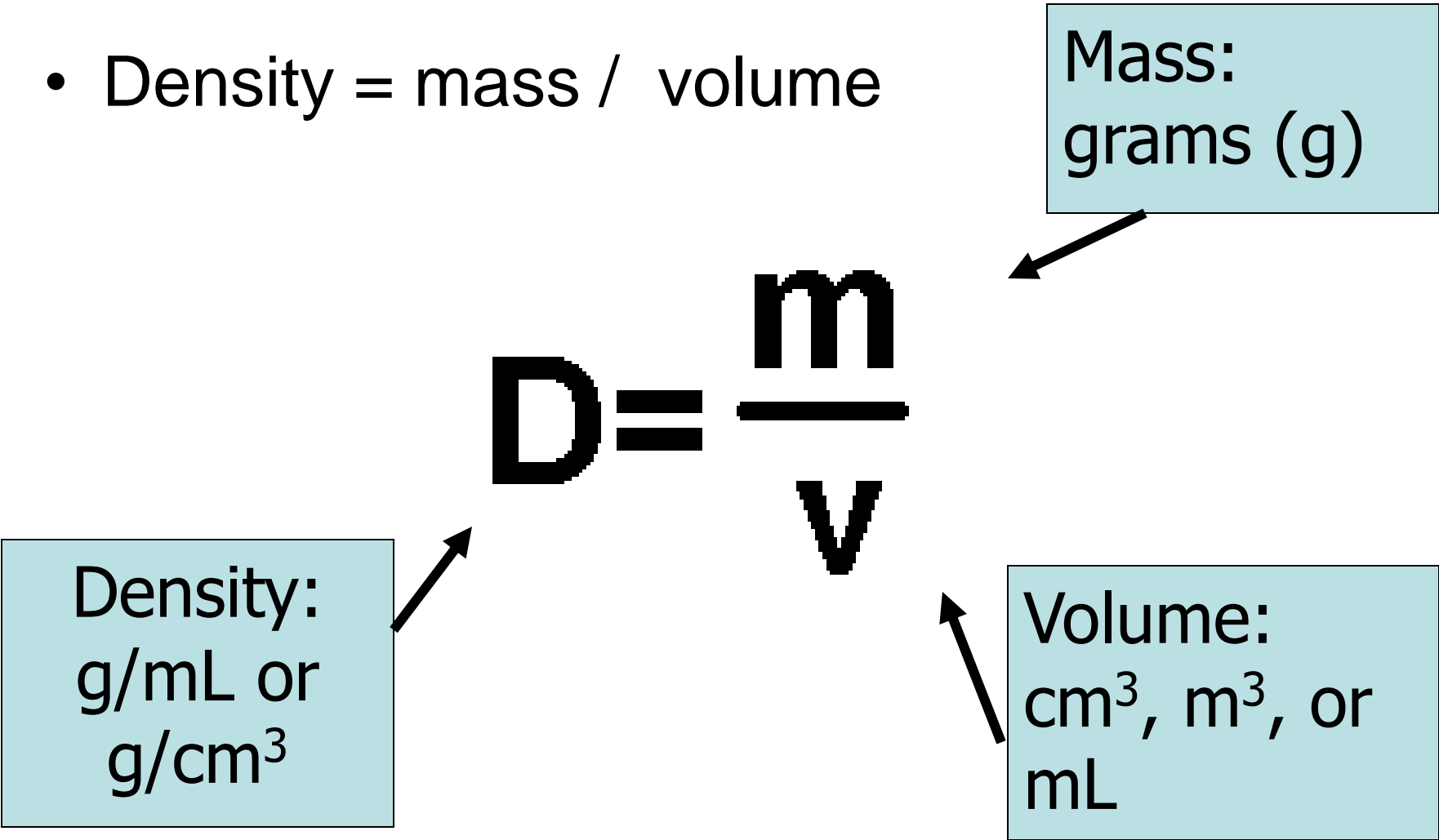
- Substances change density when a phase change takes place.
 - Ex: If you freeze water, it becomes less dense which is why ice floats.
- The composition of a substance does not change when mass and volume are measured to calculate density.

Density

- Density = mass / volume

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

Mass:
grams (g)



Density:
g/mL or
g/cm³

Volume:
cm³, m³, or
mL

Solubility

- A substance is soluble in a solvent if it will dissolve in that solvent.
 - Solute → Substance being dissolved.
 - Solvent → The dissolving medium.
 - Example: Salt being dissolved in water.



Solubility

- Saturated solution → The maximum mass of the solute is dissolved in the solvent at a particular temperature.
- **How would you know you had a saturated solution?**
- The components of the mixture do not chemically combine to form a new substance. Each keep their own properties.

Viscosity

- Measure of a materials resistance to flow.
 - High-viscosity fluids take longer to pour than low-viscosity fluids.
 - Example: Maple syrup vs. water



Viscosity

- **How could the viscosity of a liquid be changed?**
- Changes with temperature.
- Composition of fluid does not change when poured.

Electrical Conductivity

- Ability of a solid to act as a conductor or insulator in an electric circuit.
- Conductors → Metals have high conductivity which allows current to flow easily through them.
- Insulators → Most nonmetals have low conductivity and do not allow current to flow through them.

Electrical Conductivity

- Some solutions can conduct electricity but is dependent upon the solute.
 - Electrolytes → Solutes that dissolve in water and result in a solution that allows a current to flow easily.
 - Electrolyte solutions contain ions.

Chemical Property

- The ability of a substance to undergo, or not undergo, a change that will alter the composition of the original substance.
- **Can you name a chemical property?**

Types of Chemical Properties

1. Combustibility or Flammability
2. Oxidation
3. Corrosion
4. Decomposition
5. Reaction with Acids

Combustibility or Flammability

- Oxidation reaction that releases heat and light. (burning something)
- Carbon reacting with oxygen to form carbon dioxide.
 - Example: Burning charcoal.
- Hydrocarbons reacting with oxygen to form carbon dioxide and water vapor.
 - Example: Burning of fossil fuels

Oxidation

- When a substance combines with oxygen to form a new substance with new properties.
- Iron reacting with oxygen to form iron (III) oxide. → Iron rusting

Corrosion

- Process by which metals naturally combine with O, S, or other nonmetals; new substance is a combination of a metal and a nonmetal.
 - Decaying or destruction of material due to environment
- Silver reacting with sulfur to form silver sulfide. → Silver tarnishing

Decomposition

- Hydrogen peroxide decomposing (breaking down) into water and hydrogen gas when exposed to light.

Reaction with Acids

- Zinc reacts with hydrochloric acid to form zinc chloride and hydrogen gas.

No reaction

- Gold used in jewelry does not react in most scenarios.

Quiz

- Be prepared for a quiz on wed/thurs.
- It will be on density, physical and chemical properties.