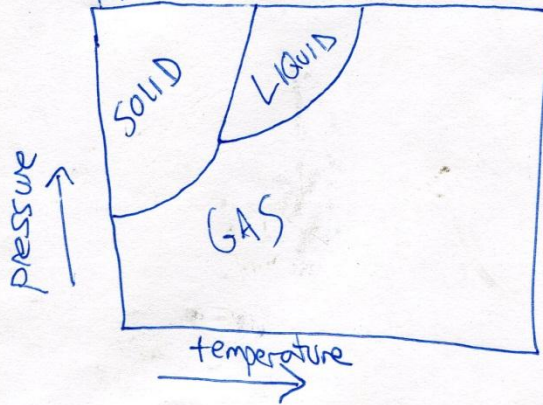


PURPOSE: WHAT ARE  
SOME INTERESTING  
THINGS ABOUT SOLIDS?

WARMUP (SKETCH):

"PHASE DIAGRAM OF SULFUR"

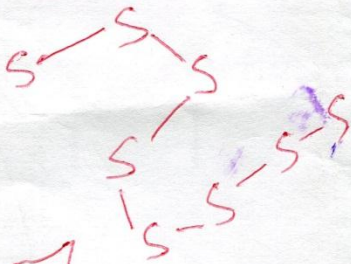
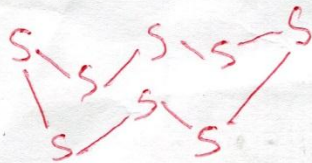


ALLOTROPES (def'n) two solid substances with the same formula but different ~~of~~ ARRANGEMENT of atoms and different properties

EXAMPLE

Crystal Sulfur

polymeric Sulfur

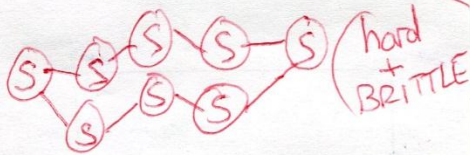


two allotropes of sulfur

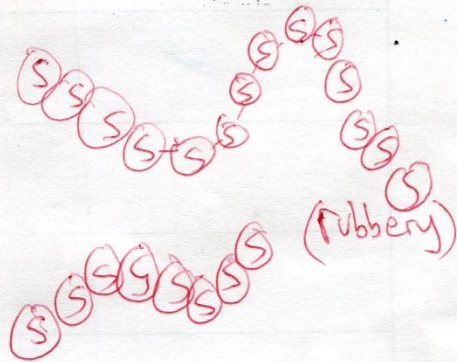
example #1

allotropes  
of sulfur

crystalline  
sulfur -



polymeric  
sulfur -



EXAMPLE #2

allotropes  
of carbon

DIAMOND - pure carbon - very strong

GRAPHITE - pure carbon - very weak, slippery

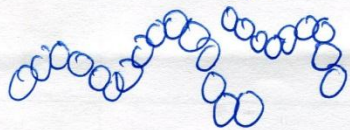
## crystalline substances

have a regular pattern of atom arrangement.  
most substances are this.



## Amorphous substances

have totally random atom arrangements.



example : glass, plastic

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STP - standard temperature pressure

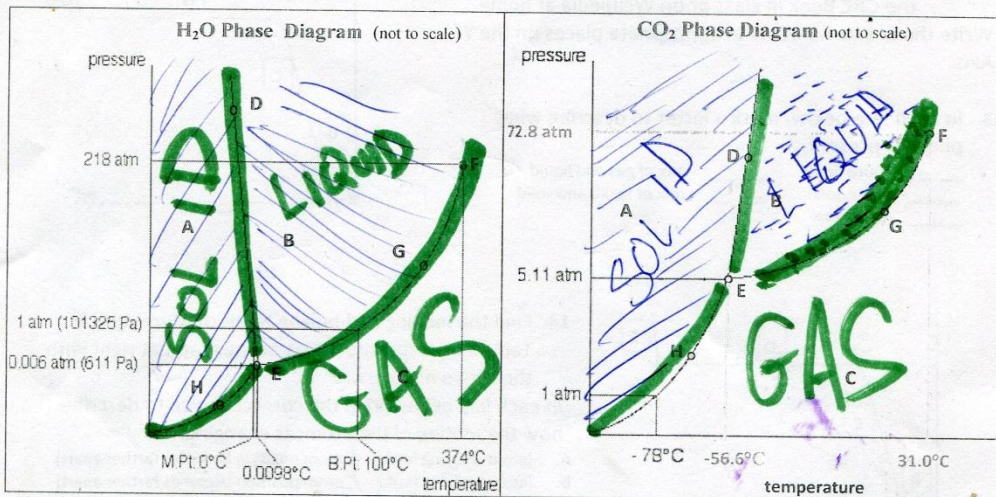
standard temperature -  $0^{\circ}$  Celsius

standard pressure - 1 atmosphere

# HOMEWORK



Name \_\_\_\_\_ Chemistry Practice with Phase Change



Use the two phase diagrams to answer the following questions.

- Point E on the phase diagrams represents a point where all three phases are in equilibrium.

What is this point called?

the triple point

- At what point or region do solid and liquid phases exist in equilibrium? (Use the letter labels from the diagram.)

along the line ED

- At what point or region would a boiling liquid be found? (Use the letter labels from the diagram.)

along the line EDF

- At what point or region would sublimation occur?

along the line HE

- What is the name of the highest temperature at which it is possible to liquefy a gas with any amount of pressure?

the critical point

- What is the critical pressure for water?

218 atm

- What is the critical temperature for carbon dioxide?

31.0°C

- Does the solid-liquid equilibrium line on the water diagram have a positive or negative slope?

negative (it is falling)

- What does this slope tell you about the density of each of the two phases?

IT TELLS US THAT for H<sub>2</sub>O, the LIQUID IS DENSER THAN the SOLID

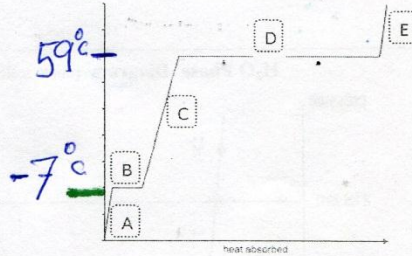
- What change is observed as one approaches point D from the left at constant pressure and increasing temperature?

The solid vibrates faster and at point 'D' it starts to melt.

11. Using the water phase diagram, what changes in pressure and temperature would be necessary to go from point C to point B?

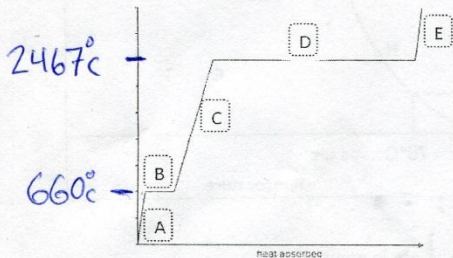
RAISE THE PRESSURE WHILE LOWERING THE TEMPERATURE

12. Find the melting and boiling point of Bromine in the CRC Book in class or on Wikipedia at home. Write those two numbers in appropriate places on the Y-axis. answer:  $-7^{\circ}\text{C}$  and  $59^{\circ}\text{C}$



13. In each line below, mark a letter to describe what phase is present.

C pure liquid      D mix of gas and liquid  
A pure solid      B mix of liquid and solid  
E pure gas



14. Find the melting and boiling point of Aluminum in Tables and label the Y-axis of the graph at right with those two numbers. answer:  $660^{\circ}\text{C}$ ,  $2467^{\circ}\text{C}$

In each line below, circle the correct choice to describe how the motion of the atoms is changing.

- A. (atoms moving faster / atom position becomes farther apart)  
 B. (atoms moving faster / atom position becomes farther apart)  
 C. (atoms moving faster / atom position becomes farther apart)  
 D. (atoms moving faster / atom position becomes farther apart)  
 E. (atoms moving faster / atom position becomes farther apart)

15. The normal pressure in our classroom is 101.3 kiloPascals. Draw a horizontal line on this graph to show what the pressure in our room would be if the air pressure in here doubled.

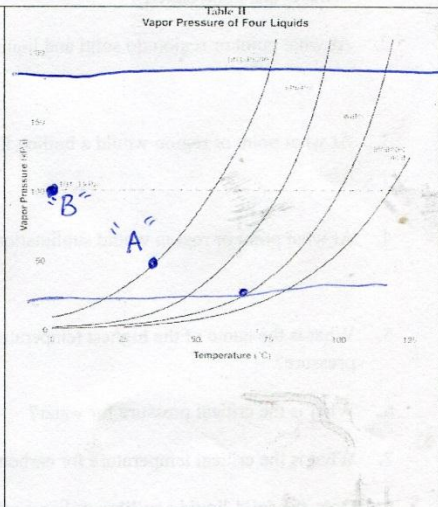
16. If the pressure in this room increased the vapor pressure of ethanol would (stay the same / decrease / increase)

17. On the chart, mark an "A" to show what the vapor pressure of propanone would be if the room pressure were 50 kiloPascals.

18. The technical definition of boiling point is the temperature at which the air pressure of the room equals the vapor pressure

19. If we reduce the room pressure to 20 kPa at what temperature will water boil? around  $70^{\circ}\text{C}$

20. Mark a "B" on the chart to indicate the single point that is STP



202 kPa