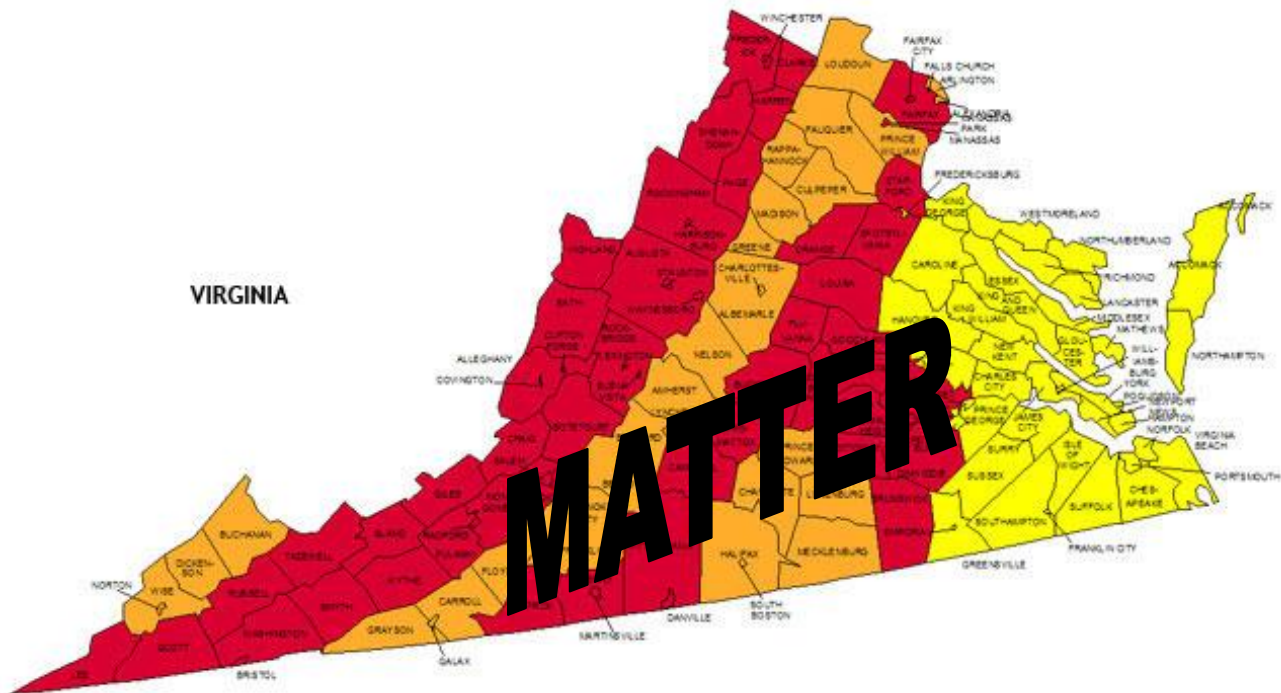


VIRGINIA



# STATES OF MATTER

- ***The Four States of Matter***

- Four States

- Solid
- Liquid
- Gas
- Plasma

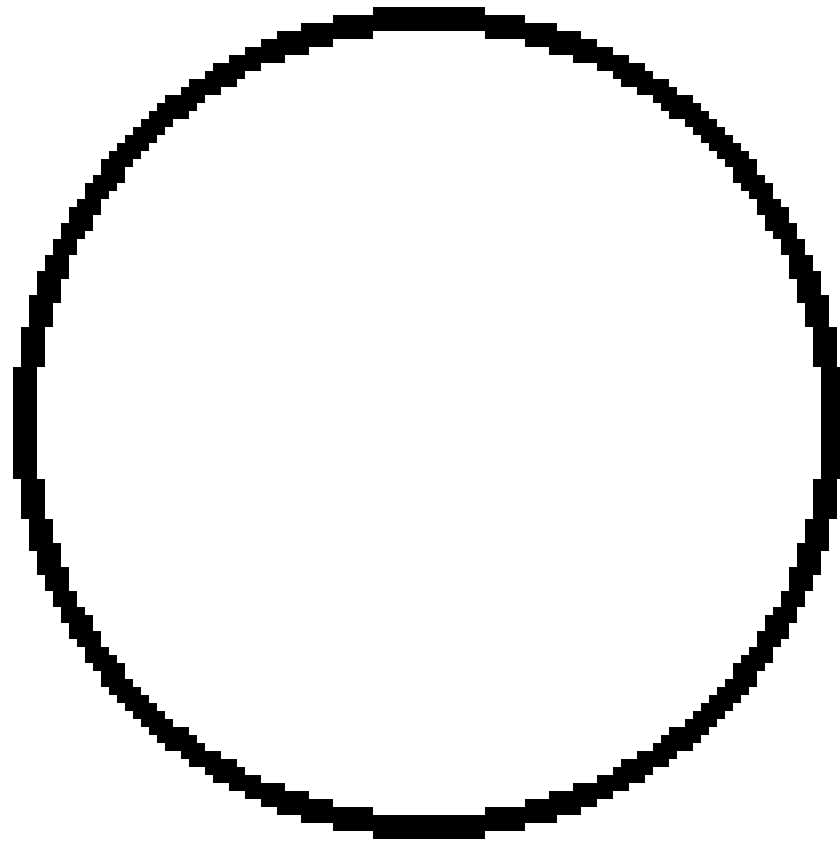
# STATES OF MATTER

- Based upon particle arrangement
- Based upon energy of particles
- Based upon distance between particles



# Kinetic Theory of Matter

**Matter is made up of particles which are in continual random motion.**

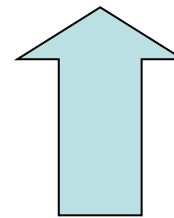
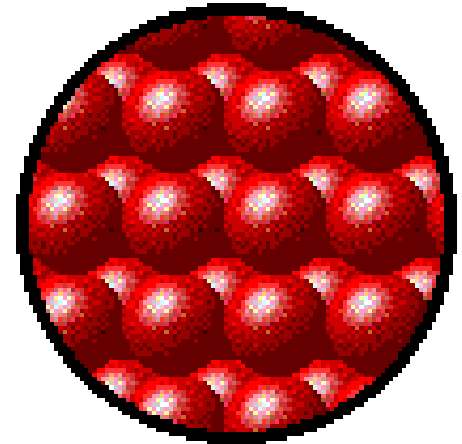


# STATES OF MATTER

## SOLIDS

- **Particles of solids are tightly packed, vibrating about a fixed position.**

- **Solids have a definite shape and a definite volume.**

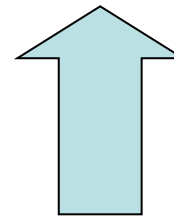
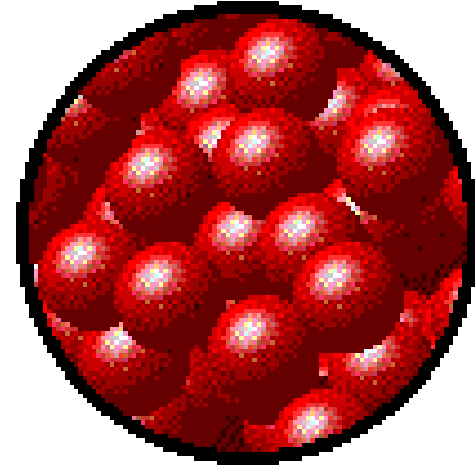


**Heat**

# STATES OF MATTER

## LIQUID

- **Particles of liquids are tightly packed, but are far enough apart to slide over one another.**
- **Liquids have an indefinite shape and a definite volume.**

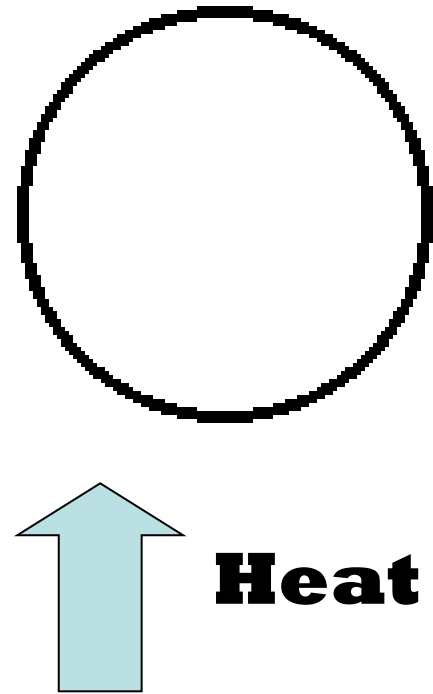


**Heat**

# STATES OF MATTER

## GAS

- **Particles of gases are very far apart and move freely.**
- **Gases have an indefinite shape and an indefinite volume.**



# PHASE CHANGES

**Description of  
Phase Change**

**Term for Phase  
Change**

**Heat Movement During  
Phase Change**

**Solid to  
liquid**

**Melting**

**Heat goes into  
the solid as it  
melts.**

**Liquid to  
solid**

**Freezing**

**Heat leaves the  
liquid as it  
freezes.**



# PHASE CHANGES

**Description of  
Phase Change**

**Term for Phase  
Change**

**Heat Movement During  
Phase Change**

**Liquid to  
gas**

**Vaporization,  
which includes  
boiling and  
evaporation**

**Heat goes into the  
liquid as it vaporizes.**

**Gas to liquid**

**Condensation**

**Heat leaves the gas  
as it condenses.**

**Solid to gas**

**Sublimation**

**Heat goes into the  
solid as it sublimates.**

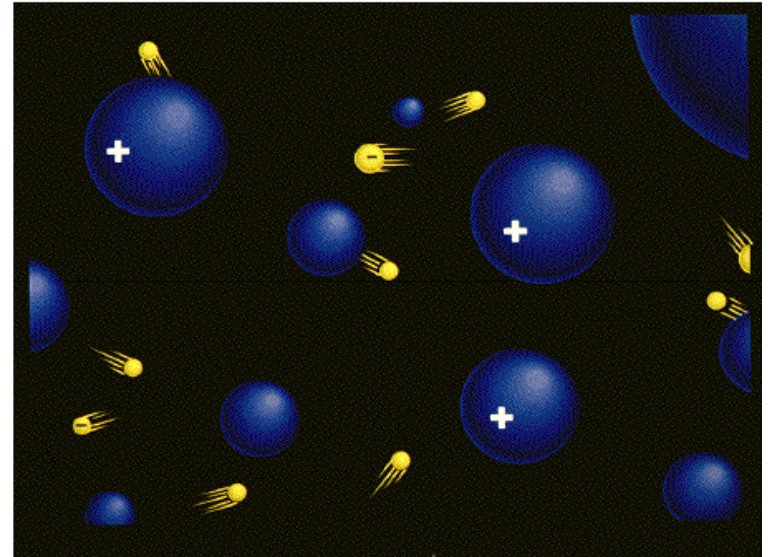
**But what happens if you raise the  
temperature to super-high levels...  
between  
1000°C and 1,000,000,000°C ?**

**Will everything  
just be a gas?**

# STATES OF MATTER

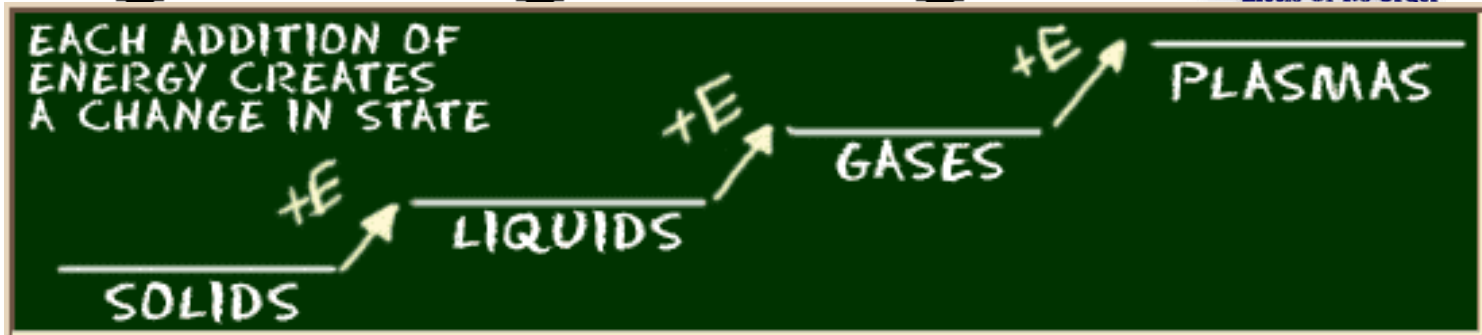
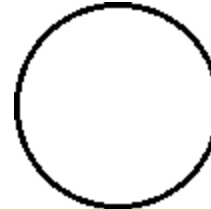
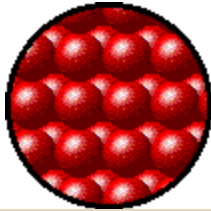
## PLASMA

- **A plasma is an ionized gas.**
- **A plasma is a very good conductor of electricity and is affected by magnetic fields.**
- **Plasmas, like gases have an indefinite shape and an indefinite volume.**



- **Plasma is the common state of matter**

# STATES OF MATTER



SOLID

Tightly packed, in a regular pattern  
Vibrate, but do not move from place to place

LIQUID

Close together with no regular arrangement.  
Vibrate, move about, and slide past each other

GAS

Well separated with no regular arrangement.  
Vibrate and move freely at high speeds

PLASMA

Has no definite volume or shape and is composed of electrical charged particles

# Some places where plasmas are found...

1. Flames

A close-up photograph of a fire with bright orange and yellow flames against a dark background. The flames are intense and appear to be a plasma state.



## 2. Lightning

### 3. Aurora (Northern Lights)

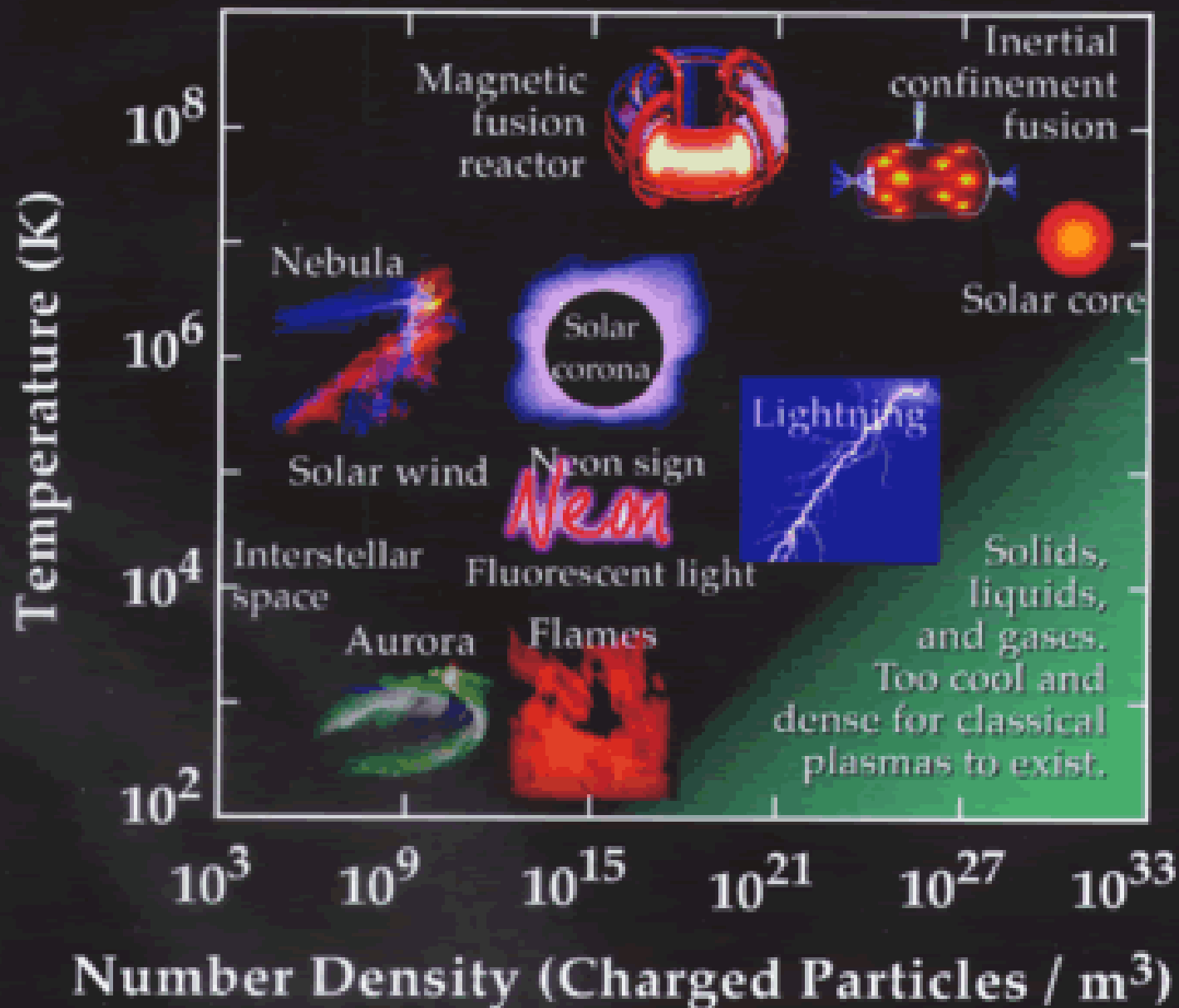


**The Sun is an example of a star in its  
plasma state**





# Plasmas - The 4<sup>th</sup> State of Matter



# **COLD PLASMA**



# COLD PLASMA PEN



Source: Old Dominion University