Chp 2: Lect 1 The Properties of Matter 2pts ec printing **Name:** **pd:**

What do the following objects have in common?

Give up? They are all made up of atoms and molecules, which means, they are all types of _____
So basically, everything in the universe is matter. Cupcakes are matter, baby elephants are matter, 8th graders are matter. Matter is everything around you. Matter is anything made of atoms and molecules. As of 1995, scientists have identified _____ states of matter - we will talk about these later. Matter is also anything that has _____ and _____
Matter is made up of atoms! All matter is the same because all _____
Matter is also different because objects can be made up of different kinds of atoms. Gold is made of one kind of atom-gold atoms. Salt is made up of two different kinds of atoms-sodium atoms and chloride atoms.

Objects have mass

Mass is how much there is of an object. Mass is related to how much something weighs. Mass and weight are two different things. The unit for mass is a gram. A nickel has the mass of about one gram. Objects that take up space and have mass are called _____ Everything around you is made up of matter. Chocolate cake is made up of matter. You are made of matter. If you are having trouble understanding matter, look all around you. You can see matter makes up the walls of your house and your classroom. Matter is large and matter is small.

M is for Mass

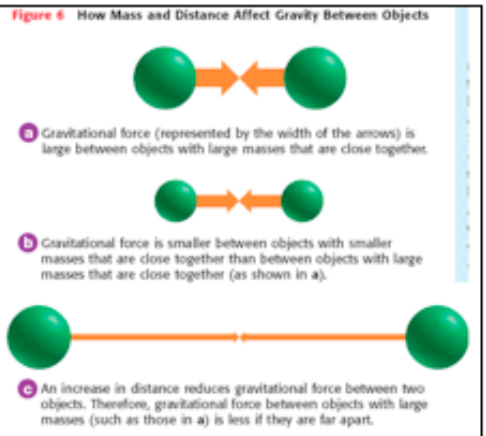
Mass is the _____in an object. Mass is also affected by gravity. _____ is a force of attraction between two objects. This force causes all objects to "pull" towards each other. The more mass two objects have; the stronger the pull. The closer the objects are to each other; the stronger the pull.

How are mass & weight different?

_____
A measurement of the amount of matter in a object (grams).

_____
A measurement of the gravitational force of attraction of the earth acting on an object.

What about weight?
Weight is the measure of _____ on an object. Compare a brick to a sponge. The brick has mass. Earth has mass. Therefore, the brick and Earth are attracted to one another. The weight of the brick is a measure of this attraction by Earth. Now look at the sponge. It is the same ***size*** as the brick, but its ***mass*** is less.



Therefore, the sponge's attraction to Earth is less. It's weight is also less than the brick.

Massive Confusion
On Earth, gravity is the same everywhere. Sooo…. On Earth, mass and weight are the same thing. BUT, if you were to go to the moon, they would be different. The moon has less gravitational pull, so the attraction between you and the moon would be less. On the moon, your weight is less. Your mass remains the same though.

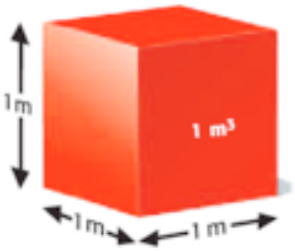
V is for Volume

Briefly, volume is the _____something takes up. Whether it's a speck of dust or Jupiter, all matter takes up space.

Measuring the volume of…

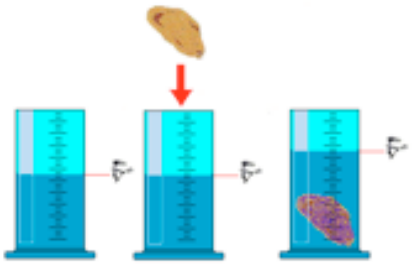
_____
Graduated cylinder
Displacement method
Measured in liters (L) & milliliters (mL)

_____
Length x width x height



_____
Since a gas expands to fill its container, if you know the volume of the container, you know the volume of the gas.

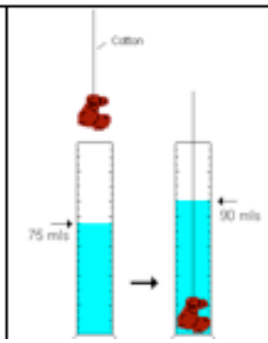
_____
The mass of a substance divided by its volume.
Density is an important physical property.
Density is the mass of a substance per unit volume.
Volume is the amount of space an object occupies.



_____
Properties that do depend on the amount of matter present.

_____
A measurement of the amount of space a substance occupies.

_____



Physical Properties

How can you describe them if you didn't know what they were? Describing objects by using : **size, shape, color, texture** uses an object's _____ It doesn't matter what the object is, everyone used similar descriptions. What were some of the "properties" you listed about your object? Size, Weight & Mass, Shape, Odor, Sound, etc. These are _____ _____Remember: all objects are made of matter, take up space and have _____.

Common Physical Properties

Physical properties can be observed or measured _____changing the identity of the matter. Basically, properties you notice when using one of your five senses: Feel - **mass, volume, texture** Sight – **color**, Hear, Smell, Taste

Physical properties of matter are categorized as either: Intensive or Extensive

_____Properties that do not depend on the amount of the matter present.

Color & Odor, _____How shiny a substance is.

_____- The ability of a substance to be beaten into thin sheets.

_____- The ability of a substance to be drawn into thin wires.

Conductivity- The ability of a substance to allow the flow of energy or electricity**.**

_____**-** How easily a substance can be scratched.

_____The temperature at which the solid and liquid phases of a substance are in equilibrium at atmospheric pressure.

Boiling Point- The temperature at which the vapor pressure of a liquid is equal to the pressure on the liquid (generally atmospheric pressure).

Physical Changes: Changes in matter that do NOT alter the identity of the matter itself. Changes that **DO NOT CHANGE the identity of the substance.**

More Examples of Physical Changes

- Freezing water for ice cubes
- Sanding a piece of wood
- Cutting your hair
- Crushing an aluminum can
- Bending a paper clip
- Mixing oil and vinegar

Physical Changes: You may or may not be able to undo a physical change. **For Example:** 1. Size 2. Shape 3. State -solid, liquid, gas 4. Dilutions: The water doesn't turn into soil or macaroni. It remains water. If it did change into soil or macaroni, your drink would taste terrible and you would have an example of a _____ **change**

Please remember, ice is water in the solid state. When you drop the ice cube into the liquid, it begins to melt because the temperature is higher than that of the ice cube. It's like putting a snowman on your front lawn in July. The ice cube becomes liquid water. This is an example of a _____ The solid water turned to liquid water. It is STILL water!

Common Errors: Ice melting, water freezing, water evaporating, and steam condensing are all examples of a state change.* These are _____changes, not chemical. Diluting a solution is a _____change, even if the color becomes more faint.

Physical Properties The measurement of mass and other characteristics that can be seen without changing how that object looks are its physical properties. When you look at oranges, you know that they are oranges because of their color, shape, and smell. Mass, color, shape, volume, and density are some physical properties. The answers to the question about the present are physical properties. **A property describes how an object** _____
Properties are constantly changing... Matter is constantly changing. Ice in your soda melts, glass breaks, paper is ripped. When ice in your soda melts where does it go? What does it become?

Physical properties vs Chemical properties:

Physical properties: observed without changing the identity of the substance

Chemical properties: observe only when the identity changes. How do you know if it is chemical or physical? **If it CHanges, it's Chemical**

Chemical Properties: A common chemical property is _____
Reactive to oxygen **Reactive** to air **Reactive** to water…

Chemical properties aren't always EASY to observe, unlike physical properties. **Chemical Properties:** These are properties that can only be observed by changing _____ of the substance. A piece of paper burns and turns to a black substance. After the flame goes out you can no longer burn the new substance. The chemical properties have been changed.

Comparing Physical and Chemical Properties

Substance	Physical property	Chemical property
Helium	less dense than air	nonflammable
Wood	grainy texture	flammable
Baking soda	white powder	reacts with vinegar to produce bubbles
Powdered sugar	white powder	does not react with vinegar
Rubbing alcohol	clear liquid	flammable
Red food coloring	red color	reacts with bleach and loses color
Iron	malleable	reacts with oxygen
Tin	malleable	reacts with oxygen

Chemical Changes:

Chemical changes ***do alter*** the identity of a substance. In other words, a chemical change is when something changes into an

_____

For example: Iron rusting Wood burning Copper turning to brass Baking a cake spoiled milk
Milk needs to be in the refrigerator or else it will go bad. If you've ever seen or smelled spoiled milk, it is not a pretty sight. The milk gets a sour odor and becomes lumpy. Unlike physical changes, you cannot reverse chemical changes. You can melt ice to get water and freeze that water to get ice again. You cannot make milk unspoiled.

The Take Home Message State changes, like melting, freezing, boiling, are all _____ changes. The substance remains the same substance, it just changes what **STATE** it is in.

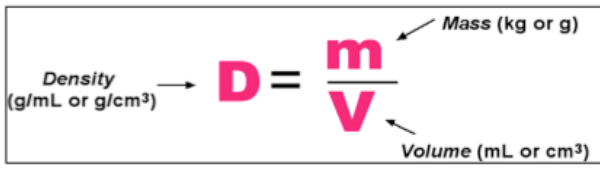
BrainPop: State Changes: circle the correct answer.

1. When water changes to ice, what kind of change has occurred? **A.** chemical **B.** physical **C.** a train
2. What type of change has occurred when a nail rusts? **A.** Nuclear **B** Physical **C.** Chemical
3. What does it mean when there is a physical change? **A**. Matter has changed from 1 substance to another
   B Matter has changed size, shape or form **C.** Matter has morphed into anti-matter
4. What does it mean when there is a chemical change? **A.** There is a change in size or shape
   B. Once substance has changed into another **C.** A solid changes into a chemical
5. What is an example of a **chemical** change that happens inside your body? **A.** Food being broken down by enzymes in your stomach
   B. Food being broken down into small pieces by your teeth **C.** your heart beating
6. What is an example of a **physical** change that happens inside your body? **A.** Food being broken down by enzymes in your stomach
   B. Food being broken down into small pieces by your teeth **C.** your heart beating
7. What type of change is weathering? **A.** chemical **B.** physical **C.** seasonal
8. What chemical change produces table salt? **A.** Sodium & chlorine react with one another **B.** Pepper & sugar are mixed together
   C. A piece of salt cane is crushed into tiny pieces.
9. Which of these is a chemical change that occurs over a long period of time?
   A. Adding chlorine to the pool B ice cream melting **C.** Metal rusting
10. What type of change has occurred when a glass breaks? ? **A.** chemical **B.** physical

Chp 2: Lect 2 Density & Buoyancy

What is density?

Think about the many kinds of matter you come into contact with every day. Wood, cement, aluminum, plastic, foam, liquids, steel, etc. In solids, we have huge differences. A block of steel and a block of aluminum may be the same size, but one has a lot more mass than the other. Density describes how much _____ is in a given _____ of a material. Steel has a high density; 7.8 grams of mass per cubic centimeter. Aluminum has a lower density; 2.7 grams/ cm^3. Liquids & gases are matter & have density too.



Measuring Density

The more matter you place into a defined volume, the _____ it becomes. For example, New York City is DENSELY populated because there are a lot of people in a small area. 20 people in an elevator is DENSER than 2 people in an elevator. Notice our units: cm^3

Which one is denser?

If each box has the same volume, and each ball has the same mass, which box would weigh more? Why? Which weighs more? 100 pounds of lead or 100 pounds of feathers?

Lead and Feathers

Although 100 pounds of feathers may take up much more room than 100 pounds of lead, they both still weigh _____ The steel is heavier for its size, due to the fact that it is denser!!! Thus, a material such as feathers takes up much more room (volume) than a denser material such as steel, for the same mass or weight.

Density of Common Materials

Density is a property of materials - independent of shape or quantity. For example, a steel nail and a steel cube have different amounts of matter and therefore different masses. They also have different volumes. However, if you calculate density by dividing mass by volume, the result is the same for both the nail and the cube. Solids that are _____, such as steel, typically have _____ density. High density means there are many atoms per cubic centimeter. _____materials typically have _____ density. Solids with low density, such as cork or foam, are often used as cushioning material. Low density means there are relatively large spaces between atoms.

Why does density vary? The density of a material depends on two things:

1. the _____of each atom or molecule 2. on _____the atoms are packed

A diamond is made of carbon atoms and has a density of 3,500 kg/m3. The carbon atoms in diamonds are closely packed.

Why does density vary?

Paraffin wax is mostly carbon, but the density of paraffin is only 870 kg/m3. The density of paraffin is low because the carbon atoms are mixed with hydrogen atoms in long molecules that take up a lot of space.

Calculating Density Problems: Follow the video as we do them

1. A student determines the density of manganese to be 5.54 g/cm^3. If a sample had a mass of 3.43g what was the volume?

2. A cube 5.7cm on a side has a mass of 630 g. Find the Density!

3. The density of a gas is 0.0043 g/cm3. Find the mass of 280 cm^3 of this gas.

Cube or Rectangular	Cylinder	Irregular Object
1. Find mass • Use a _____ • Units: _____or kg **2. Find volume** • Use a ruler • Measure all 3 _____: length, width, height • Units: _____, m^3, km^3 • Use this equation: Volume = length x width x height V = l x w x h **3. Density = mass / volume** • Units:	**1. Find mass** **2. Find volume** • Use a ruler • Measure the height & _____ • Divide the diameter in half to find the _____ • Units: cm^3, m^3, km^3 • Use this equation: Volume of a cylinder = 3.14 x radius^2 x height V = π r^2 h **3. Density = mass / volume** • Units: g/cm^3	**1. Find mass** **2. Find volume** • _____method o Fill a graduated cylinder with water. o Drop the object in without splashing water. o Calculate the change in volume! • Units: _____, L **3. Density = mass / volume** • Units:

What is buoyancy? What is the relationship between density & buoyancy?

California Content Standards #8. **Density and Buoyancy:** All objects experience a buoyant force when immersed in a fluid.

a. Students know density is mass per unit volume.

b. Students know how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.

c. Students know the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.

d. Students know how to predict whether an object will float or sink.

Will it float or sink?

The largest ship in the world is the Jahre Viking, an oil-carrying tanker. This super-sized ship is 1,504 feet long and 264 feet wide, longer than 5 football fields laid end-to-end. If the Empire State building was laid on its side, the Jahre Viking would be longer by 253 feet! Crew members use bicycles to get from place to place on the ship. The Jahre Viking is largely constructed of steel, so how can a big, heavy ship like this actually float?

Soda Experiment:

Let's look at something we're more familiar with….Soda!

Write down 2 similarities between these two cans. _____

Write down 2 differences._____

Predict what happens when a can of regular coke and a can of diet coke are placed into tap water.

Hypothesis:_____

What did you see? _____

_____

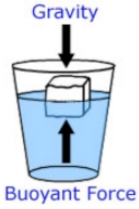
What happened and why? _____

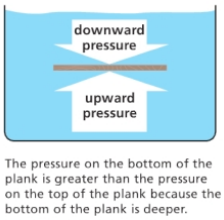
_____

More "stuff" (matter) is crammed into the same amount of space, or VOLUME, and that increases the MASS. The relationship of Mass to Volume is Density.

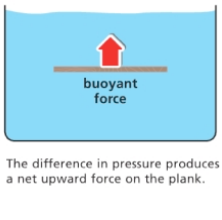
Buoyant Force

Why do ice cubes float in water? Even though gravity forces an ice cube down, water exerts an upward force on the ice. This upward force is called buoyancy. All objects submersed a fluid, whether it be a liquid or gas, experience this buoyant force. The buoyant force exists because of pressure differences in fluids. In any fluid, the greater the depth, the greater the pressure. In the 2nd picture, a thin plank of wood has been pushed underwater.





The pressure on the bottom of the plank is greater than the pressure on the top of the plank because the bottom of the plank is deeper.



The difference in pressure produces a net upward force on the plank.

Floating & Sinking

An object will float in a fluid if the buoyant force is equal or greater than the object's weight. A cork floats because the weight is less than the buoyant force. An object sinks if the object's weight is greater than the buoyant force.

A marble sinks because its weight is more than the buoyant force.

BrainPop: Buoyancy (circle the answer of choice!)

1. What is the name of the force that keeps you afloat? **A.** Buoyance **B.** Electromagnetism **C.** Density
2. What is an object's buoyancy if it floats in water? **A.** Negative **B.** Neutral **C.** Positive
3. What is an object's buoyancy if it sinks in water? **A.** Negative **B.** Neutral **C.** Positive
4. If an object neither sinks or floats, what is it's buoyancy **A.** Negative **B.** Neutral **C.** Positive
5. Which of these has neutral buoyancy? **A.** a boat **B.** a fish **C.** a rock
6. What determines whether an object will float or sink? **A.** its size **B.** its volume, relative to the mass of the liquid it's in **C.** its density, relative to the density of the liquid it's in
7. If you drop a cube in a bucket of water, the amount of water level rises is equal to:
   A. the volume of water displaced by the cube **B.** the mass of the cube **C.** The weight of the water
8. Compared with the molecules within a freshwater lake, the molecules of a heavy stone are
   A. Farther apart **B.** closer together **C.** Equally close together
9. How do you calculate an object's density? **A.** Break it in half **B.** Divide its weight by its height **C.** Divide its mass by its volume
10. Which is the densest? **A.** A sheet of paper **B.** A brick **C.** A cloud of nitrogen

Chapter 2 Density / Buoyancy Questions:

Answer the questions that are shaded: Show your work!

Object	**Mass** (gram)	**Volume** (mL or cm^3)	**Density** (g/mL or g/ cm^3)	**Sink or Float?**
Piece of Cork	24	100	**Question 1**	**Question 2**
Piece of Wood	89	10	**Question 3**	**Question 4**
Steel Cube	7.8	1	**Question 5**	**Question 6**
Steel Nail	**Question 7**	1.6	7.8	**Question 8**
Block of Gold	575	**Question 9**	19.3	**Question 10**
Ice Cube	**Question 11**	1	0.92	**Question 12**
Rubber Stopper	33	30	**Question 13**	**Question 14**
Milk Carton	2	**Question 15**	0.95	**Question 16**
Block of Aluminum	81	30	**Question 17**	**Question 18**
Pinewood	**Question 19**	25	0.50	**Question 20**

Formulas to Remember:

D= Density V= Volume m= Mass D=m/v V=D/m m= D x V

Remember: Density of water is 1.For an object to float, density must be LESS than 1, otherwise it will sink!