Do Now

- Convert 2,048 kPa to atm and psi.
- Convert 100 degrees C to K
- Convert 400 degrees K to C.

Solids

Physical Properties

- Fixed arrangement of particles.
- Packed tightly together.
- Particles vibrate, but stay in place.
- With enough energy, they can overcome intermolecular bonds and flow. We call this melting.

Crystal Structure

- Orderly arrangement of particles in a repeating, 3D pattern called a "lattice"
- The types of bonds in a crystal determines its melting point.
- Ionic bonds generally are crystalline and have the higher melting points.

Crystal Structure

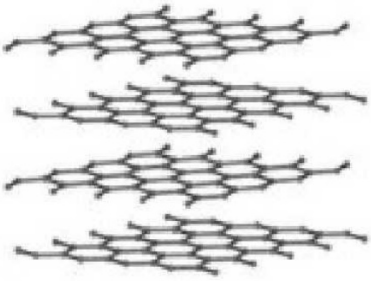
- Shape of a crystal depends on its unit cell. This is a repeating building block.
- A crystal is simply a solid made of a repeating from of unit cells.
- This gives crystals their different shapes.

Allotropes

- Crystalline structure can vary depending how atoms bond together.
- Some elements (carbon, sulfur, and oxygen) can bond to themselved in different arrangements.

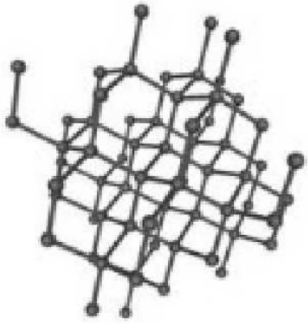
Graphite

Dull, opaque, soft, common



Diamond

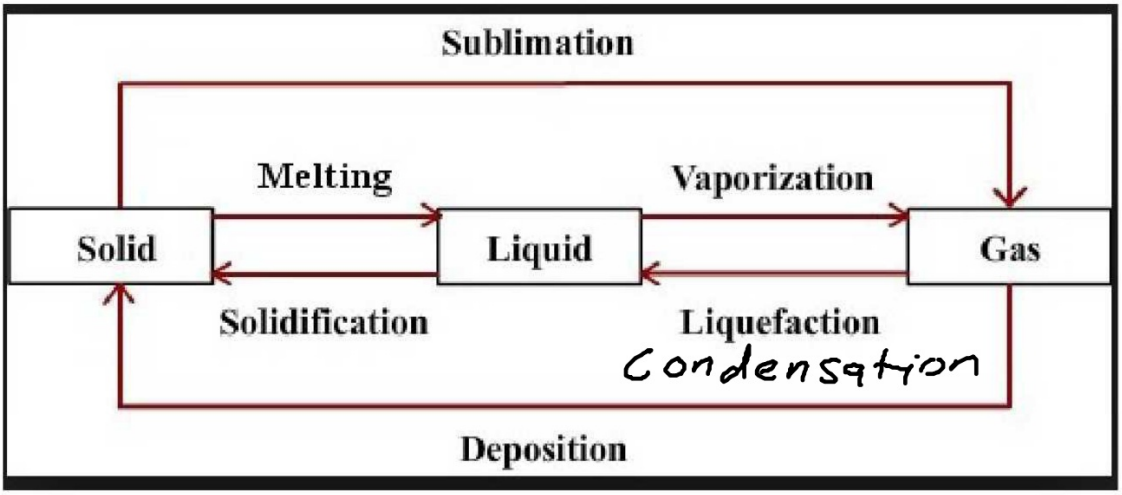
Brilliant, transparent, hard, rare



Diamond vs. Graphite

Non-Crystals

- Amorphous - Lacks organization of internal structure.
- Examples - Glass, Rubber, & Plastic.
- When these materials break, the pieces are irregular.



Changes of State

Do Now:

Grab a whiteboard.

Draw a picture that explains why water condenses to the mirror in the bathroom after the shower has been running.

Take out the homework.

Sublimation

- Solid to gas state without going through the liquid form.
- Solids may have a vapor pressure higher than atmospheric pressure.
- Think of dry ice.

Changes of State

- Melting - solid to liquid.
- Solidification (freezing) - liquid to solid.

Not always

- Vaporization (boiling) - liquid to gas.
- Condensing - gas to liquid.

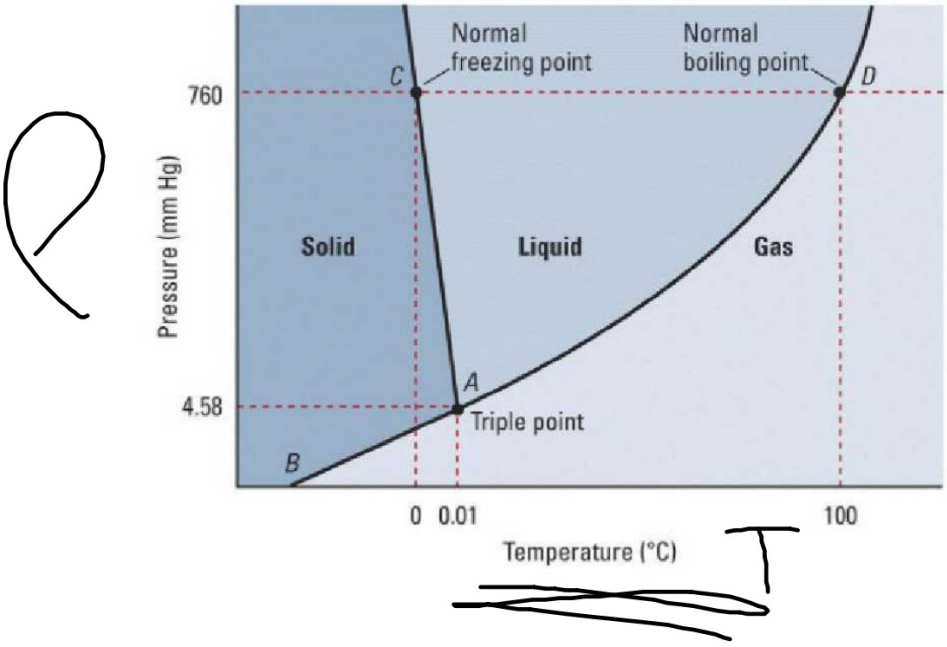
Plasma!

What's In A Candle Flame?

Plasma Ball:

Shhhhhhh.... It's sleeping.

We need to wake it up.



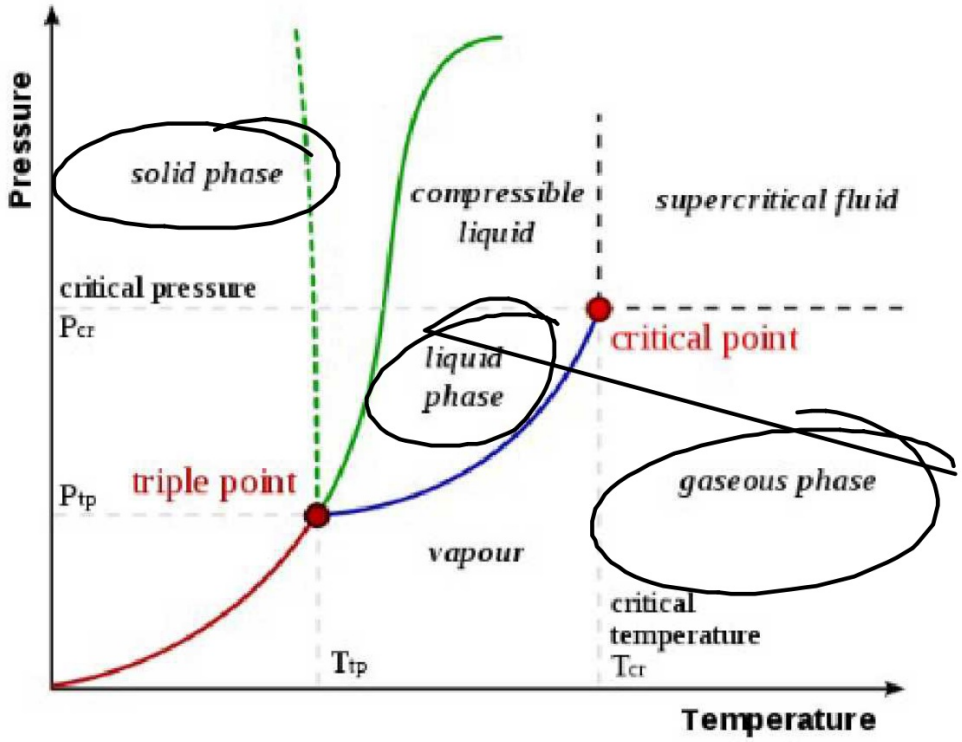
Phase Diagrams

Phase Diagrams

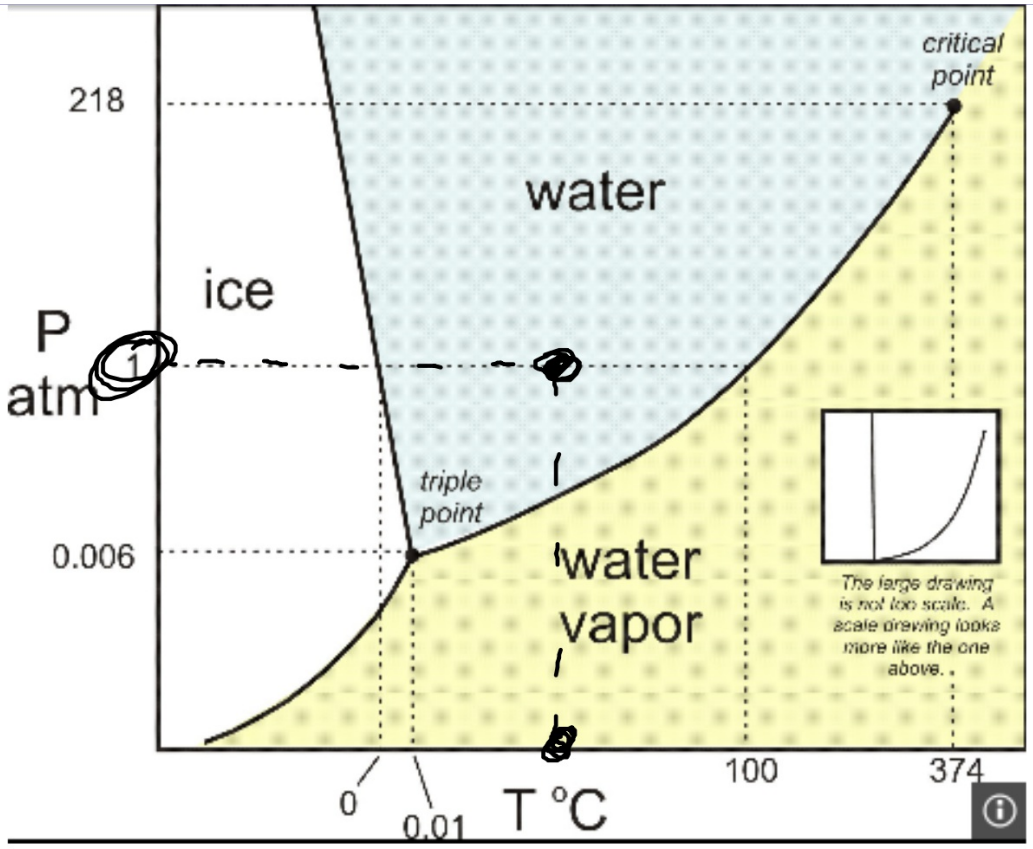
- Illustrate the phases of matter for a material dependent on temperature and pressure.
- Show where changes in state occur.
- Temperature - X axis
- Pressure - Y axis

Phase Diagrams

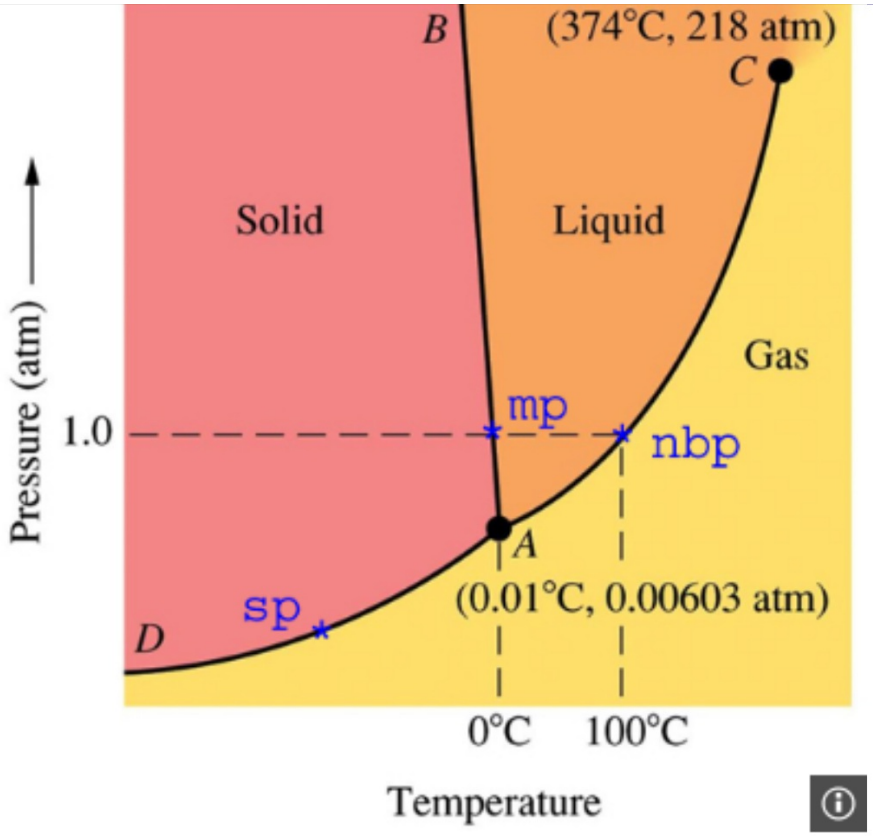
- Triple Point - The temperature and pressure condition where a material can be in the solid, liquid, or gas phase
- Critical Point - There comes a temperature and pressure where the liquid and gas phases cannot be distinguished. The line between them ends.



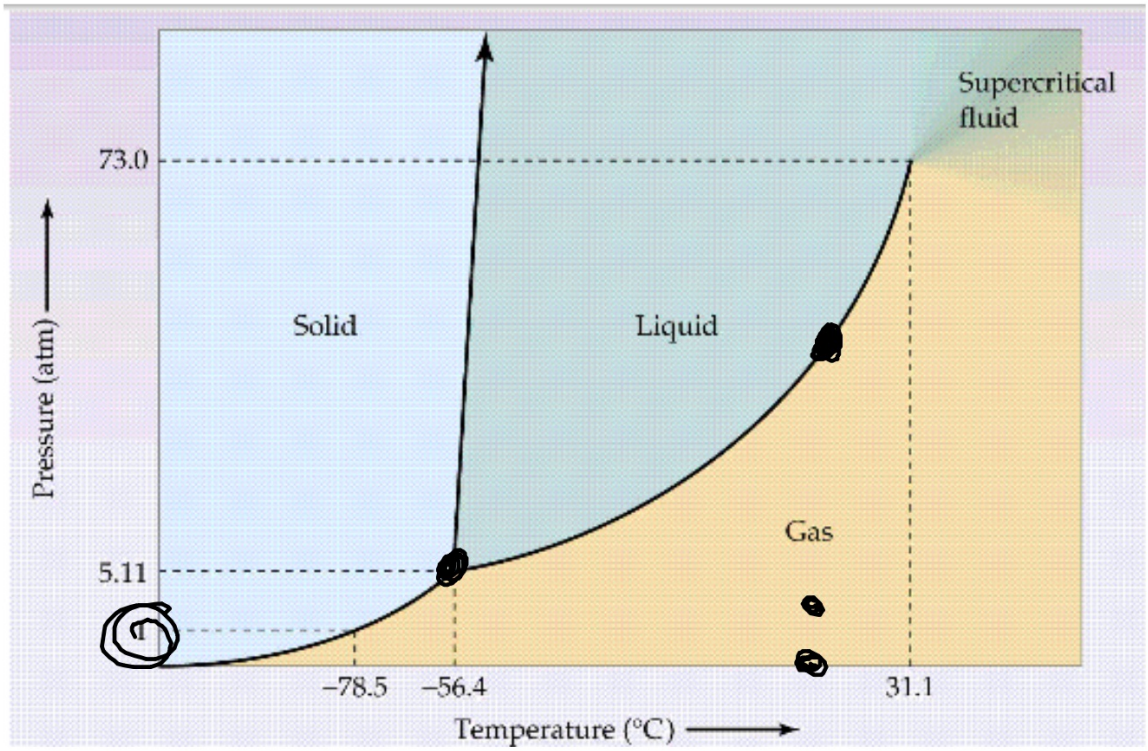
Critical and Triple Point



What is the phase when T=40 degrees and P=1 atm?



What is the phase of matter when T=0 degrees and P=0.003atm?



About what pressure would you need for CO2 to be a liquid at room temperature? What is this pressure in PSI?

Wet Dry Ice Lab:

Each group should have one copy of the procedure.
Please get goggles.
Begin reading over the procedure.

CO_2: At STP, it sublimates.

We will create conditions where we can see all three phases of matter.

Collect the materials that you need.

I will come around with the dry ice in a few moments.

Observe the nature of CO_2 as it sublimates.

Do not touch the solid.

It will cause serious harm.

Triple point:

Where you can see all three phases of matter.

You will try to create this with the dry ice.

Read procedure for proper instructions.

Finished??
Clean up your station.
Return all materials to the places specified.
Hand in your procedure.
Get a questions sheet (one per person.)
Put them in your lab folder when finished.

You may begin the homework if time permits.
I will hand it out as you are working.
Finish the worksheet overnight.