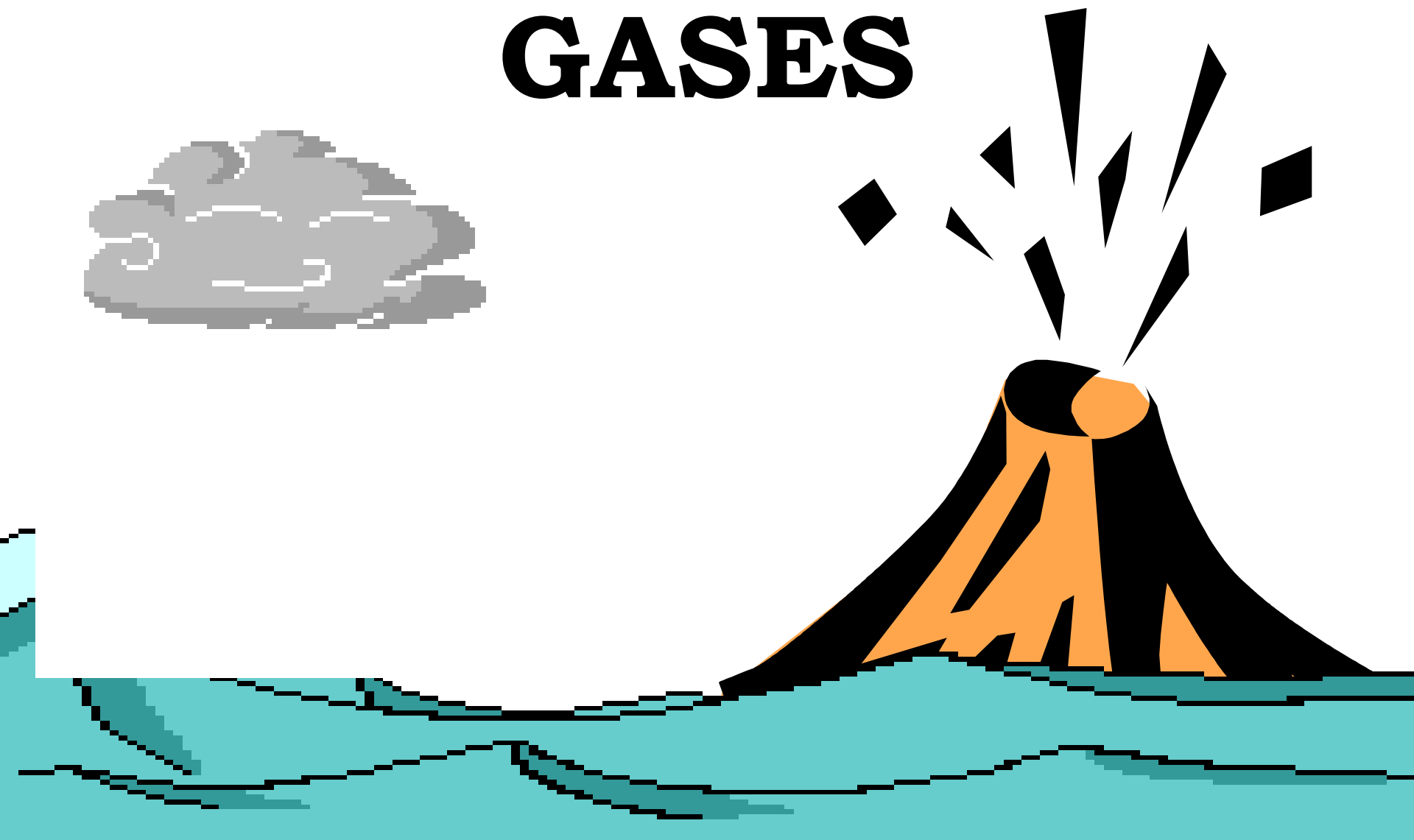
CHAPTER 16

Get ready to take notes!

SOLIDS, LIQUIDS & GASES

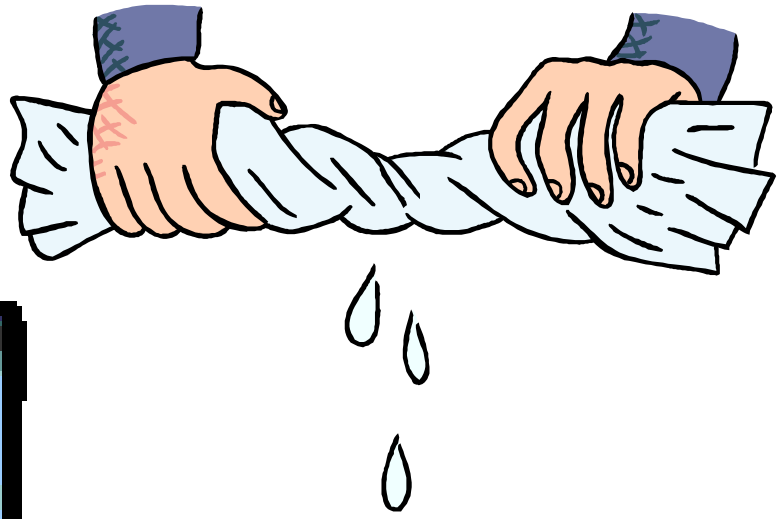


Kinetic Theory

There are 3 states of matter:

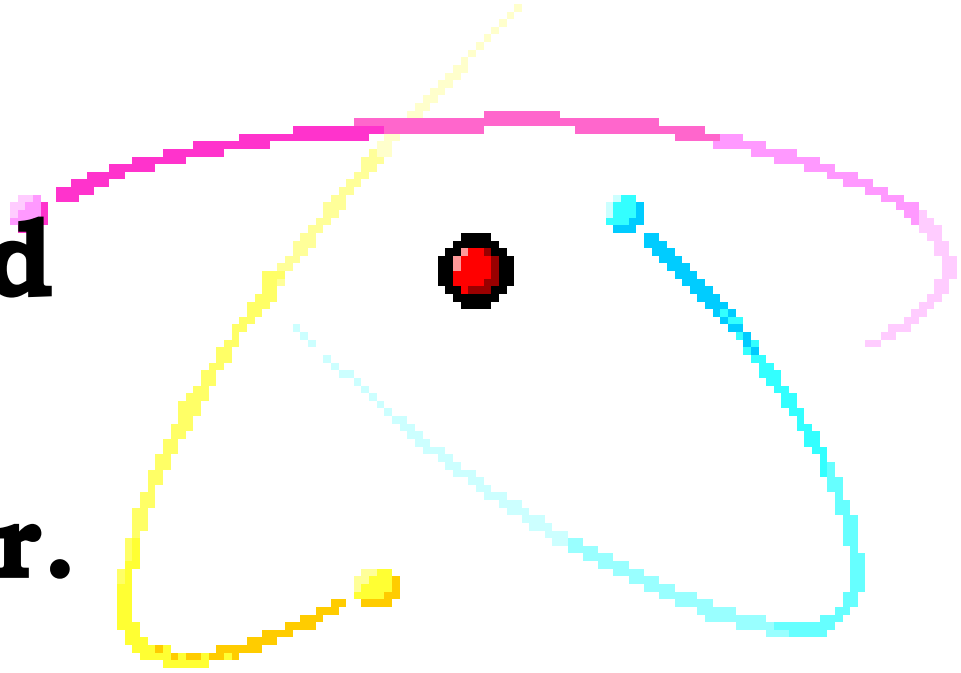
SOLID

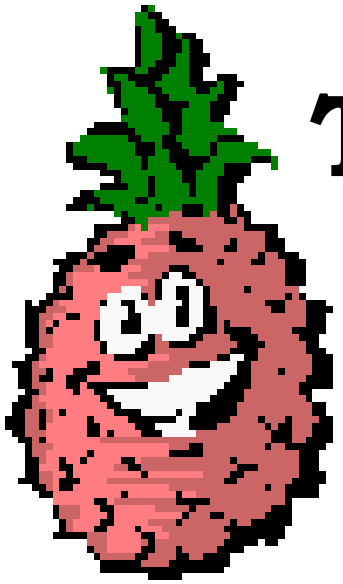
GAS

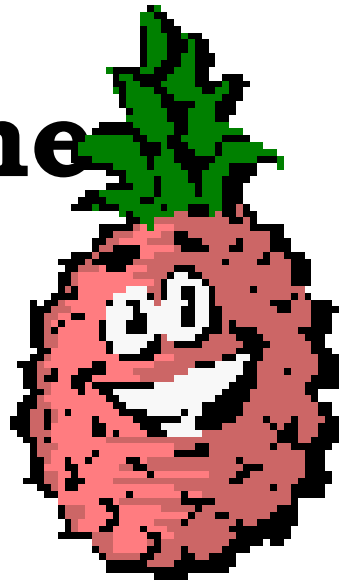


LIQUID

Kinetic theory explains how particles in matter behave. All matter is made of small particles in constant, random motion. They collide with each other and the walls of their container.



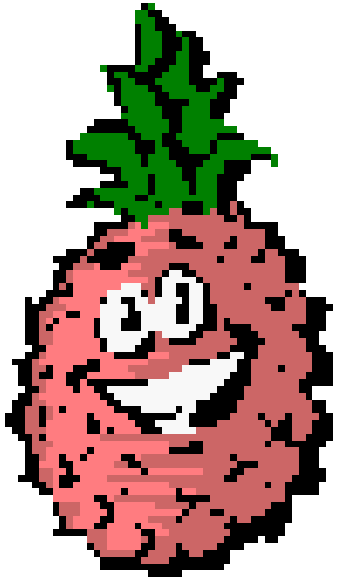


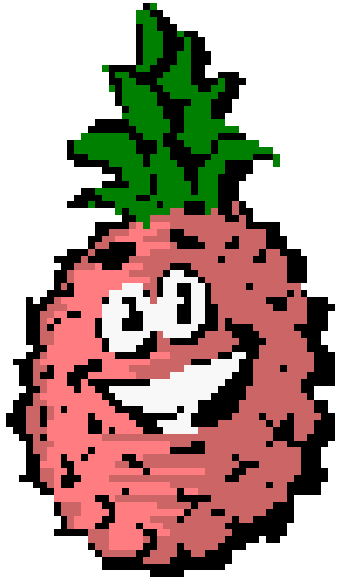


Thermal energy is the

<u>total energy</u>

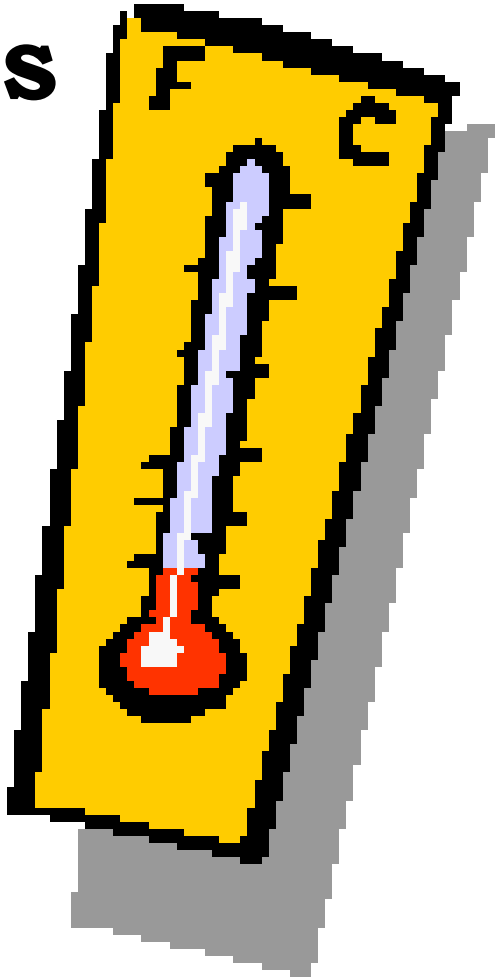
of a material's particles and causes the particles to

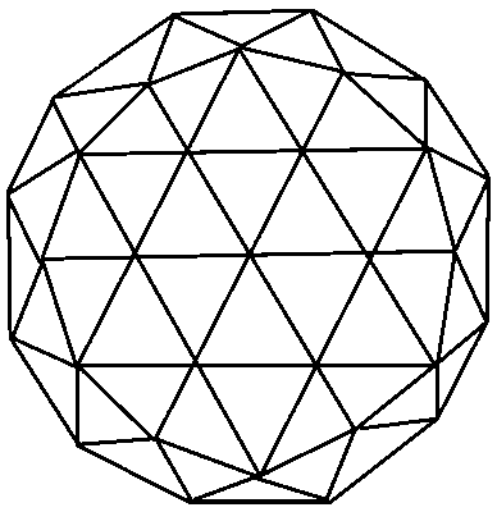


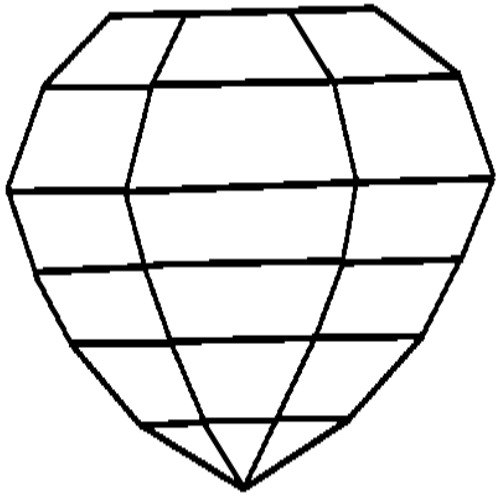


<u>vibrate in place</u>.

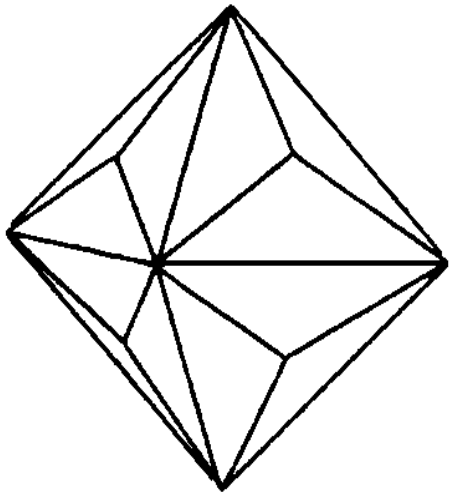
Average kinetic energy is the temperature of the substance, or how fast the particles are moving;
the lower the temperature, the slower the particle motion.

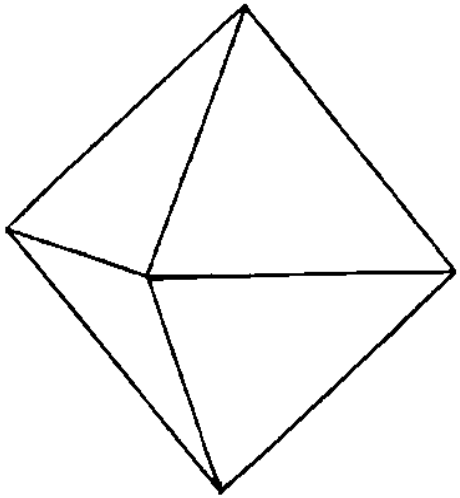






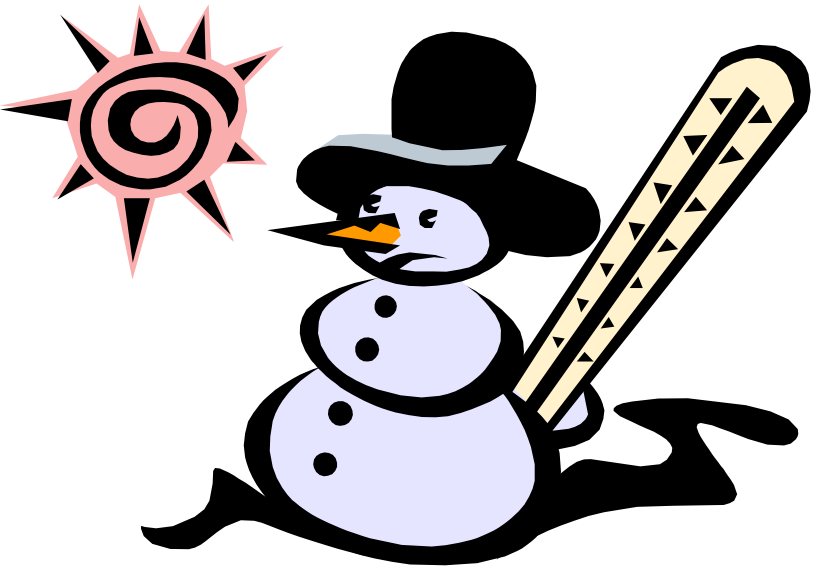
Solid state particles are closely packed together in a specific type of geometric arrangement.

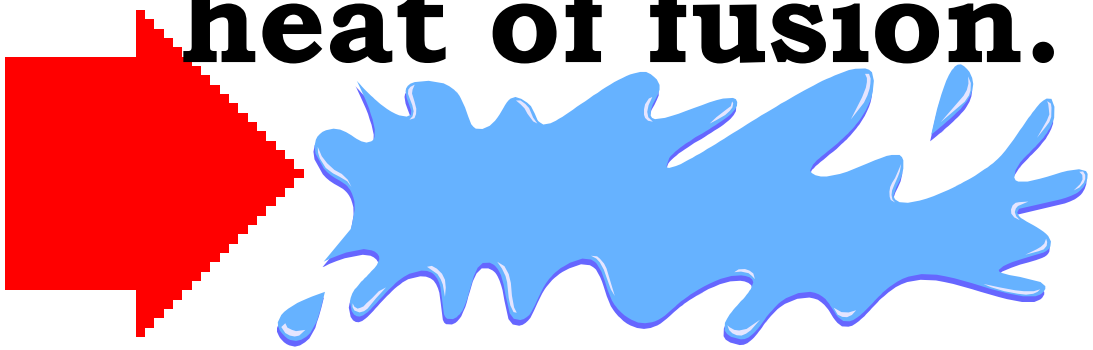




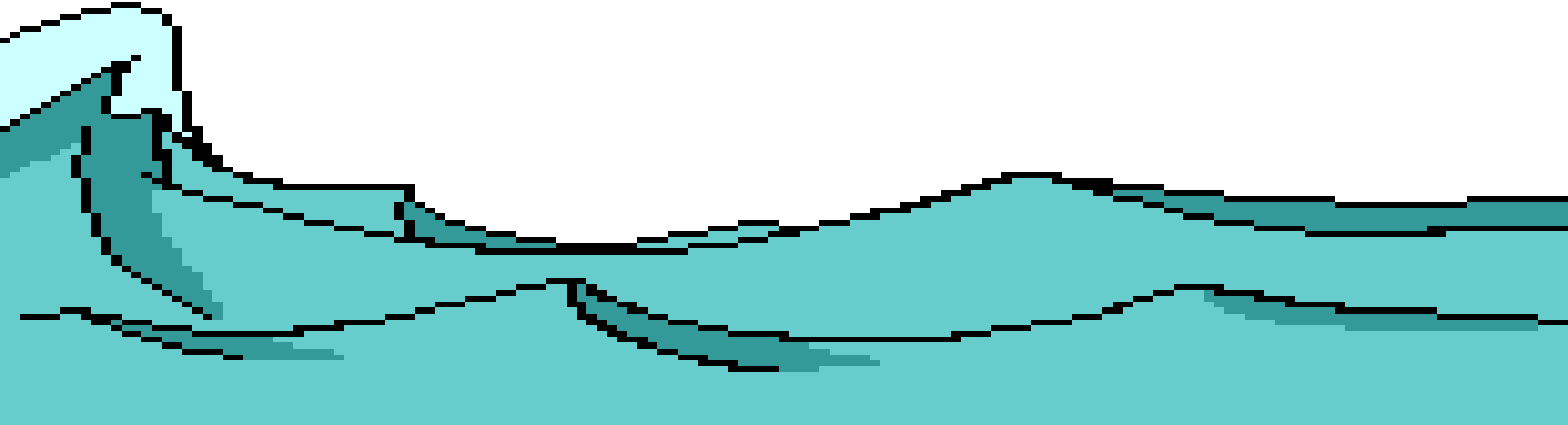
Liquid state - A solid will liquefy at the melting point as the particles gain energy to overcome their ordered arrangement.

The amount of energy required to reach the melting point is called heat of fusion.

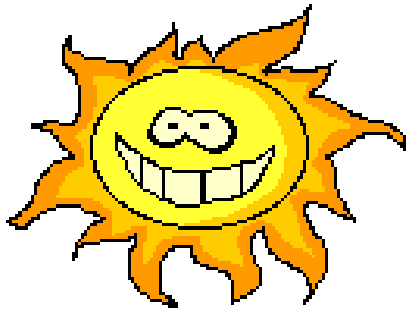


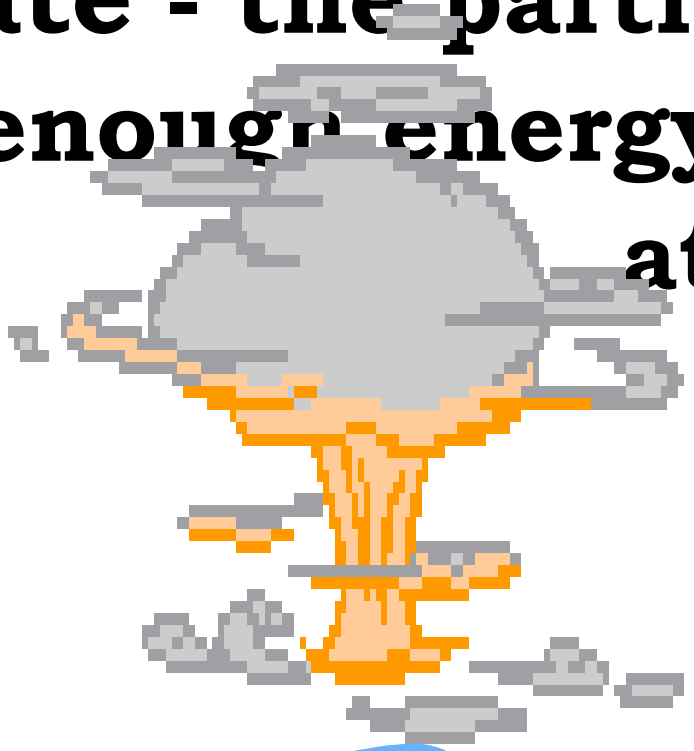


Liquid particles have more space between them allowing them to flow and take the shape of their container.



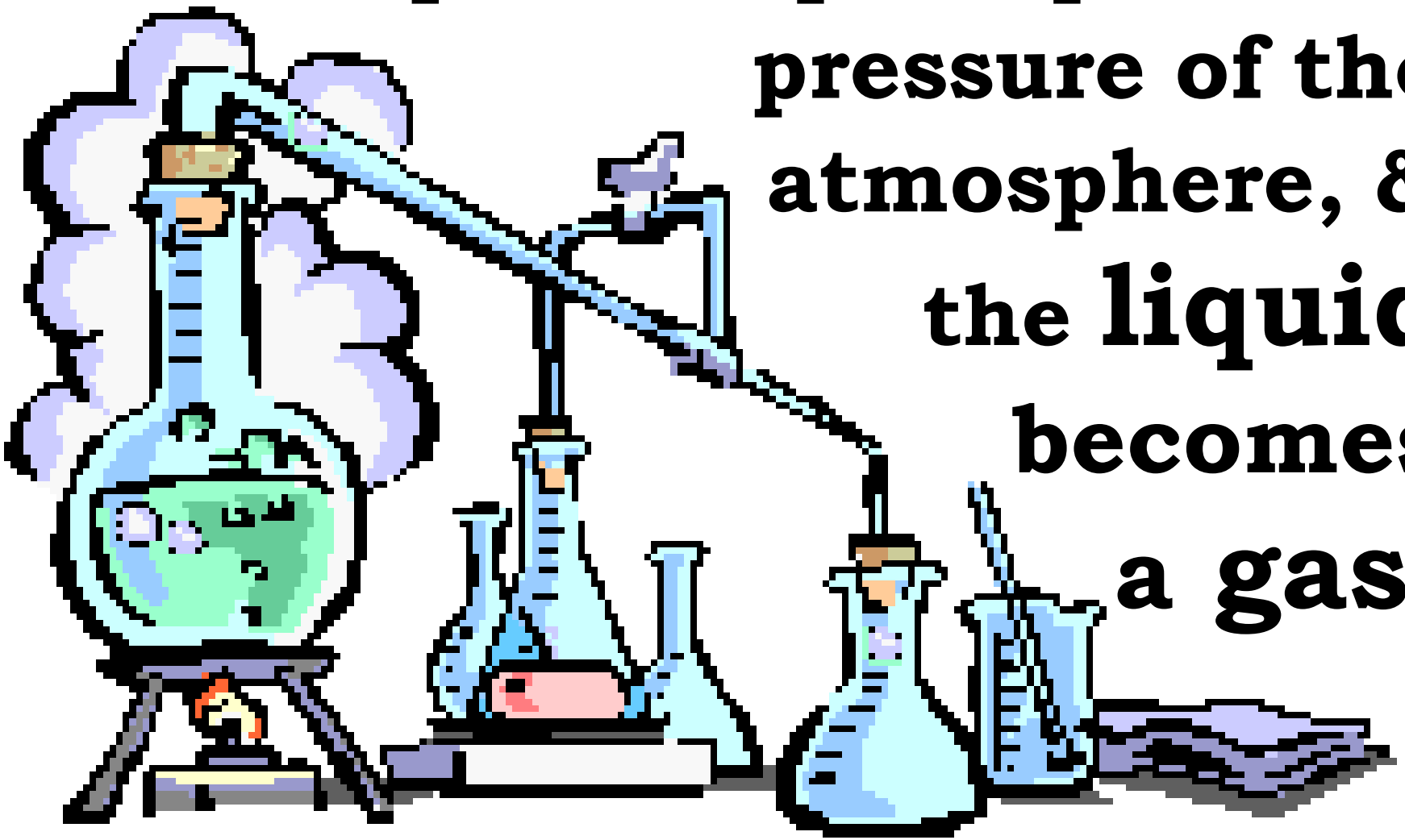
Gas state - the particles in a liquid have enough energy to escape the attractive forces of the other particles in the liquid.



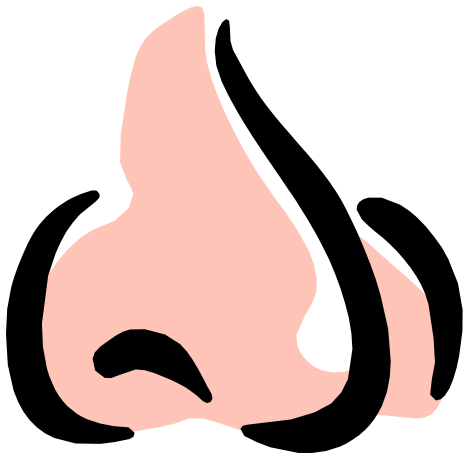


Heat of vaporization - the energy needed to change a liquid to a gas.

Boiling point – the pressure of the liquid's vapor equals the pressure of the atmosphere, & the liquid becomes a gas.

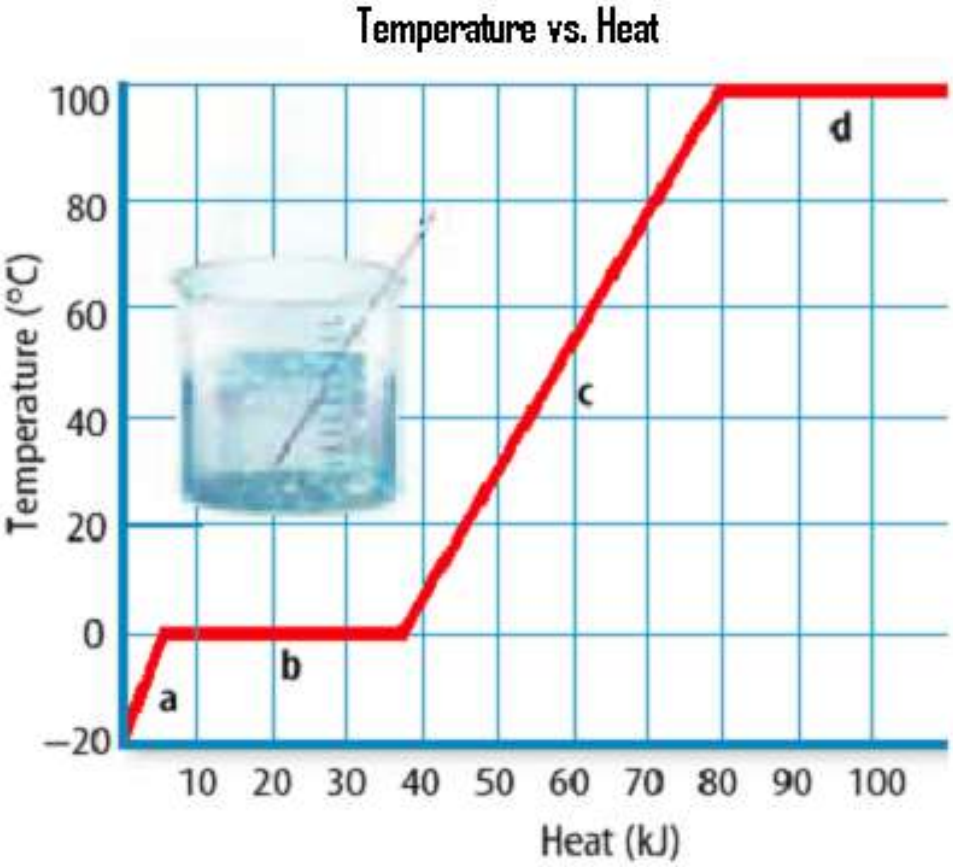


Diffusion

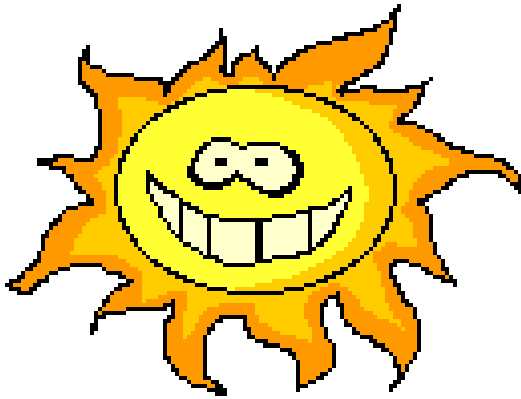


Gas particles spread evenly throughout the container.

As solids melt & liquids vaporize, the temperature remains constant; the temperature will increase only after the attractive forces of the earlier state have been overcome.



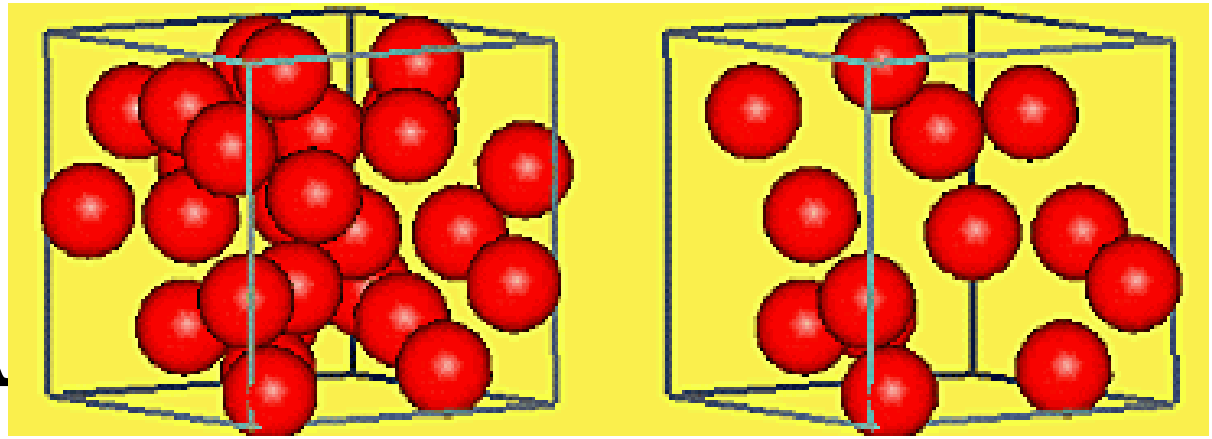
Heating curve of a liquid



Plasma - 4th state of matter consisting of high-temperature gas with

positively & negatively charged particles.

WARM UP 9.6.11

- A 

DESCRIBE THE PARTICLES IN BLOCK A.

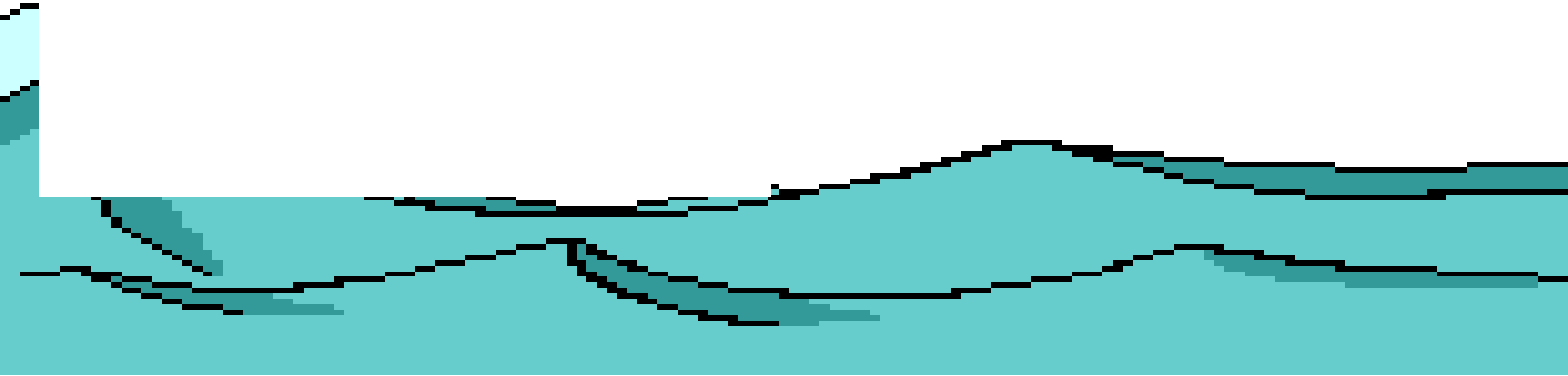
IS IT A SOLID, LIQUID, OR GAS?

NEW RULES

- **CLEAN UP AFTER YOURSELF!!!!**
- **EVERY PIECE OF PAPER=POP QUIZ NEXT DAY for that many pieces on floor!!!!**

- **Stars ARE TO STAY THERE!!!! DON'T REMOVE THEM (I know your seat number)**

Properties of Fluids

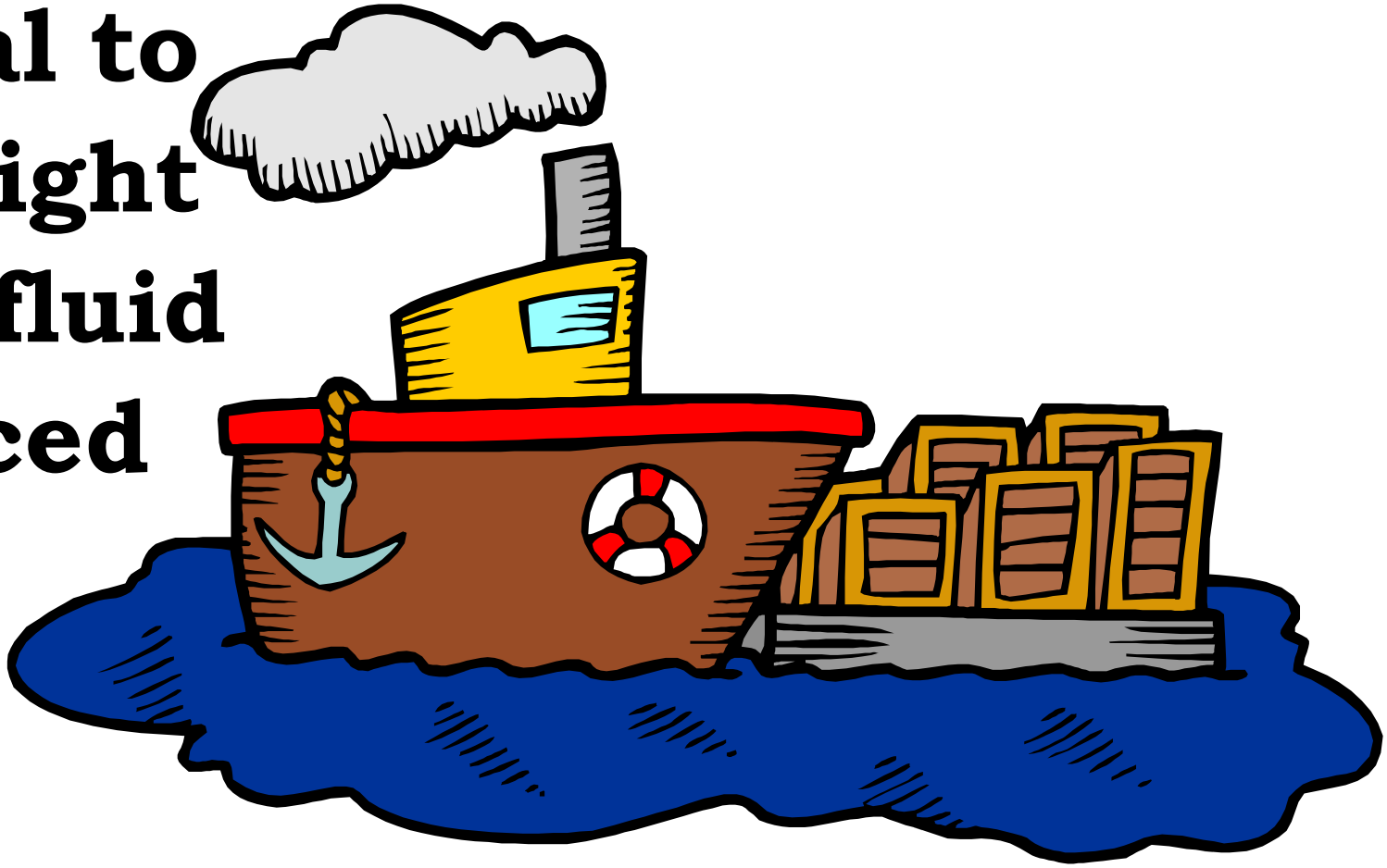


Buoyancy - the ability of a fluid (liquid or gas) to exert

an upward force on an object immersed in it.

Archimedes' principle

The buoyant force on an object is equal to the weight of the fluid displaced by the object.



An object will **float** if its weight is **less** than the buoyant force from the fluid.

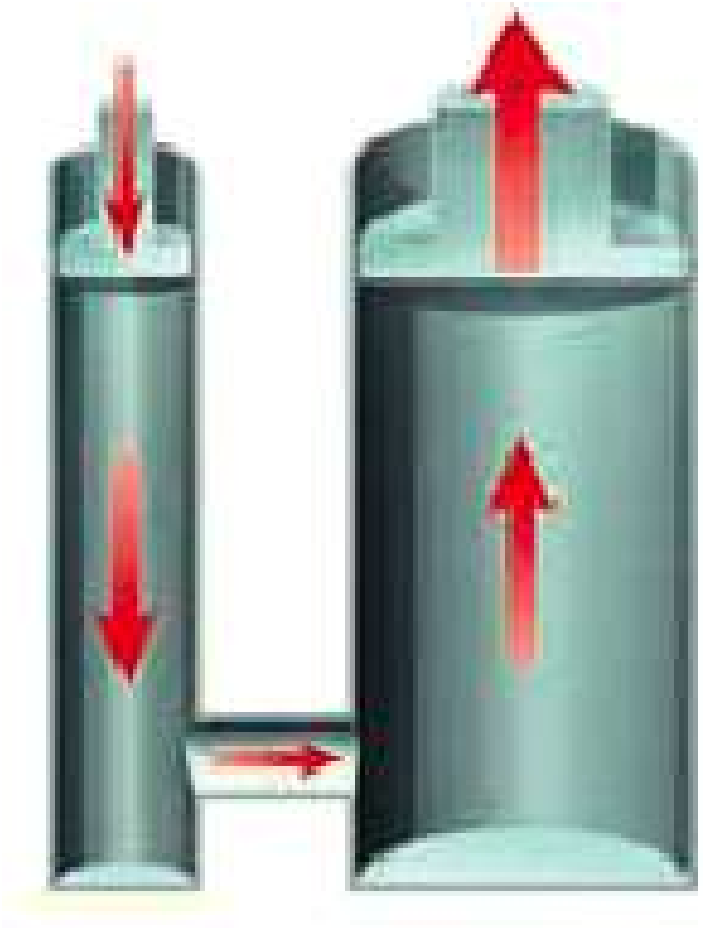
An object in a fluid will **sink** if its weight is **more** than the buoyant force from the fluid.

Archimedes Examples

- **Boats use this principle to float**

Pascal's principle

Pressure (force exerted/unit area) applied to a fluid is transmitted equally throughout the fluid.



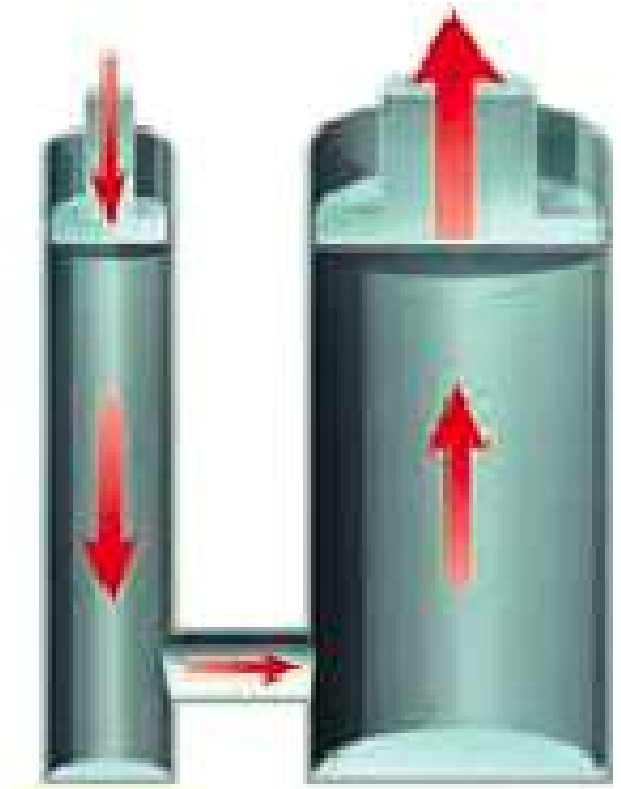
Hydraulic machines use this principle to lift heavy loads.

Essential Characteristics

- **P, P, P**
  - **Pascal's, principle of pressure**
  - **Unit for Pressure is Pascal**

Examples

- **Squeezing a ketchup bottle**
- **Hydraulic machines use this principle to lift heavy loads**



Bernoulli's principle

As the velocity of a fluid increases,

the pressure exerted by the fluid decreases.

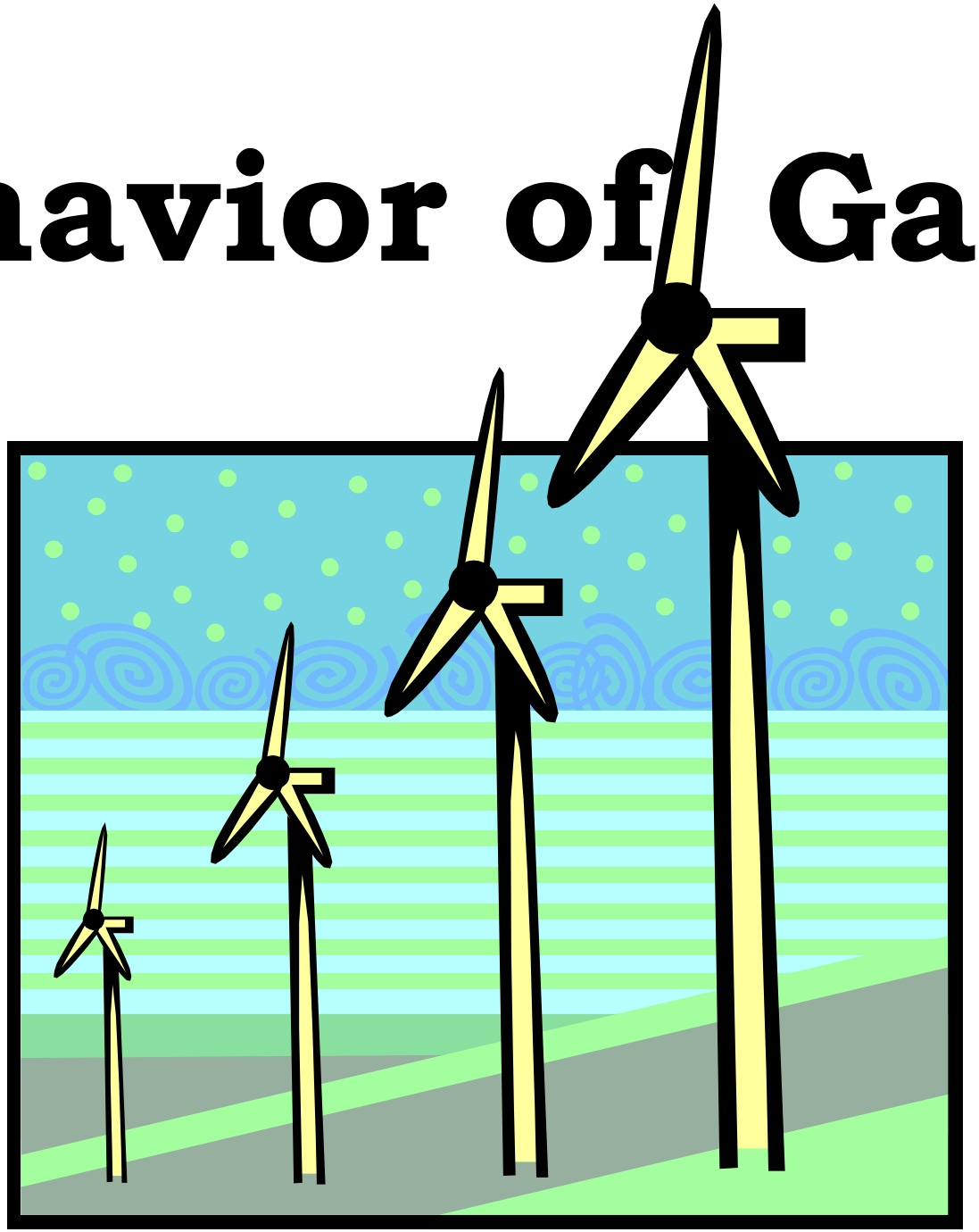
Essential Characteristics

- **Velocity goes up, Pressure goes down**

Examples

- **Airplanes fly**
- **Funnel demonstration**

Behavior of Gases



Boyle's Law

At a constant temperature …

as the pressure increases, the volume decreases and as the pressure decreases, the volume increases.

Essential Characterisitcs

- **P: Up**
- **T: Constant**
- **V: Down**

- **Inversely related**

Examples

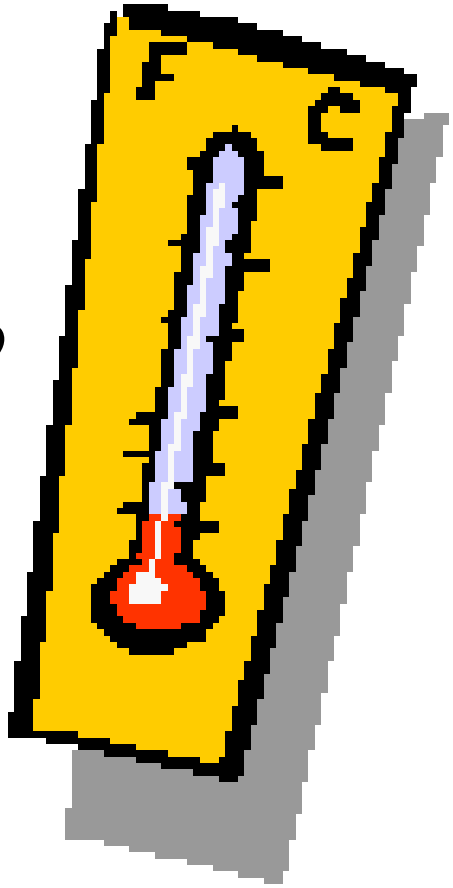
- **Pressure /Rocket demonstration**

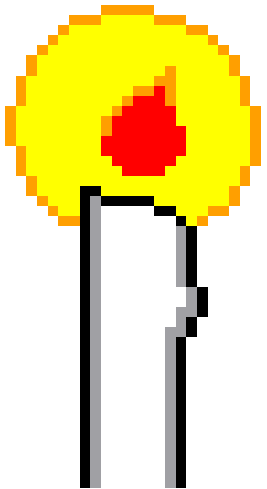
- **Weather balloons: as atmospheric pressure decreases, volume of air increase (it expands)**

Charles's Law

At a constant pressure,

as the temperature increases, the volume increases and as the temperature decreases, the volume decreases.





Essential Characteristics

- **P: Constant**
- **T: up**
- **V: up**

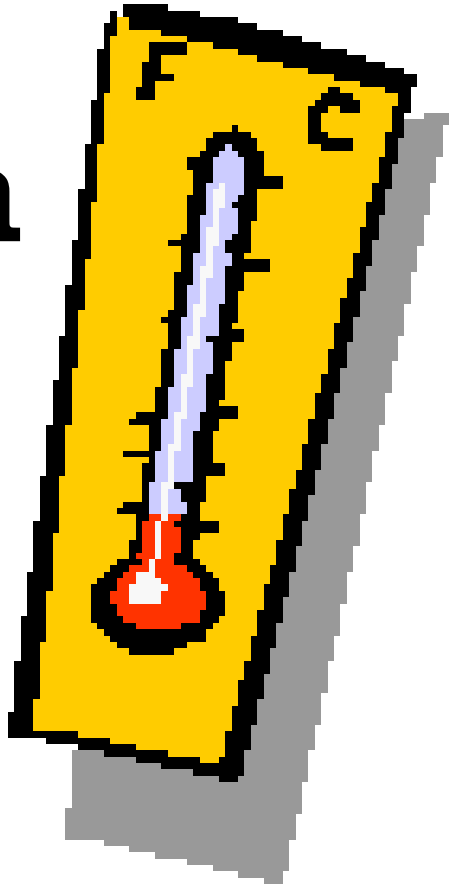
- **Directly related**

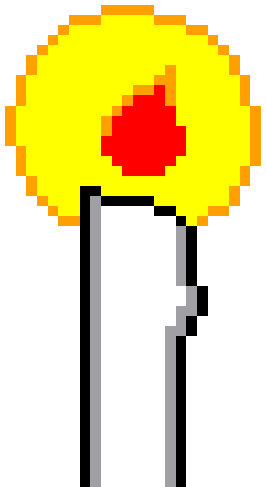
Examples

- **Bubbles getting bigger on a hot plate**
- **Cold tires in the morning looking flat**
- **Balloon in the freezer will shrink**

Thermal expansion

An increase in the size of a substance when the temperature increases. The size of a substance will decrease when the temperature decreases.





Thermal Expansion

- **Essential Characteristics**
  - **Temp goes up, size goes up**
  - **Temp goes down, size goes down**

Expansion joints allow for this to occur

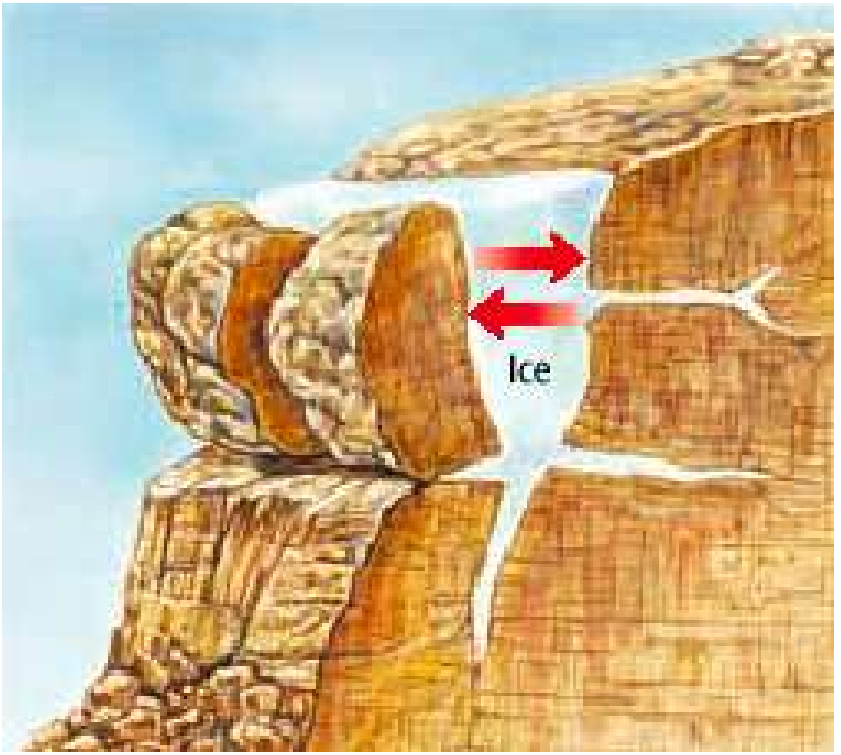
Other Examples

- **Hot air balloons, (as air is heated, becomes separates and becomes less dense)**
- **Galileo thermometer**

NON EXAMPLE

Water is an exception. It

expands



as it becomes a solid.

THE END

Warm up 9.8.11

- **1. If I hold pressure constant and decrease the temperature, what will happen to the volume? (PTV pencil)**

- **2. Name this law**

Warm up 9.7.11

- **Calculate the density of a rock that has a mass of 454 g and a volume of 100 cm^3.**

- **SHOW YOUR WORK!!!**
- **DON'T FORGET THE UNITS!!!!**

Data Table

	Volume	1000 mL	800 mL	600 mL	400 mL	200mL
	Temp (C)	Press (kPa	Press (kPa	Press (kPa	Press (kPa	Press (kPa
Off	20 C					
Lo	60 C					
Med	100 C					
High	140 C					

Conclusion to PTV Lab

- **Write a summary about the lab**
  - **What happened to the particles as they were heated.**
  - **As we decreased the volume, the pressure_____ with temperature constant…This was an example of _____ Law**
  - **As we increased the temperature, the pressure _____ with a constant volume.**

Warm up 9.2.10

- **Look at page 101 in your book.**
  - **Graphing Skills**
  - **Answer questions 1 and 4**