CHAP. 2 THE PROPERTIES OF MATTER

* FIRST DO LAB SAFETY RULES + HW

I WHAT IS MATTER? (2:1)

A. Matter

1. Anything that has mass and takes up space.

B. Matter and Volume

1. Volume is the amount of space taken up.
2. Things cannot share the same space at the same time.
3. Measuring liquids:
   a. Use a graduated cylinder
   b. Meniscus - the curve at the surface of the liquid.

LABS
volume labs available

4. Measuring regularly shaped solid objects:
   a. Cubic means having 3 dimensions.
   b. Volume = length x width x height
5. Measuring an irregular shaped solid:
   a. Liquid displacement - the volume of the object displaces the equal volume of water.

C. Mass & Weight - discuss!

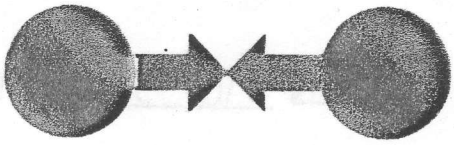
Mass is . . .

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

Weight is . . .

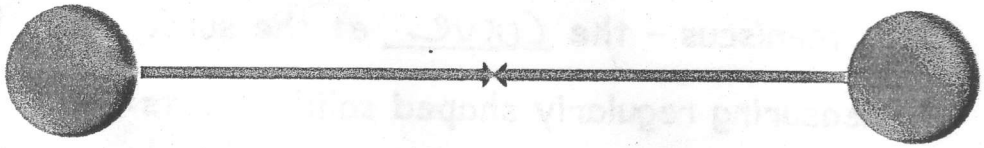
- a measure of the gravitational force on an object.
- varied depending on where the object is in relation to the Earth (or any other large body in the universe).
- measured with a spring scale (shown above).
- expressed in newtons (N).

How Mass and Distance Affect Gravity Between Objects



a Gravitational force (represented by the width of the arrows) is large between objects with large masses that are close together.

b Gravitational force is smaller between objects with smaller masses that are close together than between objects with large masses that are close together (as shown in **a**).



c An increase in distance reduces gravitational force between two objects. Therefore, gravitational force between objects with large masses (such as those in **a**) is less if they are far apart.

D. Inertia

1. The tendency of a non moving object to remain at rest.
2. The tendency of a moving object to stay in motion unless acted upon by something that changes its speed or direction

Demo: egg + glass

3. The bigger the mass, the greater the inertia.

II PHYSICAL PROPERTIES (2:2)

A. Physical Properties

1. Can be observed or measured without changing the matter's identity.
2. Examples:

color	mass	state of matter	
size	~~freezing pt etc.~~ texture	malleability (demo-hammer + copper)	
shape	ductility (demonstrate w/ glass + bunsen burner)	conductivity (demo w/ water, etc.	
		density.	

Demos
- 20 question game
- rip paper

LAB matter? or water

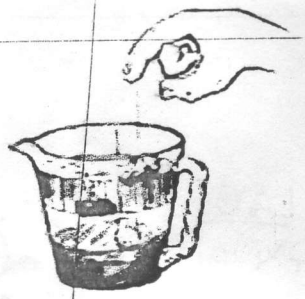
B. Density

1. The amount of matter in a given space, or volume.
2. In liquids, the densest liquids are on the bottom. LAB Density
3. Knowing the density of an object can tell you if it will sink or float in water.

3. Solving for density:

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

4. Unit for density is usually gm / cm^3
5. Density of water is 1 gram/cm^3
6. Any object less than 1 gram/cm^3 will float.



C. Physical Changes Do Not Form New Substances

1. A physical change is a change that affects one or more physical properties of a substance

2. Examples:

freezing	evaporation	change in size, shape
melting	dissolving	etc. texture, etc.

3. A physical change does NOT change the identity of the matter.

A. Chemical Properties

1. Properties that depend on the behavior of the substance in the presence of other substances.
2. Examples: *

burning rusting digesting

B. Chemical Changes and New Substances

Demos
- Sugar + sulfuric acid
- steel wool + $KClO_3$
- burn paper

1. A chemical change happens when one or more substances are changed into new substances with new properties.
2. Chemical property describes what chemical reaction will occur.
3. Chemical change is the process by which the substance changes.
4. Clues to indicate a chemical change:

Release of heat Release of light, electricity

Release of gas New substance

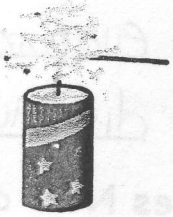
LAB
physical/chemical

C. Physical Versus Chemical Changes

A.V.
Filmstrip
phy/chem change

1. The ~~identity~~ composition changes in a chemical change.
2. Composition of an object is the type of matter that makes up the object.
3. Can you reverse the change?

Physical ?- yes Chemical ? - no



I THREE STATES OF MATTER:

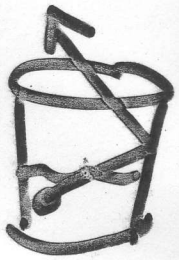
A. Particles of Matter

1. Matter is made up of tiny particles called Atoms & Molecule
2. They are always in Motion always bumping into one anoth


SOLID

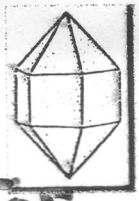

LIQUID


GAS



B. Solids

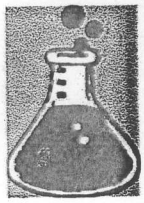
1. They have a definite shape & Volume
2. The particles in a solid Vibrate in place.
3. Crystalline solids have particles arranged in an orderly, 3D arrangement of particles.



4. Amorphous solids have particles that do Not have a special arrangement.

C. Liquids

1. They have definite Volume.
2. They take the shape of the Container
3. Their particles slide past each other.



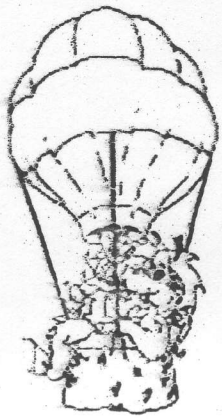
4. Two other properties of liquids:

a) Surface tension: Form that acts on particles- cause some liquids to form spherical drops.

b) Viscosity: resistance of a gas-liquid to flow.

Syrup → Oil, catsup. Ketchup

D. Gases



1. They have No definite shape or volume.
2. The particles move quickly and can breakAway completely from one another.

II BEHAVIOR OF GASES:

A. Describing Gas Behavior

1. Temperature- measure of how Fast the particles are moving.

   SO....the hotter it is, the Faster the particles move.

2. Volume- amount of Space that an object takes up.

   SO...if a balloon is heated, it will inflate.

3. Pressure-the amount of force exerted on a surface,

   SO ...the More particles of gas in a container, the more pressure there is in that container.

B. Gas Behavior Laws

* 1. Boyle's Law: volume and pressure are indirectly related, so...

   The more the pressure, the smaller the volume.

2. Charles's Law: volume and temperature are directly related, so..

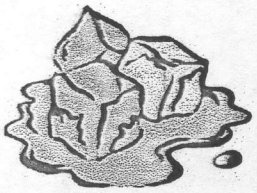
   The higher the temperature, the bigger the volume.

III CHANGES OF STATE:

A. Energy and Changes of State:

1. Changing from one physical form to another.
2. All changes of State are physical changes.

B. Melting: Solid to Liquid



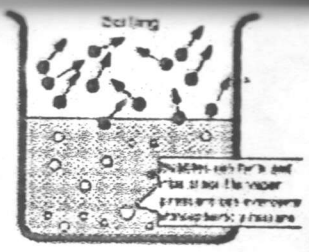
1. As the Temp. increases, the particles of the solid move Faster until it Melts.
2. Energy must be Added to make a solid Melt.
3. Energy has to be gained so it is *endothermic.*

C. Freezing: Liquid to Solid

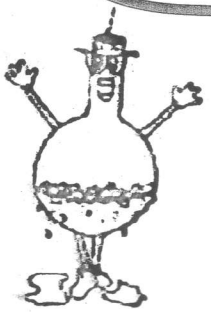
1. As the temperature drops, the particles move Slower until it Freezes.
2. Energy must be removed so it is *exothermic.*

D. Evaporation: Liquid to Gas

1. Energy is needed.....so when you sweat, heat is removed from your Skin and you are Cooled
2. Evaporation occurs at the Surface of the liquid.
3. Boiling occurs throughout the liquid.
4. Atmospheric pressure affects the boiling point.
5. The lower the pressure, the lower the boiling point.
6. Water in Saratoga, boils at 96°C.



E. Condensation: Gas to Liquid

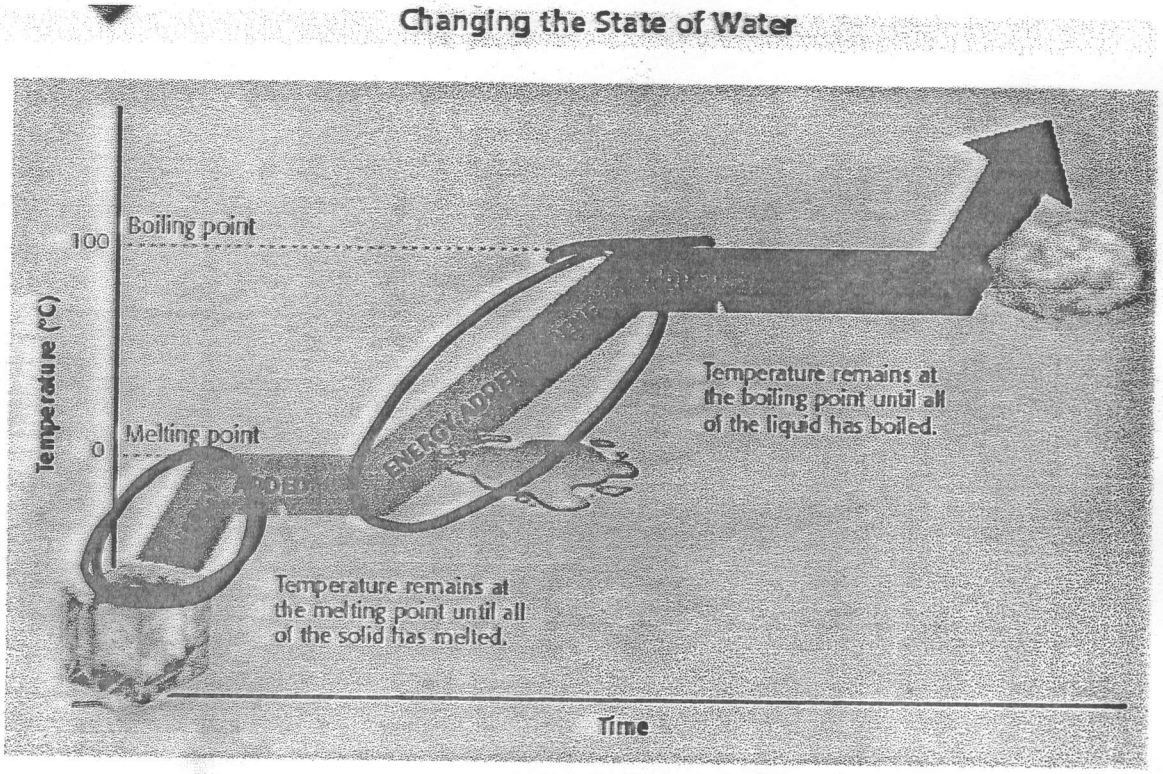


1. Condensation Point-is the temp at which a gas becomes a liquid.
2. Energy must be removed

E. Sublimation: Solid to Gas

1. Skips the liquid stage.
2. Example: dry ice (frozen CARBON DIOXIDE)

F. Change of Temperature Vs Change of State



G. Summary