ATTIVITA' CLIL DI FISICA – autore : Nitti Silvia

PROGETTO CLIL - ITI CARDANO

INTRODUZIONE

Nell'ambito del progetto CLIL del nostro Istituto ho sviluppato diverse lezioni di fisica integralmente in lingua inglese e rigorosamente con metodologia CLIL.

Come si può intuire dalla presentazione che segue questa metodologia prevede una grande *partecipazione attiva* degli studenti che, tramite molte esercitazioni (activities) sono stimolati ad attivare quattro livelli di competenze linguistiche*:* speaking, reading, listening, writing.

Le tecniche previste dal metodo CLIL e qui attuate sono molto varie e comportano attività di coppia e di gruppo che sviluppano l'apprendimento cooperativo (*cooperative learning*).

Gli studenti hanno partecipato attivamente e con molto interesse dando mediamente risultati molto soddisfacenti. I tempi di realizzazione di questo modulo di fisica sono stati più lunghi del tempo richiesto a sviluppare lo stesso percorso di fisica in lingua Italiana.

Lo scopo dell'attività qui presentata e svolta già nelle classi seconde, oltre quello ovvio del CLIL che consiste nell'apprendimento integrato di lingua e contenuti di Fisica, è anche quello di preparare *gradualmente* gli studenti alle richieste della riforma che prevede che nell'anno di quinta almeno una materia non linguistica sia insegnata in una seconda lingua. L'attività CLIL a partire dalle classi seconde ha quindi l'obbiettivo finale di ridurre negli anni il differenziale tra il tempo richiesto per l'attività didattica in seconda lingua rispetto al tempo richiesto per l'insegnamento degli stessi contenuti ma in lingua madre, così da permettere in quinta di rispettare i programmi didattici e le loro tempistiche, pur attivando percorsi CLIL di ampia portata.

In questo Power Point presento le lezioni e le esercitazioni svolte in classe. Per comprenderle meglio si legga il file "Lesson plan on phase transition", alla voce "Procedure". Ho anche sviluppato altri files per esercitazioni a casa e verifiche individuali sommative.

Nitti Silvia

MATERIAL PHASES AND THEIR TRANSITIONS

A PHYSICAL CHEMISTRY LESSONS USING THE CLIL METHOD

BY SILVIA NITTI – SECONDARY SCHOOL ITI CARDANO, PAVIA

MAY/2013

Instant Solidification! VIDEO N °1

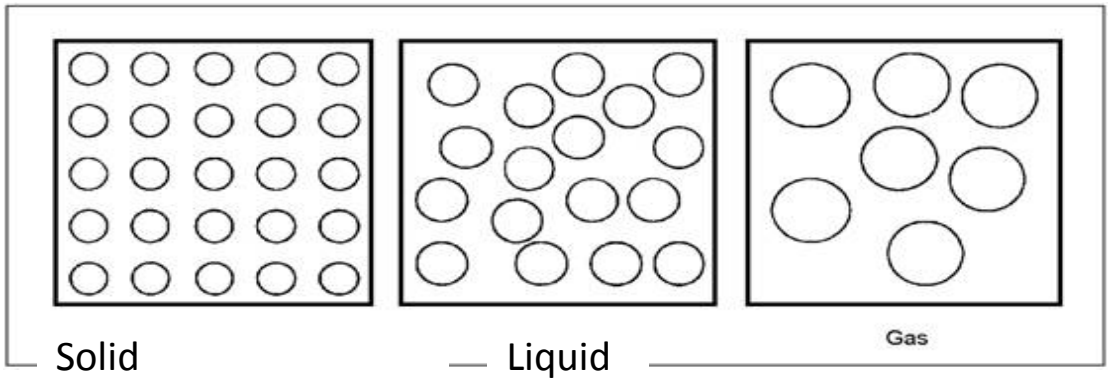
Some states of matter (solids, liquids and gases)

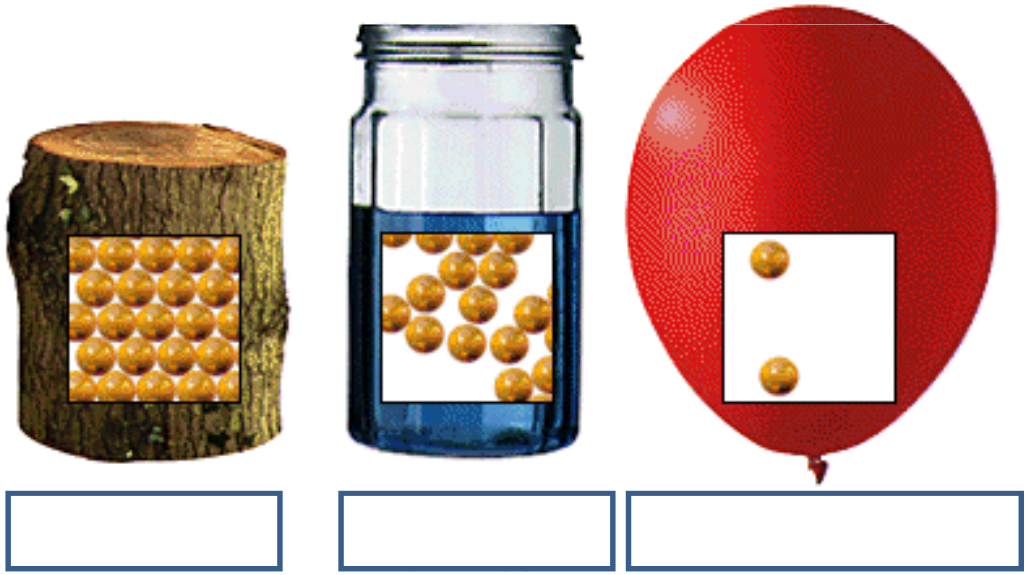
Lesson 1

Vocabulary

State of matter
Order/disorder
Fix , fixed
Pack, packed
To flow
Shape
Intermolecular forces
Dense
Unreactive
Weak/Strong
To fill
Volume
Crystalline Lattice
Material phases
Phase transition

(Code-Switching)
Lattice = *reticolo*





States of Matter (solids, liquids and gases) - VIDEO N° 2

Guided Activity n°1-1 **Vocabulary**

Group work: discuss these words in in your group and match them with the definitions.

State of matter _____

Order/disorder _____

Fix , fixed _____

Pack, packed _____

To flow _____

Shape _____

Intermolecular forces _____

Dense _____

Unreactive _____

Weak _____

To fill _____

Volume _____

Crystalline Lattice _____

Material phases _____

Phase transition _____

Guided Activity n°1-1 **Vocabulary**

Group work: the definitions (to be match). Student A reads to the others a definition then the team finds the correct word to match. After that students change roles

A. *Powerless, the opposite of strong*

B. Regular allocation/irregular

C. *Limited in a small volume*

D. Liquid, solid, gas and Plasma are examples of these states

E. *To change shape, adapting to the container*

F. Constant

G. The term phase is sometimes used as a synonym for state of matter.

H. Forces between molecules

I. *Compact*

J. It doesn't react

K. *To put in*

L. The appearence of an object, the figure of an object

M. *The regular structure of a crystal*

N. The space that one object fills

O. *The change of phase*

Activity n°2-LES1: **Type of states of matter**

Work in group: put the objects in the labels in the correct column of the table, communicating in English with your mates.








Solids	Liquids	Gases

Activity n°3-LES1

The properties of the states of matter

Work in peers: fill the chart

Hint: you can use words like the one you heard in video n°2-Less1, or that you have in the vocabulary sheet. Example: **Strong/Weak/None,** : **Fixed/Not fixed, High/Low/none**

	gas	**liquid**	**solid**
Volume			
Shape			
Intermolecular forces			
Does it flow?			
Intermolecular order			

Scaffolding

Use words like :

Fixed/Not fixed

Strong/weak/none,

High, low, none

Lesson n °2 Solid structures

The atoms in a solid *are tightly bound* to each other, either in a regular geometric lattice or irregularly

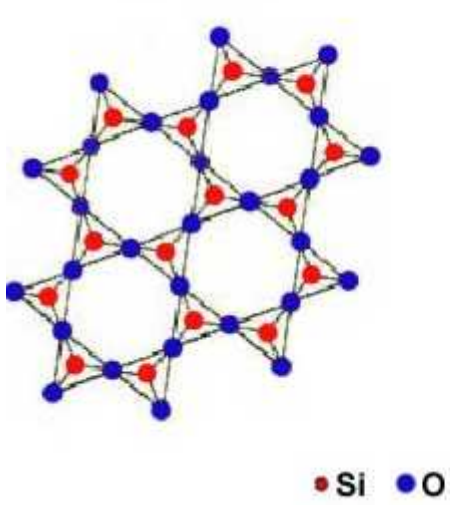
Two type of solids

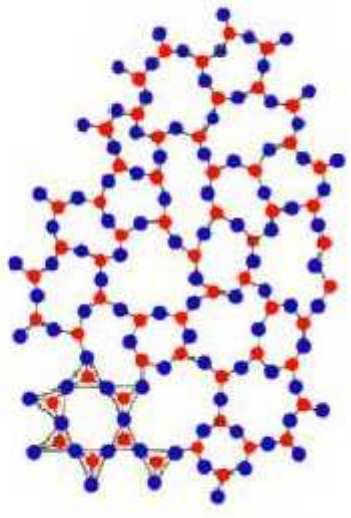
Crystalline solids

This solid structure is very **regular,** The crystal is highly ordered

Amorphous solid

This solid structure is regular only for small distance. There is a **short-range order**





Other crystals:
- Emerald
- Diamond
- Amethyst
- NaCl
- Sugar

Other amorphous solids:
Coal, Glass,
Plastic,
Rubber ,Wax

To know more: http://www.citycollegiate.com/solid3.htm

Activity n°1-LESS2

Amorphous solid and crystalline solids

Work in group: fill the chart below

Type of solids	Amorphous solid	Crystalline solids
Type of structure		
Type of order		
Examples		
Pictures		

Glossary:

Short-range order *: type of order that is kept only for short distance*

Long-range order*: type of order that is kept for long distance*

Lesson n 3 **Phase Change**

Phase Change Diagrams - Mark Rosengarten, US Video N° 3-first part

VOCABULARY

activity n °1-LESS3

to add
heat
vibrate
attracted
melting
break apart
spread out
boilinG
it occurs
to remove
crystal lattice
kinetic energy
potential energy

condense
endothermic
to absorb
exothermic
phase change diagrams
heat over time
substance
constant
melting point
boiling point

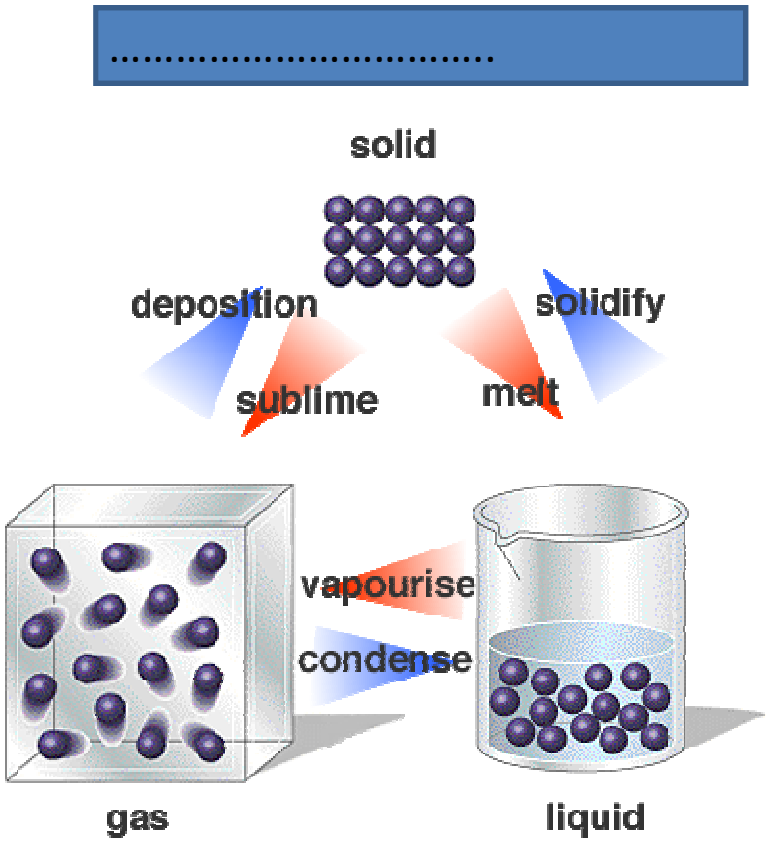
VAPORIZATION (BOILING+EVAPORATION), SUBLIMATION, DEPOSITION, SOLIDIFICATION, MELTING, CONDENSING

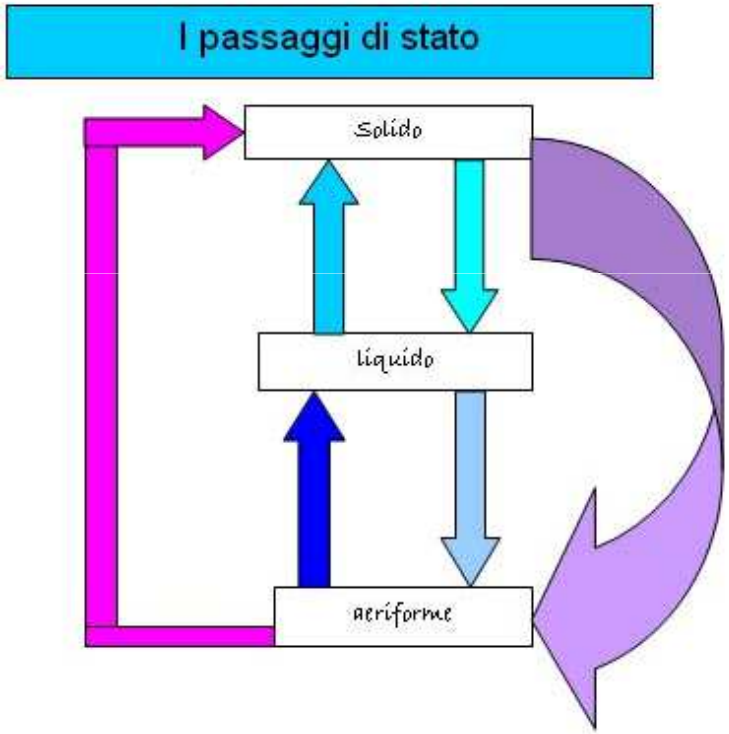
activity n °2-LESS3 **Phase Change**

1) Write the Italian names of the process onto the arrows of the figure on the right.

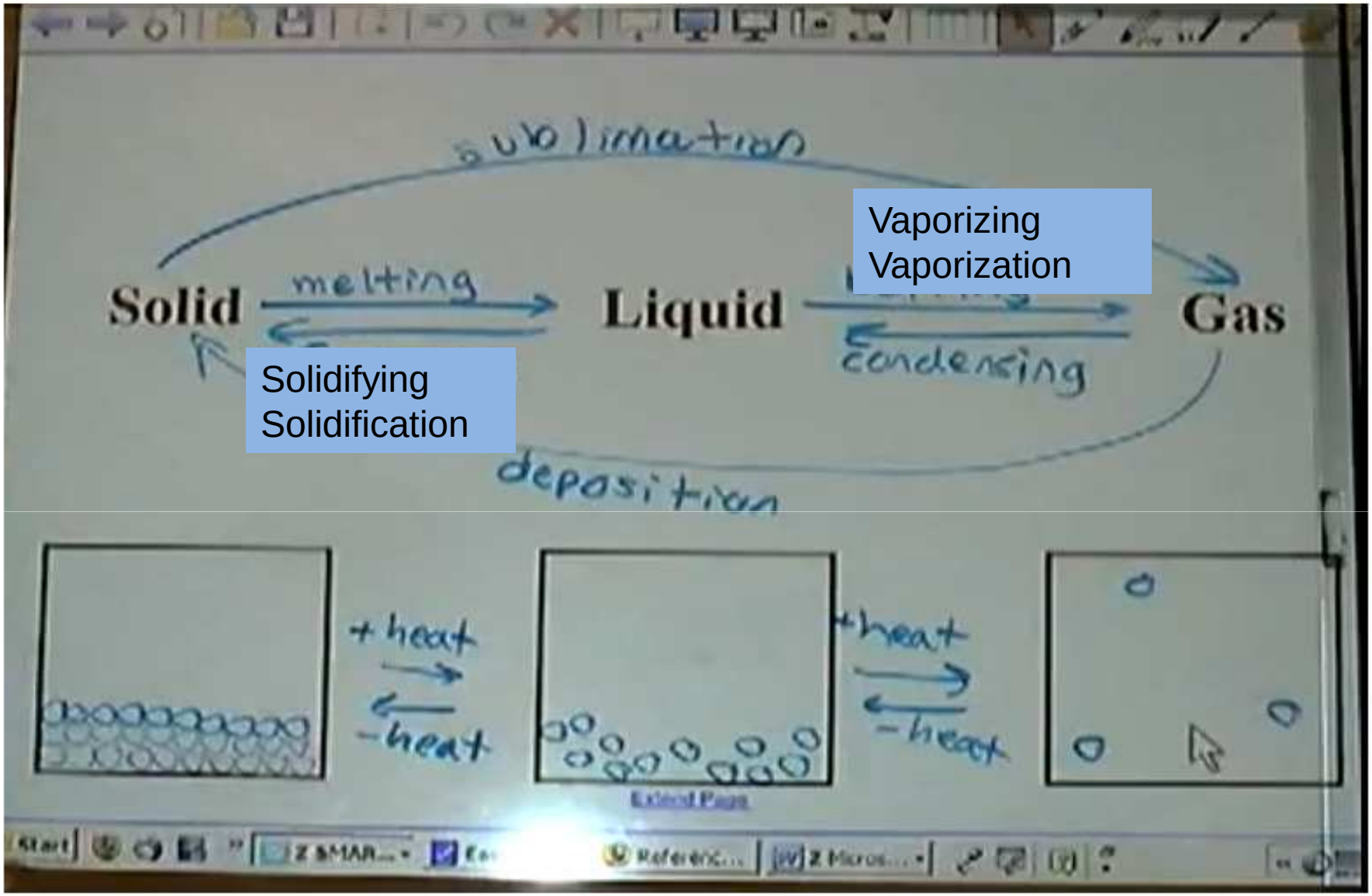
2) Complete the picture on the left then compare the two pictures and discuss (in English) with your group about how the words in the two languages are similar or very different.

3) Then compare with your mate next to you





1. *Brina*
2. *Vaporizza*
3. *Condensa*
4. *Liquefa/fonde*
5. *Solidifica*
6. *Sublima*
7. *Phase changes*



Original picture from Mark Rosengarten http://www.markrosengarten.com/Modified by Silvia Nitti

vocabulary:

VAPORIZATION or VAPORIZING

SUBLIMATION,

DEPOSITION,

SOLIDIFICATION or SOLIDIFYING , or also FREEZING

MELTING or FUSION

CONDENSING or also CONDENSATION

activity n °3-LESS3
Vocabulary and content

Phase Changes

Work in pair: Put the name of processes on the top of the arrows and put the names of the ***states of matter*** *under the objects*

S……..

L……..

……..

……..

……..

……..

activity n °4-LESS3

Work in pairs:
1) Student A read to student B his/her part. B writes into the gaps
2) then B read to A so that A fills the gaps.

PART A

A1. **Sublimation** is …… that transforms a …….. a gas

A2. …… the process …… a solid into ……

A3. **Deposition** is ……that transforms a …….. into a solid

A4. …… is the process …… a gas into a ……

A.5 **Vaporization** …… that transforms a……into a gas

A.6 **Solidification** is the process …… a liquid……

Work in pairs:
1) Student A read to student B his/her part. B writes into the gaps
2) then B read to A so that A fills the gaps.

PART B

B1. ……. the process ……. a solid into …….

B2. Melting is ……. that transforms a ……. a liquid

B3. ……. the process ……. a gas into a ……

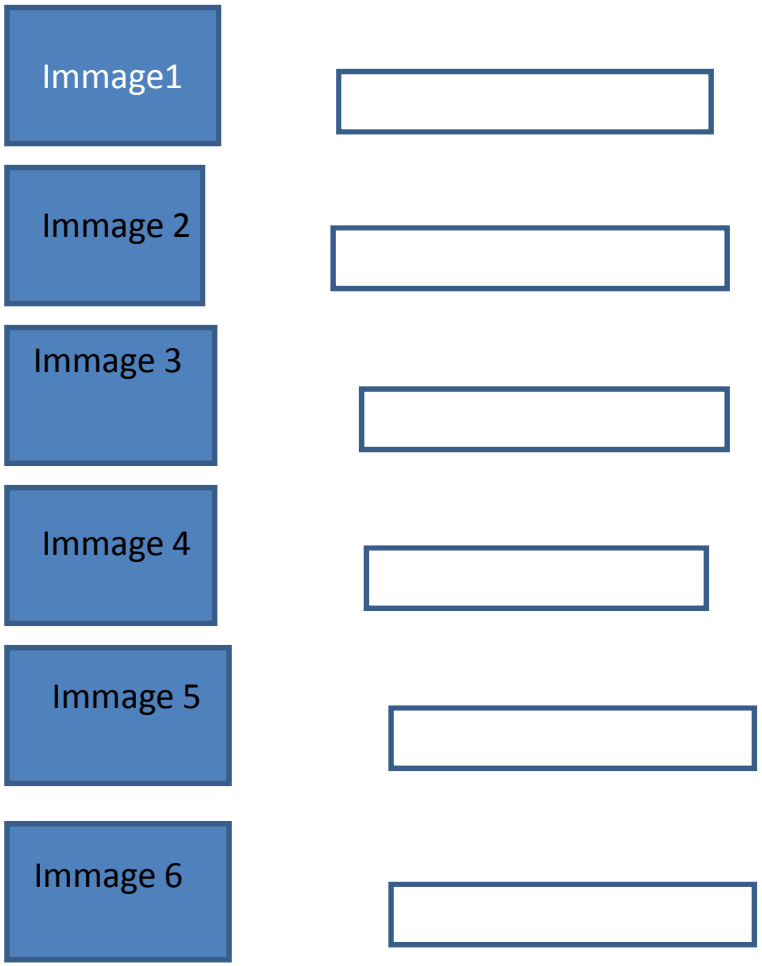
B.4 Condensation ……. that transforms a……into a liquid

B5. …… is the process …… liquid into a ……

B6. …… that transforms …….. into a solid

activity n °5-LESS3

Get into groups and order the pictures starting from the piece of ice (bordeaux picture)
Then find the corrisponding order of the processes.
When you are finished shout "we are done". Don't say the solution



Materials: labels to be cut for activity n° 5-Less3

Solidification (freezing)

Sublimation

Vaporization (evaporation or boiling)

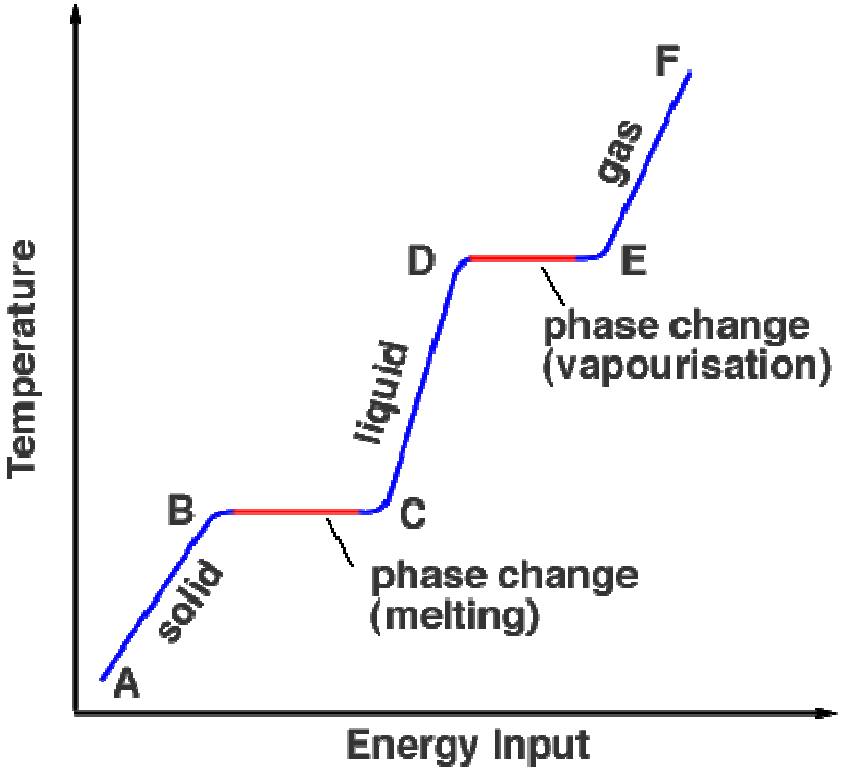
Condensation

Deposition

Melting (fusion)

[Water Phase Change - Water to ice in 90 seconds using vacuum]

The states of matter depends on temperature and on pressure

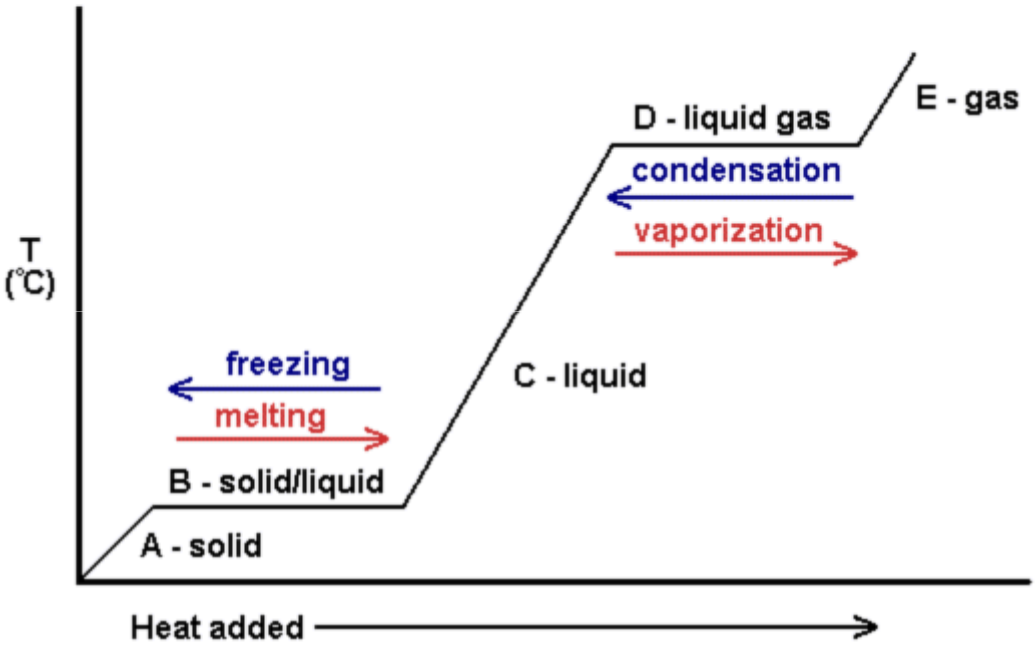


http://www.splung.com/content/sid/6/page/latentheat

Lesson n 4 **Phase Change Diagrams**

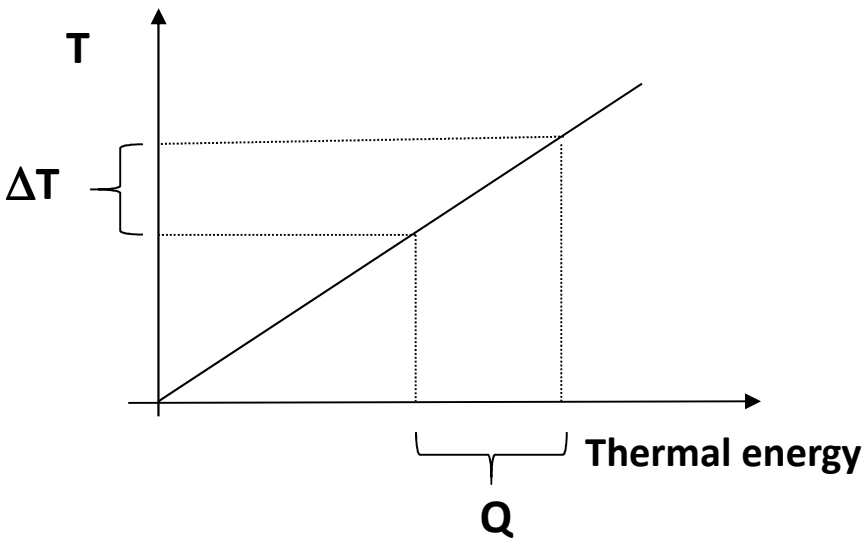
Change in State and molecular scheme video n.4

Phase Change Diagrams - Mark Rosengarten, US Video N° 3 second part



•**Freezing** (solidifying) is the phase change as a substance changes from a liquid to a solid.
•**Melting** (fusion) is the phase change as a substance changes from a solid to a liquid.
•**Condensation** is the phase change as a substance changes from a gas to a liquid.
•**Vaporization** is the phase change as a substance changes from a liquid to a gas.

When ***phase transition*** (phase change) doesn't occur an object that absorb a quantity of thermal energy **ΔE** (called also heat, "Q") will increase it's temperature of ΔT
So that **ΔE = c · m · ΔT**, where **c** is the ***specific heat***, a constant depending on the material.
The *specific heat* **c** has the same value of the energy that you would need to heat up 1 Kg of a substance in order to increase it's temperature by 1 °C.



$$Q = c \cdot m \cdot \Delta T$$

$$\Delta T = Q / (c \cdot m)$$

$$c = Q / (m \cdot \Delta T)$$ **Specific heat**

$$C = Q / \Delta T$$ **Thermal capacity**

Heat: it's a variation of thermal energy

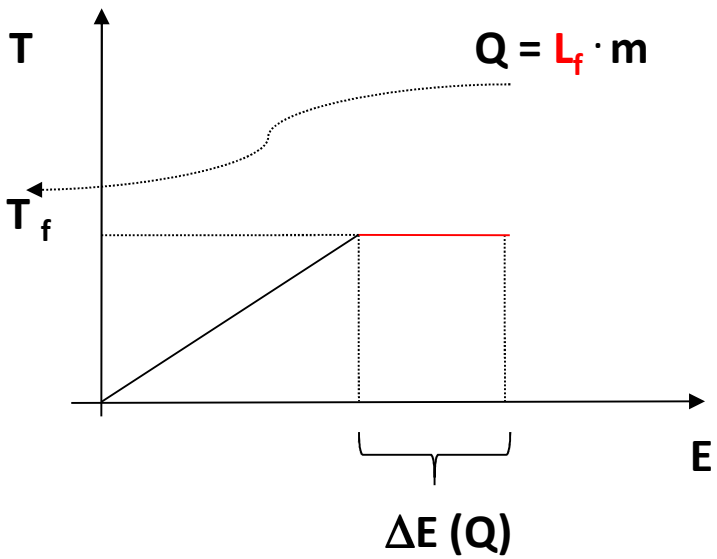
During the *phase transition* (phase change) an object that absorbs a quantity of thermal energy **ΔE (called also heat :**Q) changes it's states, but it's temperature remains constant. The energy required for the change is proportional to the mass of the object.

ΔE = L · m

where **L** is the ***Latent heat***, a constant depending on the material and on the type of transition.

For the case of melting a solid into a liquid The ***Latent heat*** $\mathbf{L_f}$ is also called the ***heat of fusion***. It has the same value of the heat that you would need to melt 1 Kg of that solid.

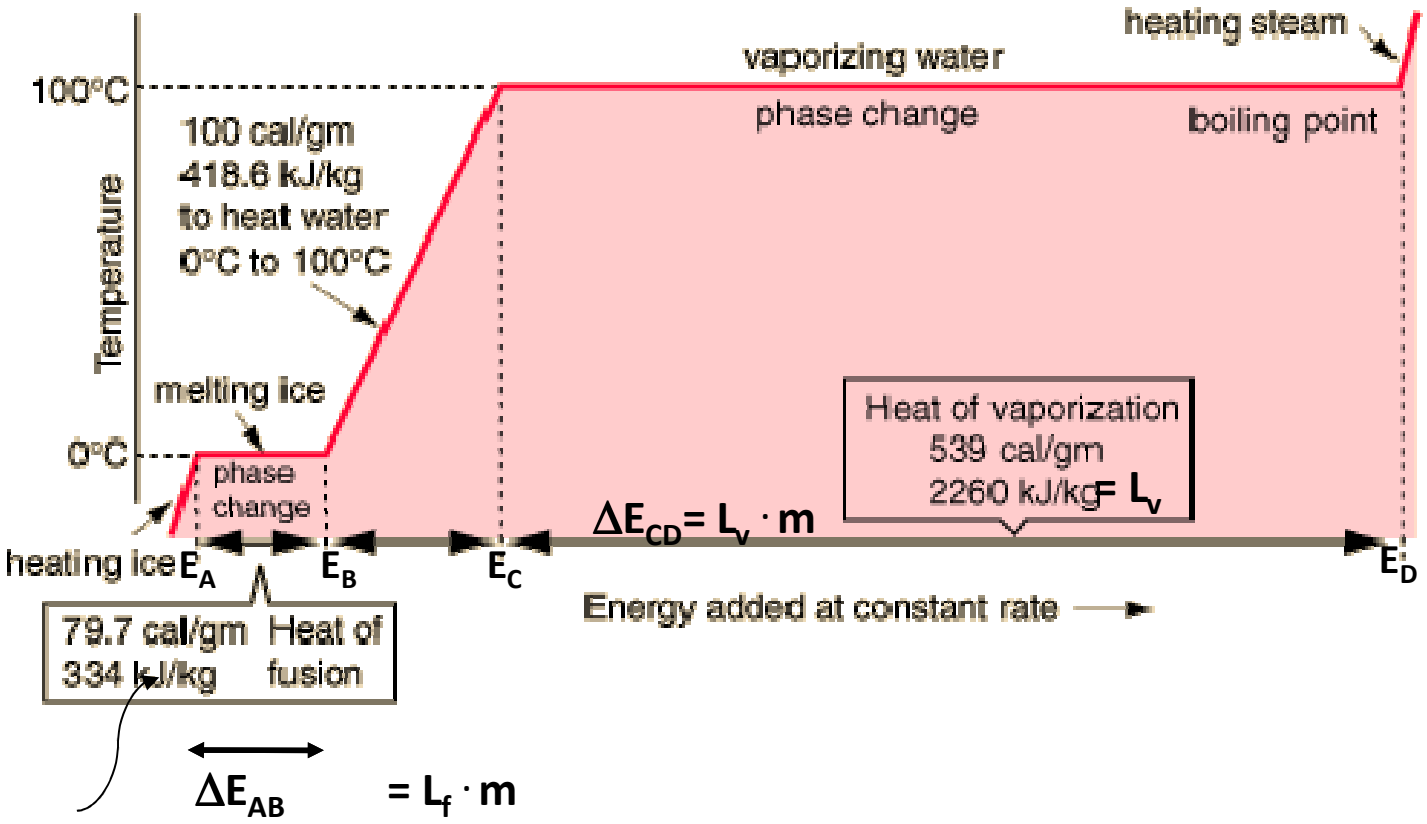
T_f= temperature at which the fusion (melting) occurs



$Q = L_f \cdot m$ **$L_f = Q / m$** ***Latent heat of fusion***

The four states of matter song

http://www.rpdp.net/sciencetips_v3/E8A3.htm



$\Delta E_{AB} = L_f \cdot m$

$E_B - E_A$

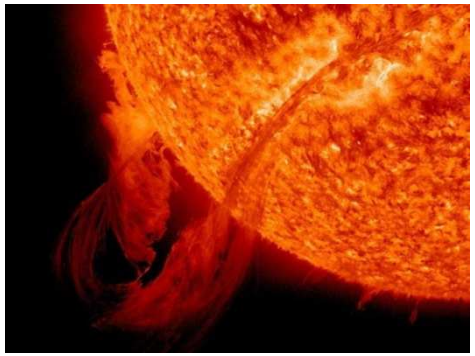
Latent heat of fusion or Heat of fusion

Lesson 5

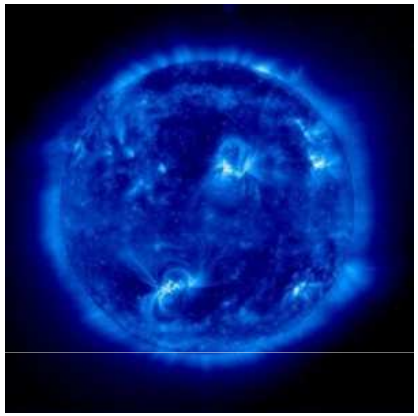
Plasma

the forth states of matter

Gigant solar eruption

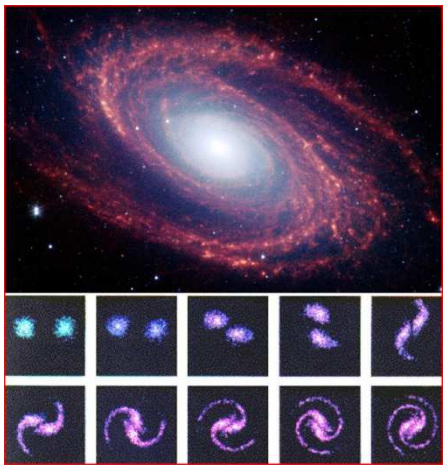


[Gas-plasma-carie]

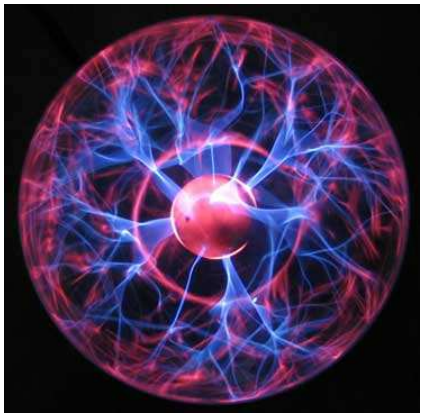


Plasma TV

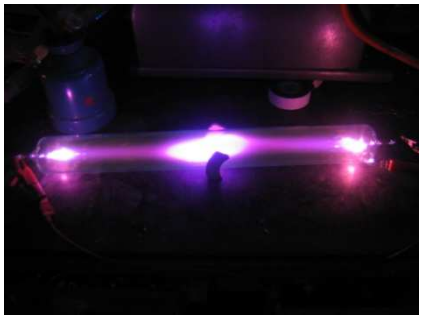
Plasma galaxy



Plasma Globe

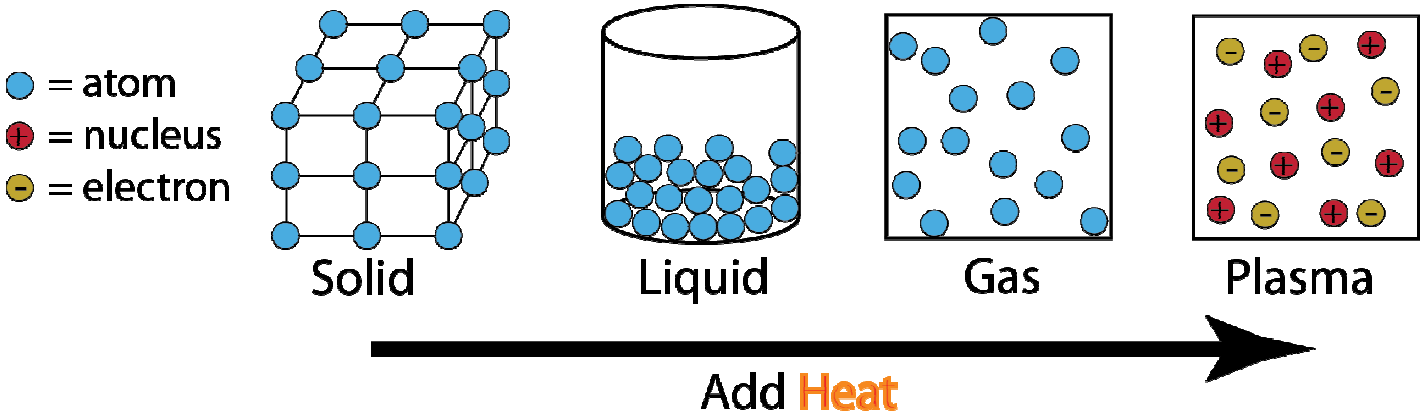


Plasma Tube

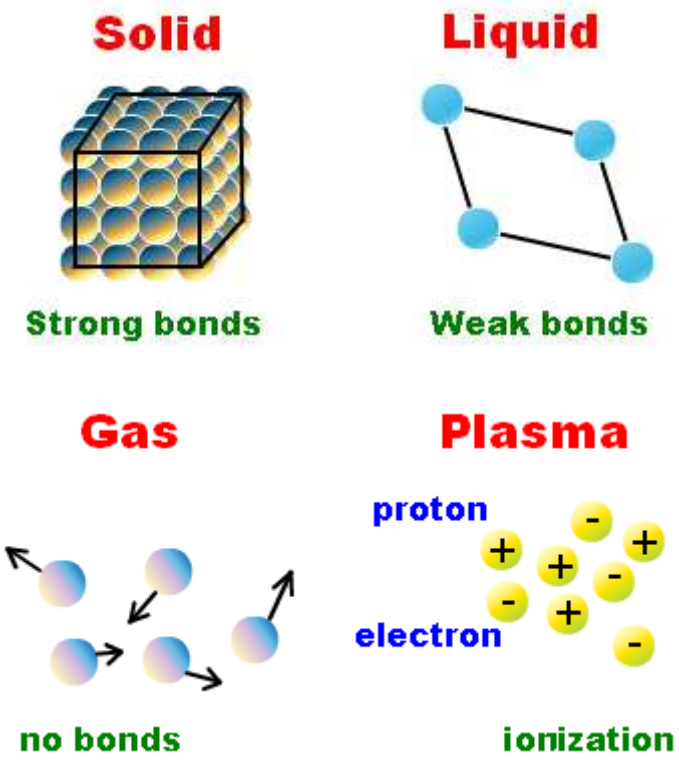


Lightning

4 States of Matter



If we **have a gas** that consists of single atoms, and we **add sufficient energy** (heat) to it, the negatively charged electrons which are typically bound to the positively charged nucleus of these atoms will overcome the pull of the nucleus (opposite charges attract). The result will be a **"soup" of particles** consisting of the **free electrons** (- charge) and the **free nuclei** (+ charge). This state is known as **plasma.**


Solid
Liquid
Strong bonds
Weak bonds
Gas
Plasma
proton
electron
no bonds
ionization

Plasma exercise

activity 1-Less5

1. **Listen while the text is read (by the Teacher) and number them in the order in which you hear them (only the first time you hear them).**
2. **Now listen to the definitions (read by the T) and say which words on your list they define.**
3. **Then write in the words next to their definitions** (give definitions on paper)
4. **Now read the text yourself** (give text)

List of words:

double layers	**increasing**	**turning it into**
charge carriers	**electrons**	**laser**
dissociation	**charged**	**electrically conductive**
ionization	**ionize**	**ions**
Microwave	**electromagnetic fields**	**molecular bonds**

The text

activity 1-Less5

Plasma is one of the four fundamental states of matter (the others being solid, liquid, and gas). Heating a gas may **ionize** its molecules or atoms (reducing or **increasing** the number of **electrons** in them, thus **turning it into** a plasma, which contains **charged** particles: positive **ions** and negative electrons or ions.[2] **Ionization** can be induced by other means, such as strong electromagnetic field applied with a **laser** or a **microwave** generator, and is accompanied by the **dissociation** of **molecular bonds**, if present.[3]

The presence of a lot of **charge carriers** makes the plasma **electrically conductive** so that it responds strongly to **electromagnetic fields**. Plasma, therefore, has properties quite unlike those of solids, liquids, or gases and is considered a distinct **state of matter.**

Like gas, plasma does not have a definite shape or a definite volume unless enclosed in a container; unlike gas, under the influence of a magnetic field, it may form structures such as filaments, beams and **double layers**

Lesson 6

PHASE CHANGES- vocabulary review

1.VAPORIZATION (BOILING+EVAPORATION),

2.CONDENSATION

3.SUBLIMATION,

4.DEPOSITION,

5.SOLIDIFICATION

6.MELTING (FUSION)

7.IONIZATION

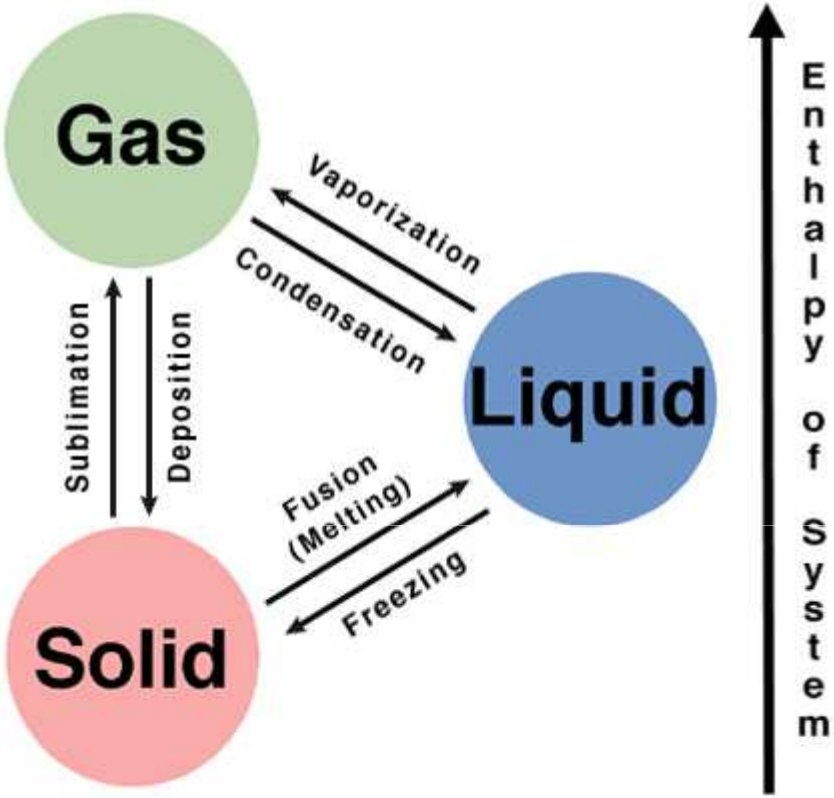
8.RECOMBINATION

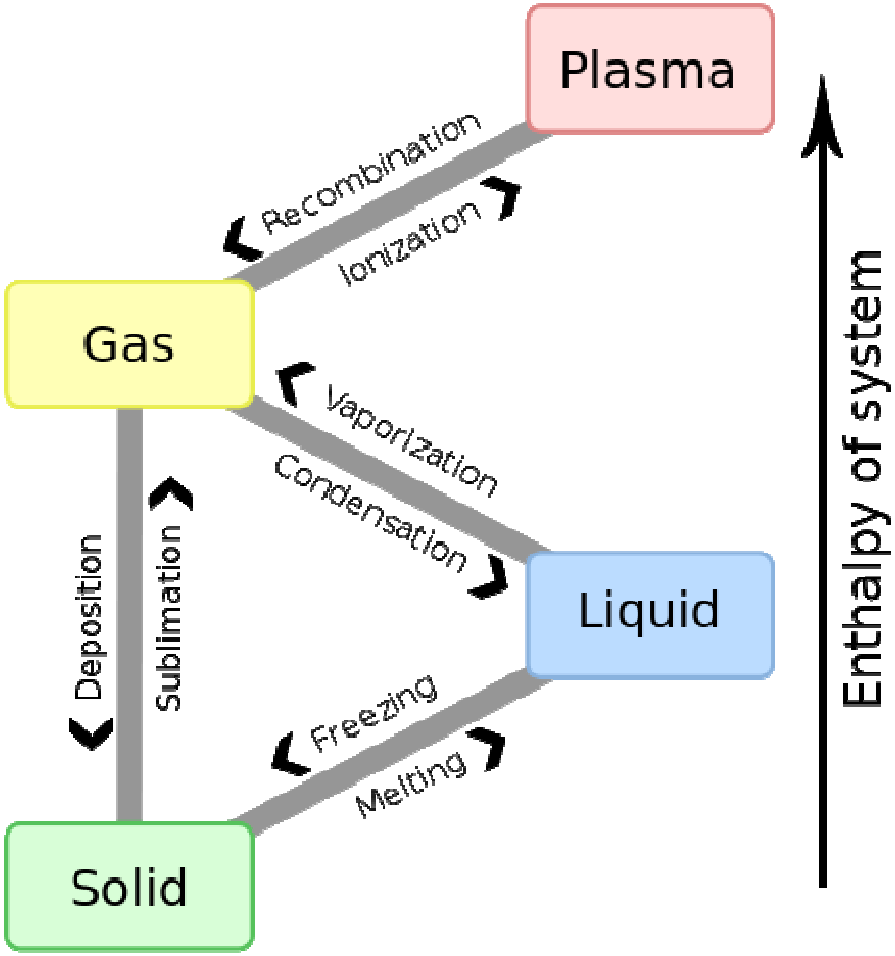
NOTE:

VAPORIZATION = VAPORIZING

SOLIDIFICATION = SOLIDIFYING

CONDENSATION = CONDENSING


Gas
Liquid
Solid
Vaporization
Condensation
Sublimation
Deposition
Fusion
(Melting)
Freezing
Enthalpy of System



http://en.wikipedia.org/wiki/File:Phase_change_-_en.svg

The forth and the fifth states of matter video ..start from minutes 4.48

Final summative kinetic activity

Read the phrases on the wall and match it with your labels.

ON THE WALL:

A) Like a gas, ... (A1) does not have definite shape or volume. Unlike gases, ... (A2) are electrically ....., produce magnetic fields and electric currents, and respond strongly to electromagnetic forces. In a ..... (A1), electrons are ripped away from their nuclei, forming an electron "sea". This gives it the ability to conduct ..... (A3)

B) A ……. (B1) is characterized by structural …….. (B2) and resistance to changes of shape or volume. Unlike a liquid, a ……. (B1) object does not flow to take on the ……. (B3) of its container and doesn't expand to fill the entire volume available to it like a gas does.

C) A ..... is a compressible fluid. It conforms to the ..... of its container and it also expand to fill the container. It has no definite shape or ....., but occupies the entire container in which it is confined.

D) ..... is the only state of matter with a definite volume but no fixed shape. Like a gas, a ..... is able to flow and take the shape of a container. Unlike a gas, a ..... does not disperse to fill every space of a container, and maintains a fairly constant density

E) In a ....., the molecules have enough kinetic energy so that the effect of intermolecular ..... is small (or zero for an ideal gas), and the typical distance between molecules is much greater than the molecular size.

lesson 6:- final summative kinetic activity

conductive

plasmas

shape

rigidity

plasma

shape

gas

Solid

Gas

Liquid

electricity

Liquid

forces

volume

Liquid

forces

THE END