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Day 06 Fire and Ice

2016

6.0.C.1 Hands-on Phase Properties of Gases

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Task 1 Review experimental work from Thursday

A) Assign a Manager, Recorder, Spokesperson, Reflector

Decide so that the person with least experience with that role takes it on.

There is a role reminder sheet at table

Recorder should keep track of important responses starting at C.

If Question arise, write those down on back of Recorder Report.

The Reflector will have a specific task – I will give that to them privately.

B) Once organized:

- Describe what you did for experiments A and B (remember you split that work up)
- Share your results.
- Review your results for expt C (which you all did).
- C) Review of class data handouts for all the experiments.

Expt A: volume of syringe vs temperature

- 1) Review results from all 6 groups on front side of page.
 - What data seems to be OK? What data seems not OK? Speculate as to why the problematic data may be problematic.
- 2) Look on the reverse.

What did I do to the data? What are the lines I've drawn?

Is this behavior consistent with:

- a) the simulation results
- b) when you played with liquid nitrogen what was the liquid nitrogen doing?
- 3) For your data (or for mine if you data is not shown), calculate what the temperature is when the gas volume goes to zero. When you have a number, Spokesperson should write in on the board.

Expt B: sublimation of dry ice in syringe

- 1) What does sublimation mean?
- 2) What is dry ice? Why is it called that?
- 3) Look at the class data to see whether your results are consistent.
- 4) Sketch a rough to-scale picture of the size of the dry ice relative to the volume of gas.
- 5) Convert your picture into a molecular level picture (what would before and after look like if this were a simulation like the PhET)

Expt C: compressibility of substances in syringe

- 1) What types of substances are compressible?
- 2) Sketch a molecular level picture of a solid, a liquid, and a gas, such that the picture helps you explain the results.
- 3) Is what you conclude here consistent with your experimental results in Expt B? How so?
- 4) In the gas phase, what is in between the particles?

Task 2 Discussion of Readings

You may address these in any order you wish. If Questions occur, please make note of them on the Recorder Report form (use a new one).

a. Hauksbee:

- What was he studying?
- What was his explanation for the behavior he found?
- What alternative explanation can you propose that is related to what we've recently considered?

b. Rumsford

- What was he studying?
- What did he conclude? How related to Hauksbee's model?
- What did he do that makes his conclusion perhaps more compelling?
- What fun facts did you learn about Count Rumsford?

Group Member Name	Role	Date: <u>\O_F</u>	Teb 2015
Tim closes	· Manager		
Calé Frost	Recorder	· ·	:
Eliza Sneedein	Reflector		-273.71
Jon Tampost	Spokesperson		
Jamantha			
Expt. A			
C. I. Everyonis data	except ours (Samantha	. Eliza, Calé) becaun	we did the
experiment wrong.	Problematic because we the experiment.	didnit depress the sy	rings + messed
2. Drew a line of a.H corresponds wi b. Liquid nitrogra ea	best dit + created an the simulation—shows and volume of balloon or liquid nitrogen. Temp	equation to show a that as temp increased to decrease. Volume in	graphed relationship. es, so does volume. creased again when
	o ,		
Expt. B			•
1. solid -> gas 2. solid coroon dioxid	u, doesn't come from a	liquid like reg. ice	
3. yes, consistent			•
4. 0 ()			
S. GAS SOLID		•	
	•		
Expt. C	_	1 . 5014)	·
1. Sastinsaction water, a	xir, TFE Coccasionally	SO-NO 4 30017	
2	SOUD SOUD		
3. yes. Same/similo	- results found.		
4. air (?), energy (?)			

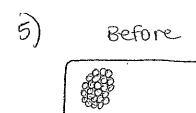
Group Member Name	Role	Date: 2 10 14
Heather Price	Recorder	_
Amanda Jonas	Roftector	•
Taylor Witkiewicz	<u> 5100 Kesperson</u>	
Kaleigh Zukowski	Manager	

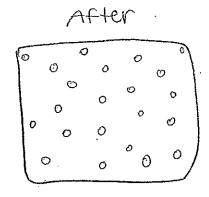
- C.) Expt A: 1) most graphs seem to reflect an upward slope except one which shows a more constant slope. This could have been due to human error.
 - 2) He figured out the line of best fit and changed the scales to better illustrate the upward slope.
 - a) les, it is consistent with PhET. As temp. increases, volume increases.
 - b) when we stuck objects into liquid nitrogen, it decreased its temperature, thus decreasing its gas volume (the balloon). It expanded instantly when returned to room temperature.
 - 3) $y = 0.0474 \times +18.785$ => x = -396.308
 - pExpt B: 1) Sublimation is when an element of goes from solid to gas without going through the liquid phase.
 - 2) It's called dry ice because we don't see it in the liquid phase. It's doesn't melt into a puddle. It is solid CO2.
 - 3) our data is very close the average, but nowhere near the theory.



his material is based upon work supported by the National Science Foundation under Grant No. 1245/30.

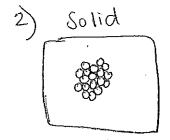
ny opinions, finding and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

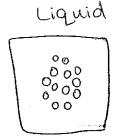


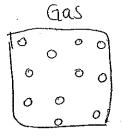


compressible.

Water, TFE, and air were







when the molecules are close together, it's more difficult to compress because there's less space to observe for them to more.

- 3) Our diagrams are the same in terms of space between the molecules.
- 4) Molecules move freely in the gas phase because there is space between them.

Questions:

Group Member Name	Role	Date: 1/10/14		
Emma	Manager			
Jake	<u>Qecorder</u>			
Marisa	Spokesperson			
Miriam	Reflector	·		

YOTA.

- 1. All data but one showed a positive relationship between volume and temperature. The one inconsistent group may have just not closed the valve, causing pressure to not remain constant.
- 2. On the reverse, CB took the last three data points and created a line of best fit for them. The relationship is consistent with simulation play when pressure is kept constant. It is also consistent with the deflation of a bailoon upon contact with freezing liquid nitrogen.
- 3. y=0.0453x + 15.285 (0) = 0.0453x + 15.285 $X = \sqrt{-337.4°C}$
- :xb+ Q.
- 1. Sublimation is when something goes directly from solid to gas
- 2. Dry ice is solid carbon dioride. It's dry" because though it looks like ice, it doesn't metr into a liquid but rather sublimates
- 3. Yes they are all consistent.
- 4. 0 ← dry ice used :



gas produced

5.



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Expt C: 1. gasses were most compressable

Solid liquid gas

- 3. Yes. Gaseous molecules take up more space than solid molecules
- 4. Empty space

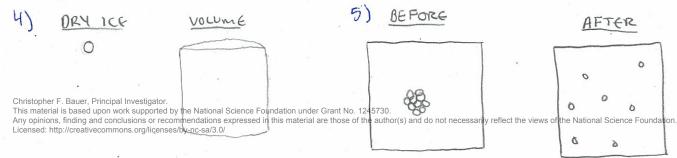
Group Member Name	Role	Date: 2/10/15		
Emily D	Reflecto			
Charles C	Recorder			
kyle R	Monager			
Mondy G	Spokespusor	ent to hay a public hox with		

XPTA

- (1) There seems to be an upward trend, with the exception to graph 3- Samontha and Eliza. Perhaps the plunger was not closed.
- He can up with an econotion for each line. This behavior is consistent with the simulation results. The liquid nitrogen was becoming a gas, hissing, beeding up when it can into contact with surfaces like the table left off the registre temperative data.
- (3) For Emily D and Amanda a s graph, the temperature when the gas volume goes to zero is -154.42°C.

EXPT B

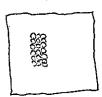
- 1) Sublimation is when a solid goes directly to a gas
- 21 Day ice is sold COz. Since it goes through sublimation, it is "day", whereas ice would melt and the evaporate.
- 3) Our results, KR CC, are fairly consistent with the class data. However, they one pretty low. That could be a result of the size of the perce and the amount it sublimated before neighbry, a loose syringe, or the time the gas lovel was read.



EXPTC

1) Gases

2) Soulo



GAS O O O

- 3) Yes, the sold and gas pictures show a similar idea in both experiments. Denser States how compact molecules, while gaseous spreads out.
- 4) Empty Space...

Role

Group Member Name

LX PURNIMENT X

Belly recorder Emily Spakes person Sean refrector The graphs that show an upward or positive curve seem to look occurate, as it does not show the same upward stope the accurate, as it does not show the same upward stope the indicate, as it does not show the same upward stope the indicator, who indicate, as it does not show the same upward stope the the accuracy of the processor took the due to temperature differences, the order of seeps for each experiment, the variation in how order of seeps for each experiment, the variation in how you allow the outliers, having only 3 points per graph. He also included the education at the top of each graph. The line he had a trawn represents a line of best fit, reflecting with temperature. The volume of as a relationary with temperature that so gas volume a temperature that is what is consistent that as gas volume a temperature when in an arrangle (of the liquid introgen experiment is consistent with our experiment is consistent to go experiment from a win cas is correlated to him temperature in the property of the part of a win cas is correlated to him temperature in the part of the part of the classes. Day it is essentially the property of the part of the classes of the material assessment and the liquid photoe; it opes straight to gas: Day it is revery opes to liquid photoe; it opes straight to gas: Day it is revery opes to liquid photoe; it opes straight to gas: Day it is revery opes to liquid photoe; it opes straight to gas: Day it is revery opes to liquid photoe; it opes straight to gas: Day and the property of the processment of the accuration of the accuration and the later of the liquid and property and to recessarily when the liquid photoe is a property and the liquid and photoe is a property and to recessarily when the liquid photoe is a property and the liquid and property and to recessarily when the liquid the liquid and property and to recessarily when the liquid the liquid to the liquid the liquid to the liquid to the liquid the liquid the liquid the	Nick	Manager			About Street	
Sean	Becky				r Penerga	
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Date: 2/10/15

This shows the change in the spacing of the undecoder.

This shows the change in the spacing of the undecoder.

With the solids + gas. However, the consist ant with the solids + gas. However, the chair bubble.

Per ethally complete the water due to the air bubble.

Our results are not what we discovered to day since over inquid went pack to the original ml.

Empty space?