Notes, Oct 21 - 24, 2013

States of Matter, Kinetic Theory,
Temperature, Pressure, Gasses

Textbook

- States of Matter - Chapter 2.1, p. 36-37
- Temperature - Chapter 3.2, p. 78-79
- Kinetic Energy, Kinetic Molecular Theory, Chapter 13.1, p. 420-424; p. 426
- Temperature , Pressure - Chapter 14.1, p. 451-454
- Gasses , Chapter 14.2-14.3, p. 456-461
- Diffusion, Chapter 14, p472
- Heating Cure For Water, Chapter 17.3, see graph p. 572 & explanations p. 571 – 572
- PhET Simulations: http://phet.colorado.edu/en/simulations/category/chemistry/general

The Model so Far

1. What do we know about our particles? (They have _____ & take up ____ and they can not be _____.

They have mass & take up space (volume) and can not be divided

2. What do we know about how our particles arrange themselves? What is this property called?

These particles can "pack together" in different ways, giving different substances and different states of matter This property of packing together is called density.

3. Whose model is this? **Democritus**

4. What do we know about COM?

These particles are neither created or destroyed. The can rearrange themselves into different substances.

Diffusion of Gasses

- **To see the diffusion animation click this link:** Diffusion
  - **Diffusion is a term that refers the tendency of particles in a fluid (gasses & liquids) to spread out and mix in with their surroundings**.
  - This usually happens because everything moves from high to low.
  - In this case from high concentration (as in a bottle of perfume) to low concentration (as in a room full of air with no perfume mixed in).
    - If a perfume bottle is opened into the air and mixes with the air what is the solute & what is the solvent??
  - The mixing is caused by the motion of the solvent particles.

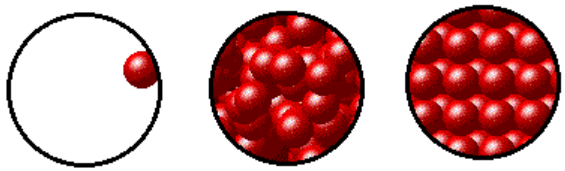
Solute: **thing present in the smaller quantity, being mixed or dissolved.**

Solvent: **thing in the greater quantity that is doing the mixing or dissolving.**

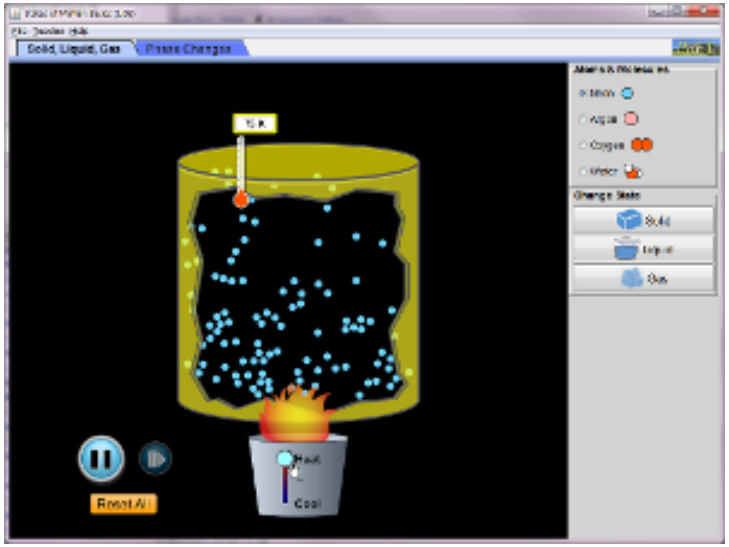
States of Matter
Solid, Liquid, Gas

- Click the links below to see the States of Matter animation and simulations

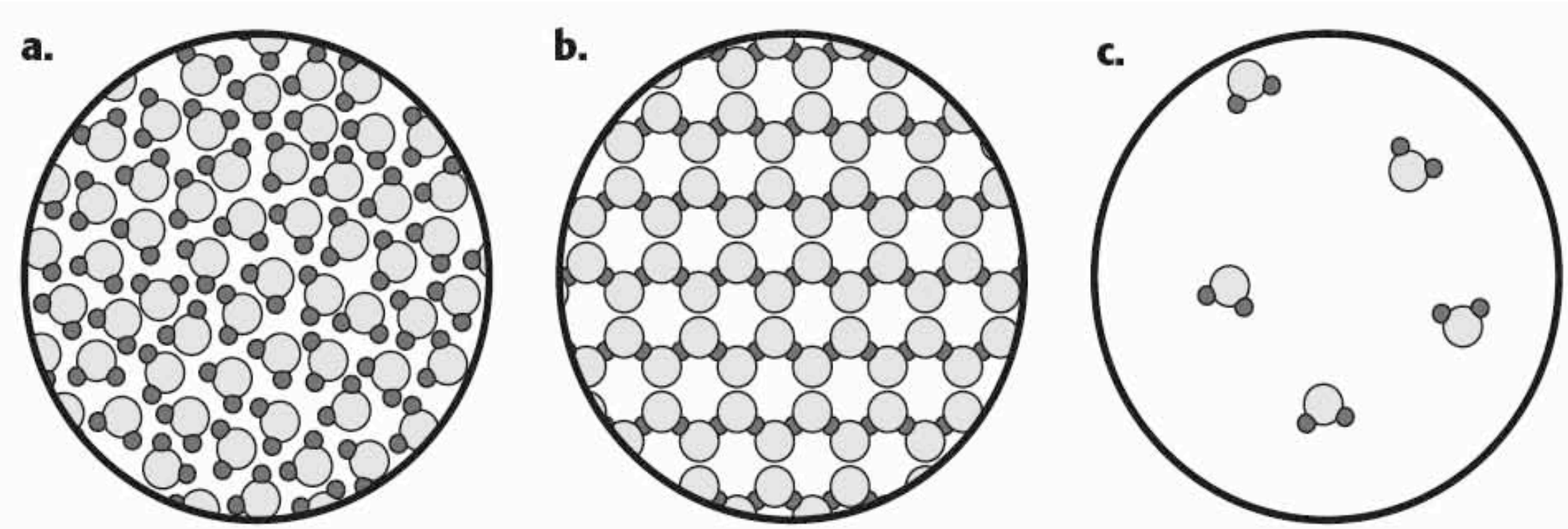
States of Mater Animation



- States of Matter Simulation



States of Water



liquid

solid

gas

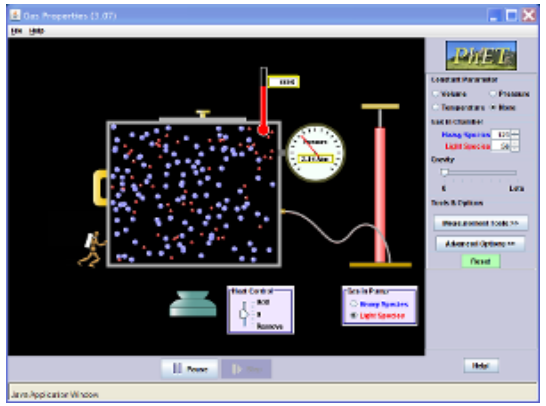
- **Identify the solid, liquid & gas**
- **Remember, ice floats in water**
- **Remember, the less dense item floats!!**

Pressure

1. **Define pressure: the amount of force exerted per unit area of a surface.**

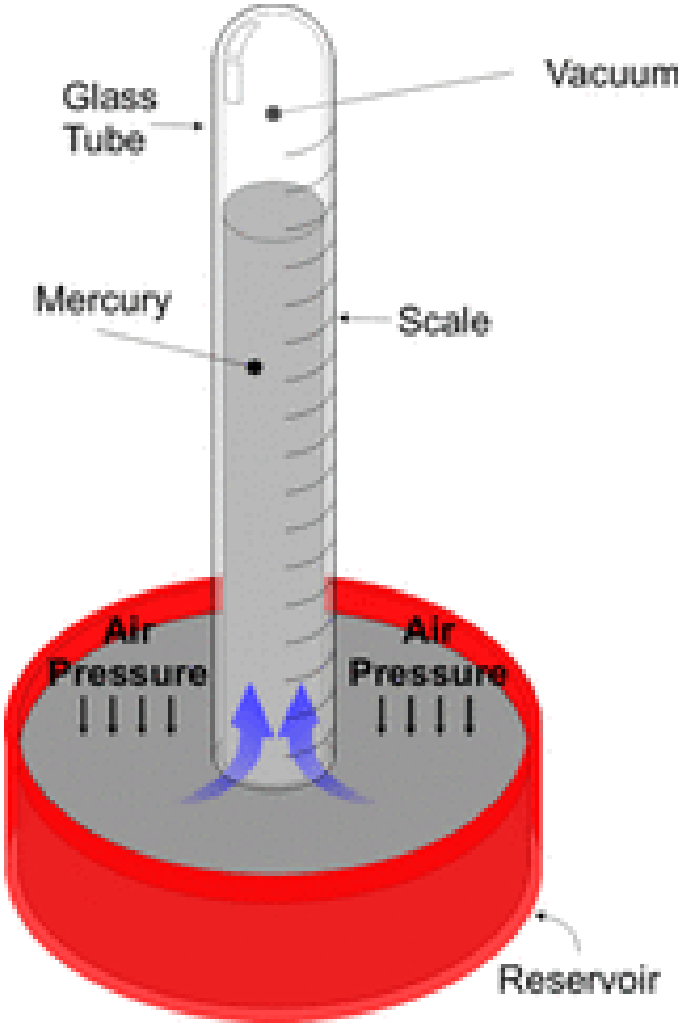
Explain why the railroad tanker care was crushed.

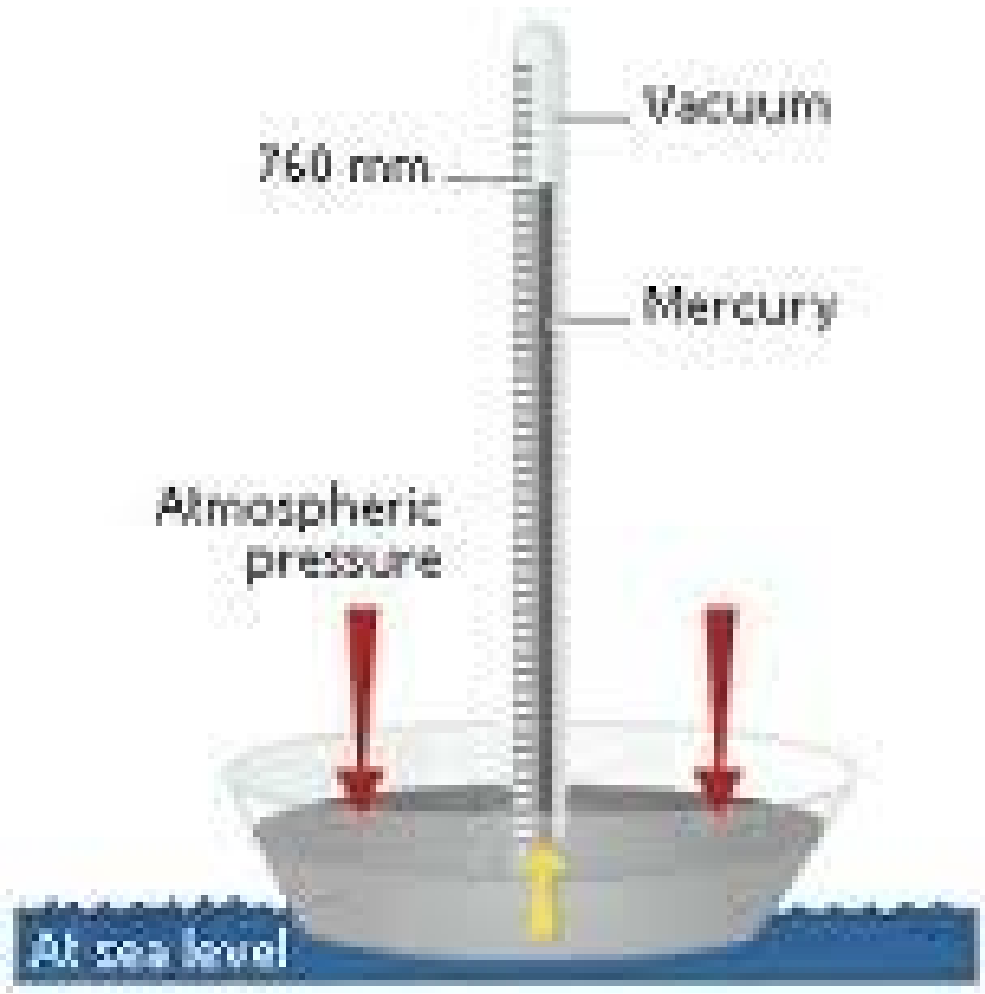
Clink the link to see the simulation of pressure, volume and temperature.



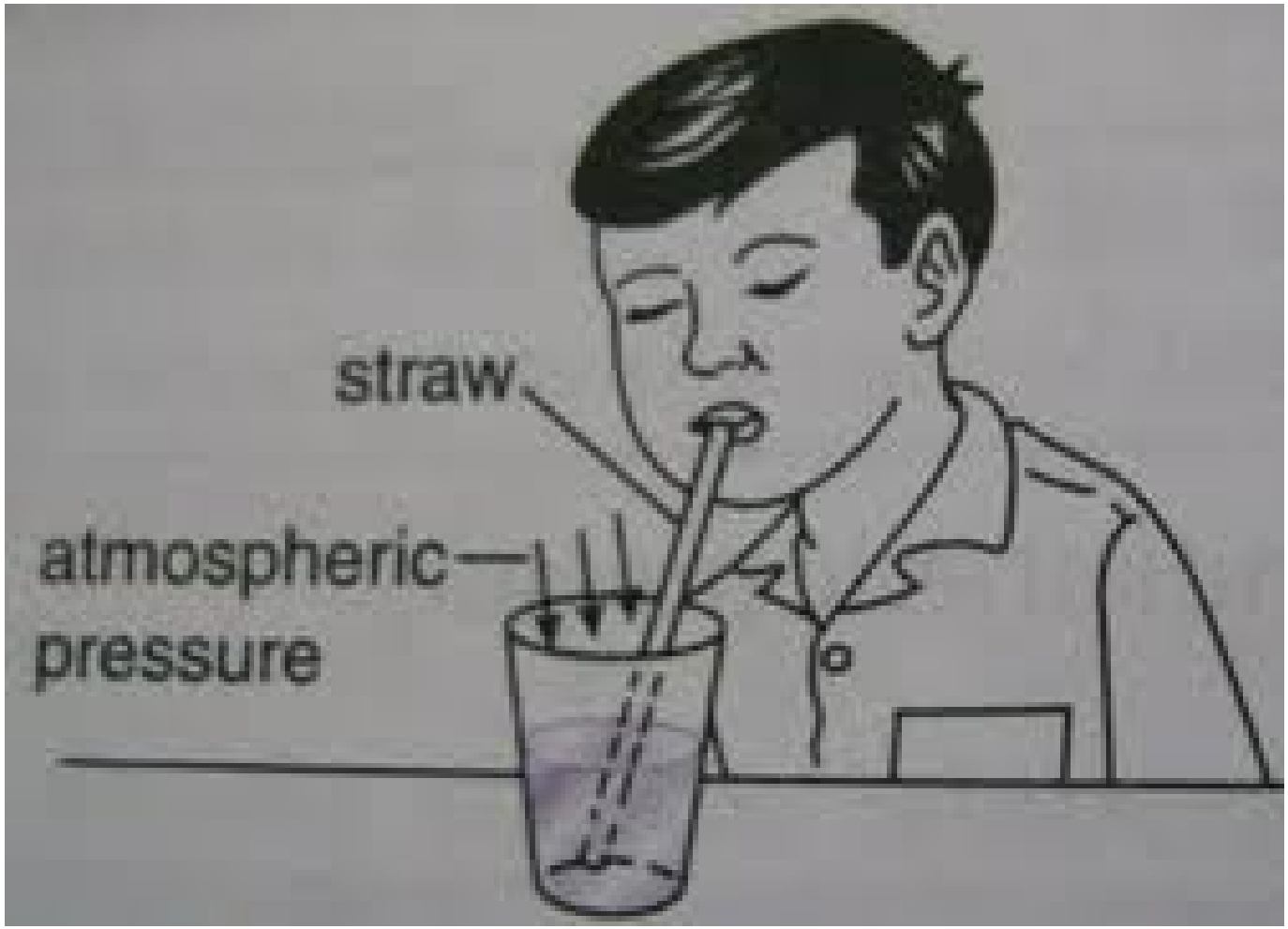
[Gas Pressure, Volume, Amount of Particles, Temperature]

Atmospheric pressure
760 mm Mercury or 29.92 inches Hg

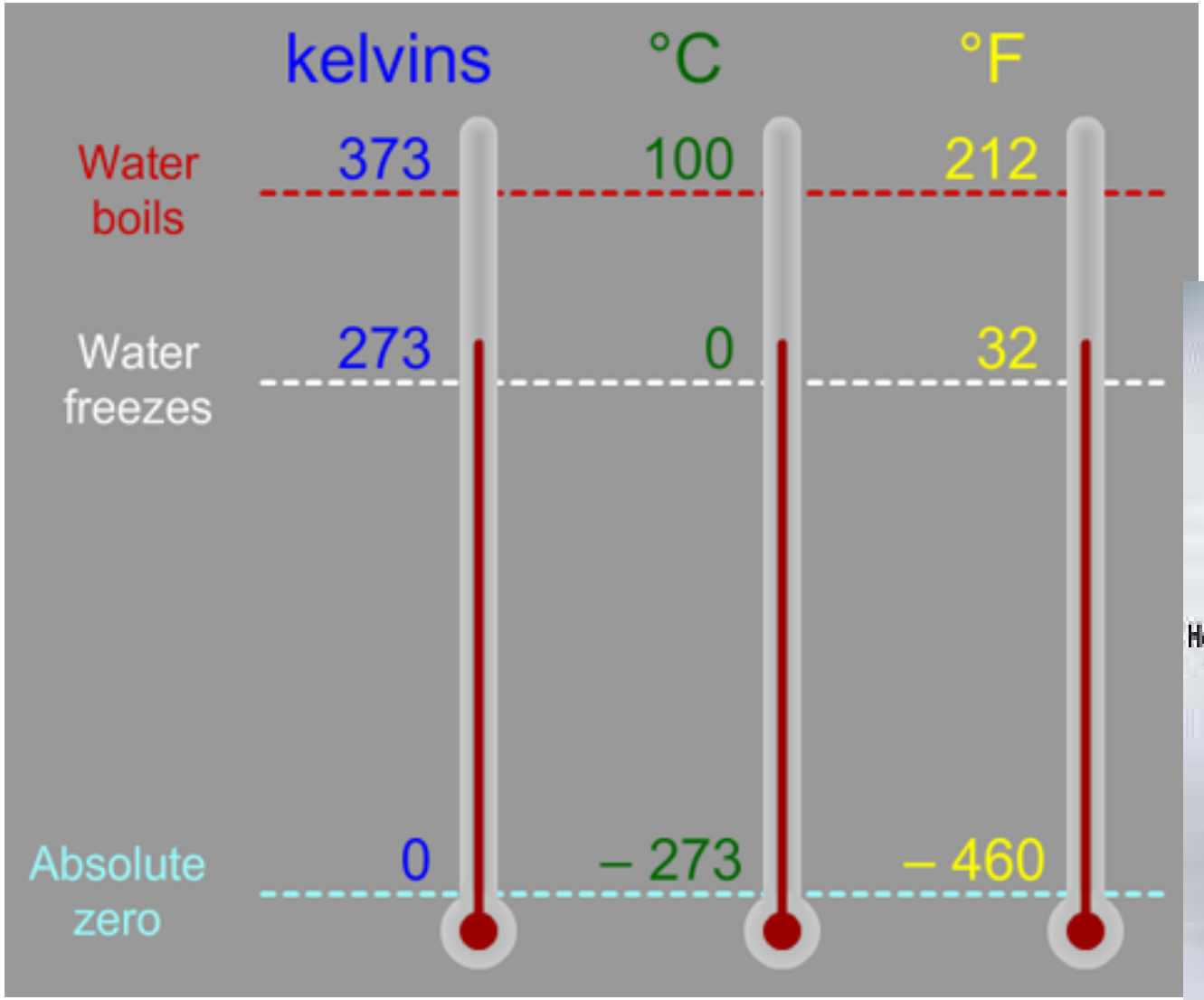




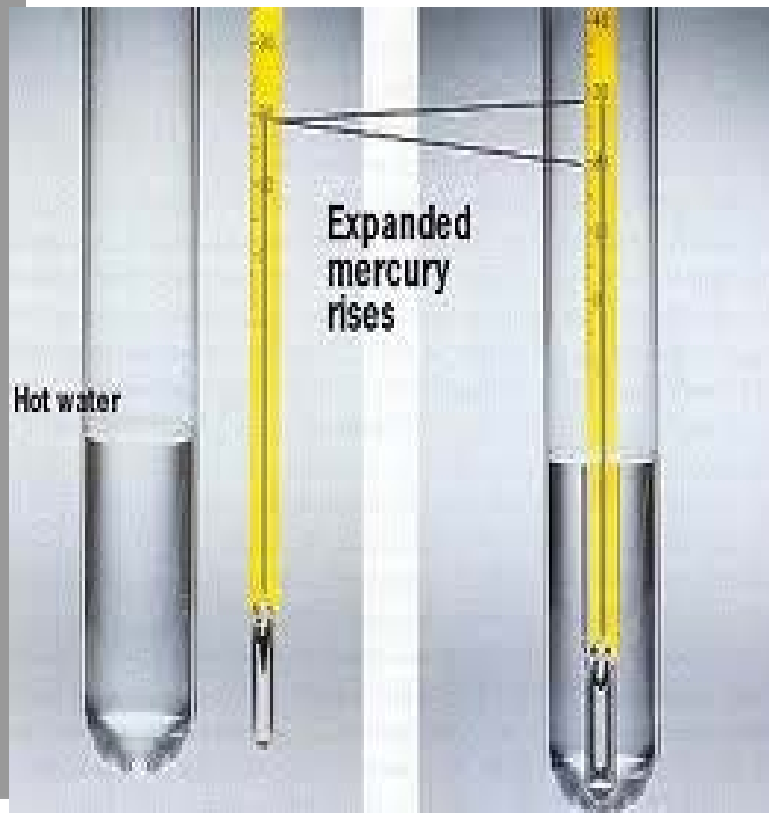
How does a straw work? Why does the liquids rise up the straw??



Temperature



Alcohol Thermometer



Bell Work, Wednesday Oct 22, 2013

2. Explain why the mercury or alcohol level in a thermometer rises when it is placed in a warmer fluid. (3-step process)

1. **Energy from the warmer fluid (the surroundings) is transferred to the liquid in the thermometer.**
2. **This energy causes the alcohol molecules to move faster.**
3. **The alcohol molecules move further apart (expand).**

Result: alcohol rises in the tube.

3. Explain why the mercury or alcohol level in a thermometer falls when it is placed in a warmer fluid. (3-step process).

1. **Energy from the warmer thermometer is transferred to the fluid (the surroundings).**
2. **This energy loss causes the alcohol molecules to move slower.**
3. **The alcohol molecules move closer together (contract).**

Result: alcohol goes down in the tube.

Copy the blue on your Whiteboard

Substance	*Density (g/ cm³)*
Gas - CO_2	0.0021
liquid - water	1.00 $^{1}/_{.002}$ =500 x less than water
Solid - Aluminum	2.70 $^{2.7}/_{.002}$ 1350 x < solid Al

1. How does the density of the gas compare a liquid (use water)?

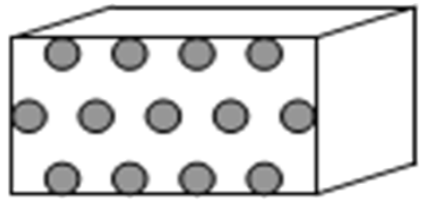
Bigger? Smaller? A lot bigger? A lot smaller? By how much?

2. How does the density of the gas compare to a solids (use aluminum) *Bigger? Smaller? A lot bigger? A lot smaller? By how much?*

3. How does the density of the liquid compare to the solid?

Liquid density is 2.7 times smaller than solid Al density

4. Using what you know about density, draw a picture of a solid, a liquid, and a gas using these types of drawings:



Label your drawings solid, liquid, gas.

Bell Work, Wednesday, Oct 16, 2013

1. **What is the density of the CO_2 gas from Mr. B's demo?**

   0.0020 – 0.0021 g/ mL

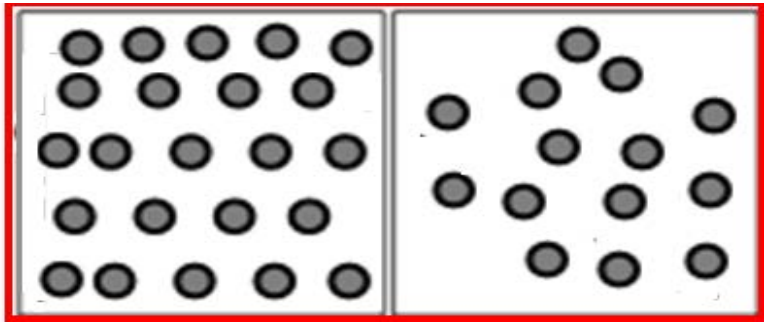
2. **Most liquids have densities between 0.6 g/ mL and 1.5 g/ mL. How does the density of the gas compare to the liquids?**

   A gas is a lot smaller, 500 x smaller than a liquid

3. **How does the density of the gas compare to the solids, like aluminum (density = 2.70 g/mL)?**

   A gas is a lot, lot, lot smaller than a solid 1250 – 1400 x smaller

4. **Using what you know about density, draw a picture of a solid, a liquid, and a gas using particle drawings in a box.**



Bell Work, Wednesday, Oct 16, 2013

5. What do we know about how our particles arrange themselves in solids, liquids & gasses ? What is this property called?

- **The solid particles are very close together (very dense).**
- **The liquid particles are not as dense as a solid but are still close together, and the gas particles are very spread out.**

This property is called density.

Bell Work, Thursday, Oct 17, 2013

1. Use the data below to answer Wednesday's questions

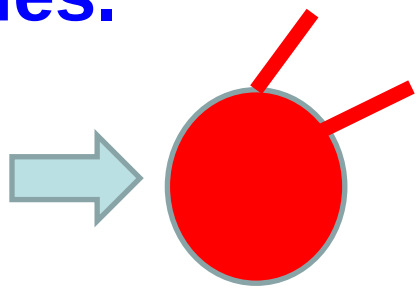
Substance	*Density (g/cm^3)*
Gas - CO_2	0.0021
liquid - water	1.00
Solid - Aluminum	2.70

2. How does the density of the liquid compare to the solid?

Liquid is smaller, 2.7 x smaller than a solid

3. Using particle diagrams, represent samples of a cold gas and a hot gas. Speed is shown by the length of the whooshies.

Cold gas



Hot gas