

Unit 4 Guided Notes

Matter

Science Starter

1. What is a unit for volume?
2. How do you measure density?
3. What instrument can you use to measure temperature?

Physical Properties of Matter

Matter:

Physical Properties

Any characteristic of a material that can be _____ or _____ without changing the _____ of the material

Physical Properties

Examples:

- _____
- odor
- shape
- _____
- texture
- _____
- _____
- _____
- hardness
- melting points and boiling points
- _____
- Ductility

Take Five -- Vocabulary

- Viscosity: _____
- Malleability: the ability of a solid to be _____ without shattering
- Conductivity: material's ability to allow _____ or electric _____ to flow
- Ductility: _____
- Density: the ratio of _____ to _____

Physical Changes

Properties of a material change, but the substances in the material remain the same---

- _____ your hair
- _____ fruit
- _____ or boiling water
- Steaming clothes to remove wrinkles

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Chemical Properties

Chemical Property:

Chemical properties can only be observed when the substance in a sample of matter are _____ into different substances

Examples: _____,

Flammability

A material's ability to _____ in the presence of _____

Reactivity

How readily a substance _____ chemically with other substances

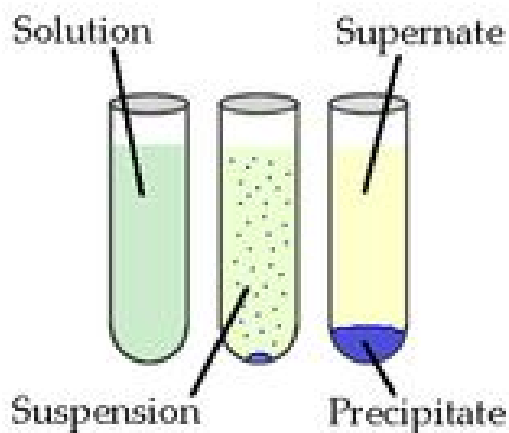
What happened in the video?

Recognizing Chemical Changes

Three common types:

- Color change
- Production of gas
- Formation of a **precipitate**

Precipitate



Definition:

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Quiz time on your own paper!

- Make a list 1-20. Determine if the following situations are a **chemical change** or a **physical change**.
- The questions are presented one-by-one through Quia on the Smartboard.
- Once you are completed, turn in your quiz for a grade!

Solids, Liquids, and Gases

States of matter:

Solids

Liquids

Gases

Materials can be classified based on whether their _____ and _____ are _____ or _____.

Kinetic Energy Review

Define-

Circle the right answer!

The faster an object moves, the **greater/lesser** its kinetic energy is.

Kinetic Theory

- The *kinetic theory of matter* says that _____ of matter are in _____.
- This theory helps to explain the _____ of solids, liquids, and gases.
- There are forces of _____ among the particles in all matter.

Solids

- _____ shape
- _____ volume

Relate to kinetic theory...

- How are the atoms of a solid moving in relation to one another?

Kinetic Theory

- The *kinetic theory of matter* says that _____ of matter are in _____.
- This theory helps to explain the _____ of solids, liquids, and gases.

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Solids and Kinetic Theory

Solids maintain a definite shape and volume because particles in a solid _____ around _____ locations.

Vibration---_____

Atoms vibrate around its location, but do _____ exchange places with other atoms.

The _____ of a particle in a _____ is the _____ of all three states of matter.

Liquids

- _____ volume
- _____ shape

More _____ atom arrangement than solids

Relate to kinetic theory...

- Particles more _____ packed than solids, but more _____ packed than gases.
- Particle _____ effects particle _____
- The _____ of a particle of a _____ is the _____ and _____ of all three states of matter.
- A liquid takes the _____ of its container because particles in a liquid can flow to new locations.
- The _____ of a liquid is constant because forces of attraction keep the particles close together.
- Forces of attraction between particles limit motion!

Gases

- _____ shape and volume
- Takes the shape and volume of its container!

The _____ of particles in a gas allows a gas to fill a container of any shape or size

Apply to kinetic theory...

Kinetic theory applied to gases:

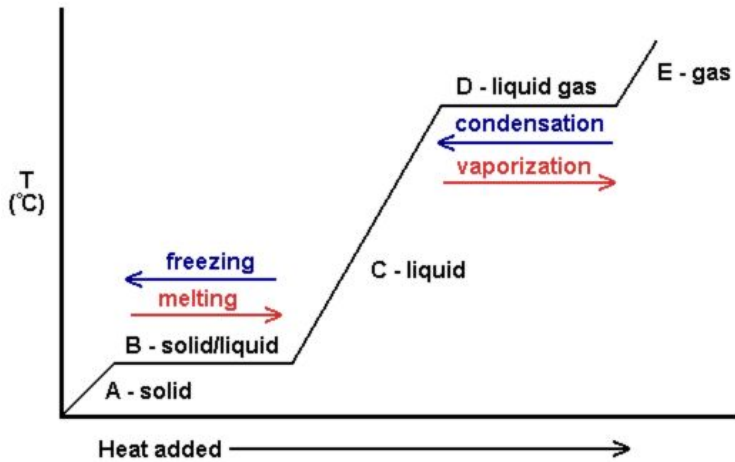
- Particles in a gas are in _____, _____ motion.
- The motion of one particle is _____ by the motion of other particles unless particles _____.
- Forces of attraction among particles in a gas can be _____ under ordinary conditions.

Heat Transfer Focus

Follow the instructions on the board. 3-4 people in Lab Groups! 1 Answer Sheet per Student!

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As heat (energy input) _____, objects undergo phase _____

Thermal Energy

A form of energy caused by the _____ of molecules of matter. It is the total _____ and _____ energy of all the particles in an object.

_____ *molecules move faster than* _____ *molecules!!!!*

Heat

The transfer of thermal energy is always _____ to _____

Work and Heat

No machine is 100% efficient!

Why?

Friction produces _____

Rub hands together!

Temperature

Temperature

The measure of how _____ or _____ something is compared to a reference point.

What are the reference points for:

Celsius (freezing point _____, boiling point _____)

Kelvin (add 273.15 to Celsius to get Kelvin!!!!!!!)

Absolute zero

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Temperature

Temperature is related to the _____ of the molecules that make up an object.

When objects heat up, their particles move _____

Moving and shaking!

Average kinetic energy increases!

Collisions determine the _____ of thermal energy (_____ ----> _____)

Hot particles move _____ --lose energy easier!

Thermal Energy

Thermal energy depends on the following properties of the object:

More mass, more thermal energy

Increase temperature, increase thermal energy

_____ (solid, liquid, gas)

Remember the phase change graph!

Thermal Contraction and Expansion

Thermal Expansion

The increase in _____ of a substance caused by the transfer of thermal energy

Particles move _____ apart as temperature increases

Examples:

_____ and Thermostat

Thermal Contraction

The _____ in size of a substance caused by the transfer of thermal energy

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- 1) What three properties affect the amount of thermal energy in an object?
- 2) In what direction does heat travel? (hot to cold or cold to hot)
- 3) What are two reference points for temperature on the Celsius scale?

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Specific Heat

The amount of heat needed to raise the temperature of one gram of a material by one degree Celsius.

Specific Heat

The **lower** a material's specific heat, the **more** its temperature rises when a given amount of energy is absorbed by a given mass.

LOOK AT THE TABLE

Which material has the highest specific heat?

Which material has the lowest specific heat?

Calculating Specific Heat

$$Q = m \times c \times \Delta T$$

Q = heat absorbed by a material

m = mass

c = specific heat

ΔT = temperature change

Know the relationships between these factors!

HEAT ABSORBED IS DIRECTLY RELATED TO MASS, SPECIFIC HEAT, AND TEMPERATURE CHANGE

Measuring Heat Changes

Calorimeter

an insulated device used to measure the absorption or release of heat in chemical or physical processes

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1) Name the two types of calorimeters.

2) When calculating specific heat, what happens to Q when you increase the mass of the substance?

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Heat and Thermodynamics

Ways thermal energy is transferred:

Conduction

Thermal _____

Thermal _____

Convection

Radiation

Making a Graphic Organizer

Include the following terms:

Conduction (thermal conductor, thermal insulator), Convection, Radiation

Define the terms

Give two examples of each

Draw a figure representing one example of each term

USE YOUR BOOK OR PHONE TO FIND ANSWERS!

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1) List two examples of physical properties.

2) Determine if the following are physical (P) or chemical (C) properties:

a ___ red color c ___ flammability

b ___ melting point d ___ density

True/False (if false, correct the underlined term)

3) The kinetic theory of matter states that all particles of matter are in constant motion.

4) Liquids have a definite shape and definite volume.

5) The average speed of a particle in a solid is the fastest of all three states of matter.

6) Determine if the following are physical (P) or chemical (C) changes:

a ___ ice melting

b ___ iron rusting

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Does it really matter?

Matter

anything that takes up _____ and has _____

Two Types

- _____
- _____

Pure Substances

- Cannot be separated by _____ means
- Have the exact _____ properties in any sample taken
- Elements
 - Like _____ (Au), _____ (Ag), oxygen (O), silicon (Si), mercury (Hg), etc.
- Compounds
 - Silicon dioxide (sand), _____ (sugar - $C_6H_{12}O_6$), water (H_2O), molecular oxygen (O_2 in our atmosphere)

Mixtures

- Consist of _____ or more pure substances
 - What are our two types of pure substances?
- Physical properties can vary
- Mixtures _____ be separated by _____ means

TWO TYPES OF MIXTURES

- _____
- _____

Homogenous Mixture

- Mixture of _____ or more pure substances that appear completely uniform even under a microscope
- Homo = _____
- Examples
 - _____ (gaseous mixture of mostly nitrogen, oxygen, carbon dioxide)
 - Sugar dissolved in water (liquid)
 - _____ alloy (solid mixture of copper and zinc)
- Mixtures occur in the same _____ (solid, liquid, gas)

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Solution

- _____
- Solvent
 - What a _____ is dissolved in
 - Universal solvent: _____
- Solute
 - What is dissolved in a _____
- Solute _____ in a solvent
- Examples
 - _____
 - _____
 - Coffee
 - Tea

Heterogenous Mixture

- Mixture of _____ or more pure substance in which the uneven texture of the sample is visible
- Hetero = _____
- Examples
 - _____
 - Granite
 - Chunky monkey ice cream

Suspension

- _____ mixtures where particles will _____ to the bottom
- Examples
 - _____
 - Muddy water
 - Sand in water
 - Dust in the air

Colloids

- _____ mixture which particles do _____ settle out, but are not true solutions either
 - _____
 - Particles are caught in a solution!
- Examples
 - Aquanet hairspray (the 80s man!)
 - _____ (fat globules dispersed and suspended in water)
 - _____ (water particles dispersed in air)

Tyndall Effect

- The Tyndall effect is the _____ of light as a light beam passes through a colloid.
- The individual suspension _____ scatter and reflect light, making the beam visible.