

Chapter 1

The Properties of Matter



Section 1: What Is Matter?

Section 2: Physical Properties

Section 3: Chemical Properties

Section 1

What Is Matter?



Matter

- **A Universe Full of Matter** Matter is anything that has mass and takes up space. It's that simple! Everything in the universe that you can see is made up of some type of matter.

Section 1

What Is Matter?



Matter and Volume

- **Liquid Volume** Liters (L) and milliliters (mL) are the units used most often to express the volume of liquids.
- **Measuring the Volume of Liquids** In your science class, you'll probably use a graduated cylinder instead of a measuring cup to measure the volume of liquids.

Section 1

What Is Matter?



Matter and Volume *continued*

- **Volume of a Regularly Shaped Solid Object** The volume of any solid object is expressed in cubic units.
- **Volume of an Irregularly Shaped Solid Object** You can measure the volume of any solid object by measuring the volume of water that the object displaces.

Section 1

What Is Matter?



Matter and Mass

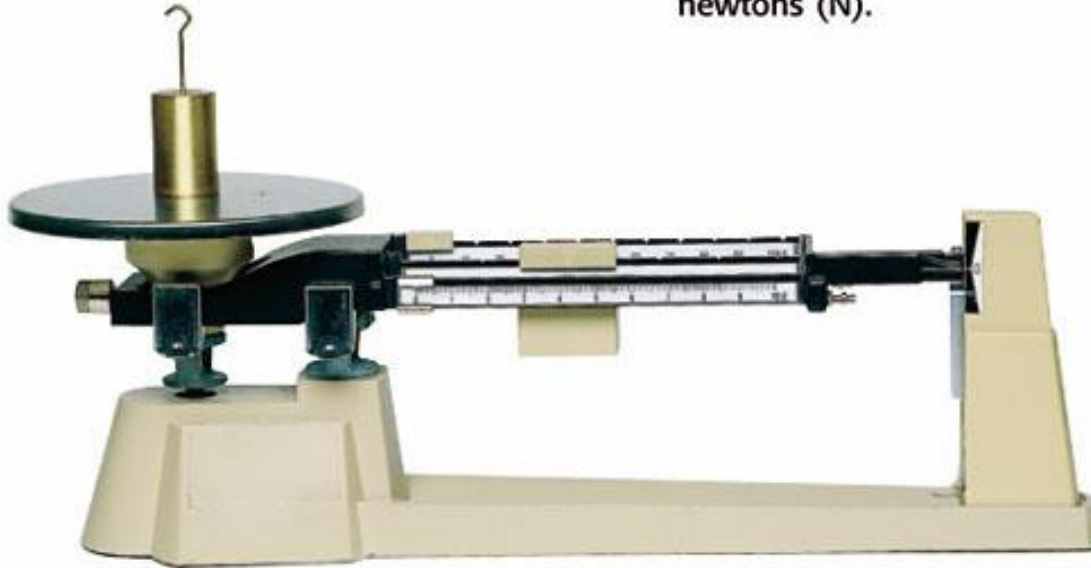
- **The Difference Between Mass and Weight** Weight is a measure of the gravitational force exerted on an object. Mass is the amount of matter in an object. The differences between mass and weight are shown on the next slide.
- **Measuring Mass and Weight** The SI unit of mass is the kilogram (kg), but mass is often expressed in grams (g) and milligrams (mg), too. Weight is a measure of gravitational force and is expressed in the SI unit of force, the newton (N).

Section 1

The Difference Between Mass and Weight

Mass

- Mass is a measure of the amount of matter in an object.
- Mass is always constant for an object no matter where the object is located in the universe.
- Mass is measured by using a balance (shown below).
- Mass is expressed in kilograms (kg), grams (g), and milligrams (mg).



Weight

- Weight is a measure of the gravitational force on an object.
- Weight varies depending on where the object is in relation to the Earth (or any large body in the universe).
- Weight is measured by using a spring scale (shown at right).
- Weight is expressed in newtons (N).



Section 1

What Is Matter?



Inertia

- **What Is Inertia?** Inertia is the tendency of an object to resist a change in motion.
- **Mass: The Measure of Inertia** Mass is a measure of inertia. An object that has a large mass is harder to get moving and harder to stop than an object that has less mass.

Section 2

Physical Properties



Physical Properties

- **Identifying Matter** You use physical properties every day. For example, physical properties help you determine if your socks are clean (odor), if your books will fit into your backpack (volume), or if your shirt matches your pants (color).
- **Density** Density is the amount of matter in a given space, or volume.
- **Liquid Layers** If liquids of different densities are carefully poured into a cylinder, the liquids will separate into layers because of the differences in density.

Section 2

Physical Properties



Physical Properties *continued*

- **Density of Solids** Knowing the density of a substance can tell you if the substance will float or sink in water. If the density of an object is less than the density of water, the object will float.
- **Solving for Density** Density equals mass divided by volume.
- **Using Density to Identify Substances** Density is a useful physical property for identifying substances. Each substance has a density that differs from the densities of other substances.

Section 2

Physical Properties



Physical Changes Do Not Form New Substances

- **Examples of Physical Changes** Freezing water to make ice cubes and sanding a piece of wood are examples of physical changes.
- **Matter and Physical Change** Physical changes do not change the identity of the matter involved.

Section 3

Chemical Properties



Chemical Properties

- **Comparing Physical and Chemical Properties** Physical properties are easy to observe. Chemical properties, however, aren't as easy to observe. For example, you can see that wood is flammable only while it is burning.
- **Characteristic Properties** The properties that are most useful in identifying a substance are characteristic properties. These properties are always the same no matter what size the sample is.

Section 3

Chemical Properties



Chemical Changes and New Substances

- **What Happens During a Chemical Change?** A chemical change happens when one or more substances are changed into new substances that have new and different properties. Examples of chemical changes are shown on the next slide.
- **Signs of Chemical Changes** Signs that indicate a chemical change include a change in color or odor, production of heat, fizzing and foaming, and sound or light being given off.
- **Matter and Chemical Changes** Chemical changes change the identity of the matter involved.

Section 3

Examples of Chemical Changes



The **hot gas** formed when hydrogen and oxygen join to make water helps blast the space shuttle into orbit.



Soured milk smells bad because bacteria have formed new substances in the milk.



Effervescent tablets bubble when the citric acid and baking soda in them react in water.



The **Statue of Liberty** is made of orange-brown copper but it looks green from the metal's interaction with moist air. New copper compounds formed and these chemical changes made the statue turn green over time.

Section 3

Chemical Properties



Physical Versus Chemical Changes

- **A Change in Composition** Physical changes do not change the composition of a substance. But chemical changes do alter the composition of a substance.
- **Reversing Changes** Many physical changes are easily reversed. They do not change the composition of a substance. But composition does change in a chemical change. So, most chemical changes are not easily reversed.

Chapter 2

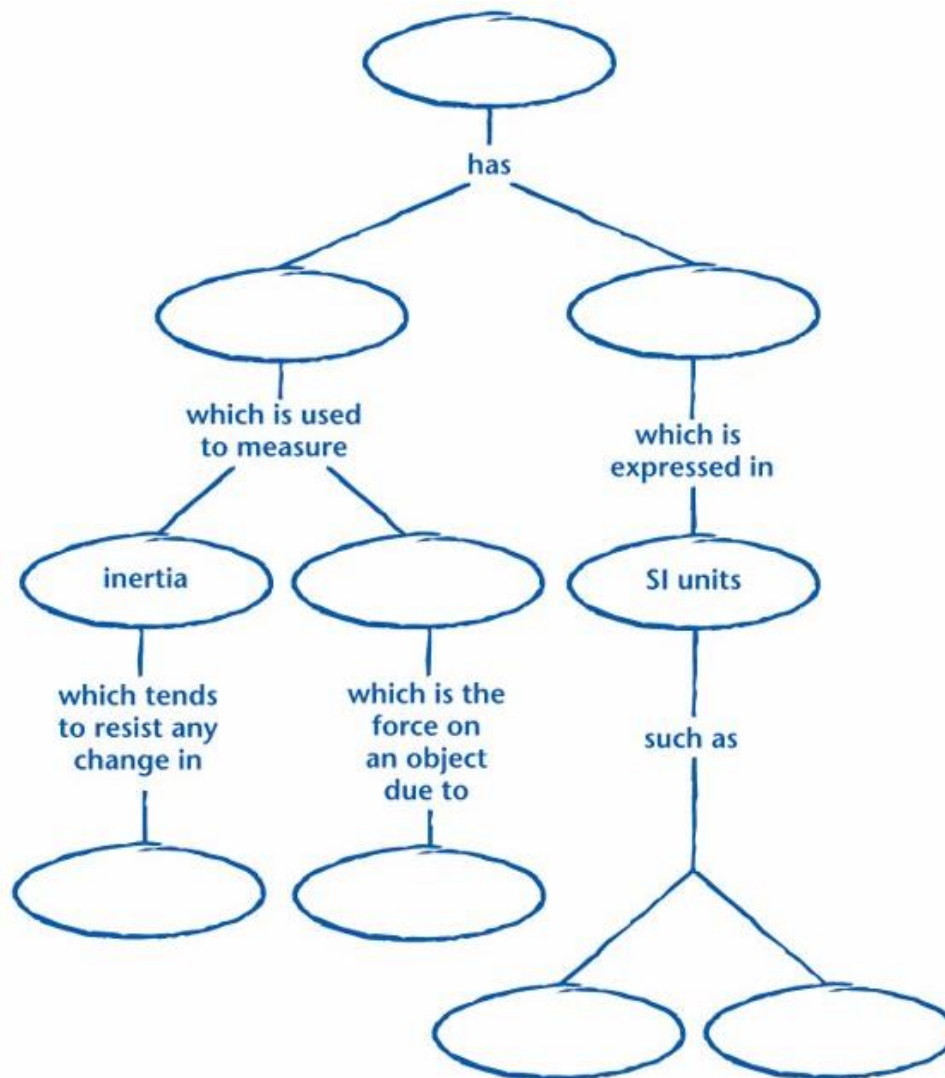
The Properties of Matter



Concept Map

Use the following terms to complete the concept map on the next slide: weight, millimeters, mass, cubic centimeters, matter, motion, volume, gravity.

Chapter 2 Concept Map



Chapter 2 Concept Map

