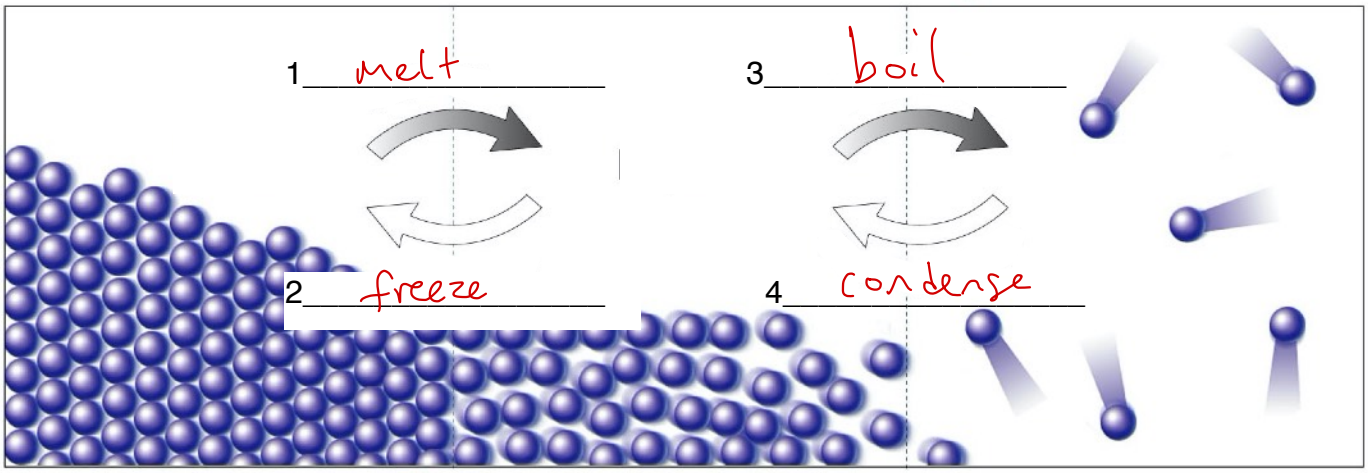
Opener: States of Matter

- Use the following words appropriately in spaces 1 – 4 to describe the processes indicated by the arrows
  - freeze boil condense melt evaporate vaporize
- Use the following words appropriately in spaces A – C to describe the phases of matter indicated by the particulate diagram.
  - liquid solid gas



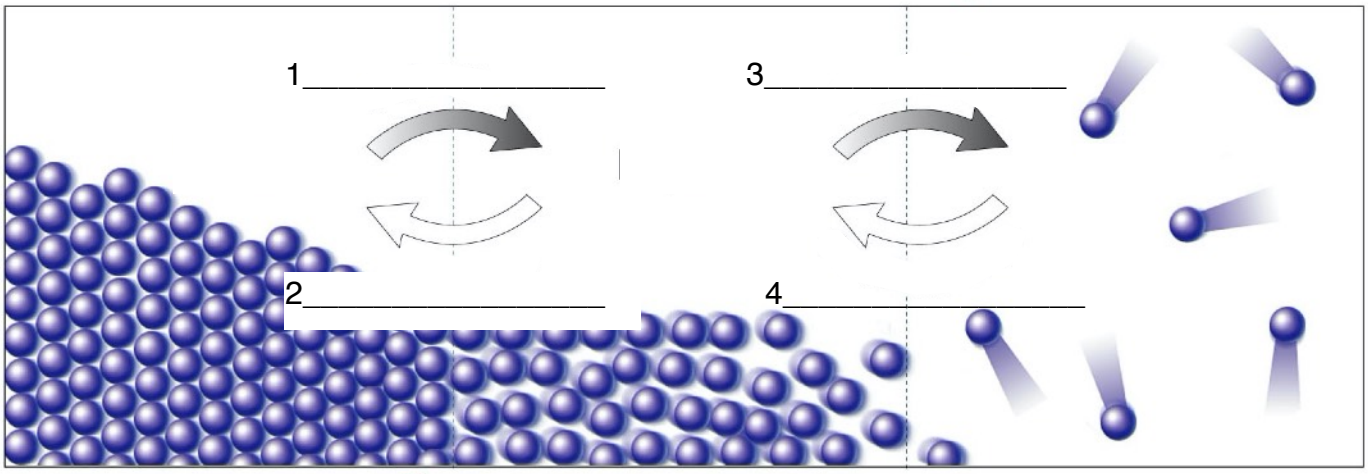
A solid B liquid C gas

- Does energy go in or come out of water as water freezes? Is this called endothermic or exothermic?

As water freezes energy is removed. That may not be intuitive, but surely you know energy in to melt ∴ reverse, energy out to freeze.

Opener: States of Matter

- Use the following words appropriately in spaces 1 – 4 to describe the processes indicated by the arrows
  - freeze boil condense melt
- Use the following words appropriately in spaces A – C to describe the phases of matter indicated by the particulate diagram.
  - liquid solid gas



A B C

- Does energy go in or come out of water as water freezes? Is this called endothermic or exothermic?

Opener: Hot Water / Cold Water

- In the space below, make some observations about the food coloring in the two beakers up front when red food coloring is added to the left and blue food coloring is added to the right.

The red food coloring dispersed very quickly in hot water

- The red is hot water, the blue is cold water. What can we infer about the movement of the water molecules in hot water and cold water?

→ This "shows" us that hot water molecules are moving around faster than cold water molecules

Opener: Hot Water / Cold Water

- In the space below, make some observations about the food coloring in the two beakers up front when red food coloring is added to the left and blue food coloring is added to the right.

- The red is hot water, the blue is cold water. What can we infer about the movement of the water molecules in hot water and cold water?

Opener: Association Statements

- Bonnie told Clyde that direct association statements increased and inverse association statement decreased. She said that "Study more, means higher grades," is a direct statement, but when restated as "Study less, means lower grades," is an inverse statement.
- Do you agree (1) or disagree (2) with Bonnie? Explain your reasoning. *Submit 1 or 2 with your clicker.*

Study less means lower grades is also a direct association statement
When both qualifiers are same direction, the statement is direct

- Write an association statement about hours worked and size of paycheck (assuming hourly wage worker)? Direct or inverse?

work more hours = more pay
direct

- Write an association statement about brushing teeth and number of cavities. Direct or inverse?

brush teeth more means less cavities
inverse

Opener: Association Statements

- Bonnie told Clyde that direct association statements increased and inverse association statement decreased. She said that "Study more, means higher grades," is a direct statement, but when restated as "Study less, means lower grades," is an inverse statement.
- Do you agree (1) or disagree (2) with Bonnie? Explain your reasoning. *Submit 1 or 2 with your clicker.*

- Write an association statement about hours worked and size of paycheck (assuming hourly wage worker)? Direct or inverse?

- Write an association statement about brushing teeth and number of cavities. Direct or inverse?

Opener: Literal Equations

When solving, please do NOT leave fractions in fractions.

Isolate) the variable indicated for each of the following equations

1. $A = \pi r^2$ isolate r

$\frac{A}{\pi} = r^2$ → square root → $r = \sqrt{\frac{A}{\pi}}$

2. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ isolate T_2

move on the diagonal since all mult + div

$T_2 = \frac{P_2V_2T_1}{P_1V_1}$

3. $A = \frac{1}{2}(b_1 + b_2)h$ isolate b_2 Could equation could also be written as: $A = \frac{(b_1 + b_2)h}{2}$?

yes

move the h

move 2 on diagonal

$b_1 - b_2 = \frac{2A}{h}$

subtract b_1

$-b_2 = \frac{2A}{h} - b_1$

now multiply by -1

$b_2 = b_1 - \frac{2A}{h}$

Opener: Literal Equations

When solving, please do NOT leave fractions in fractions.

Isolate) the variable indicated for each of the following equations

1. $A = \pi r^2$ isolate r

2. $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ isolate T_2

3. $A = \frac{1}{2}(b_1 + b_2)h$ isolate b_2 Could equation could also be written as: $A = \frac{(b_1 + b_2)h}{2}$?

Opener: Particle Survey ***Be as concise as possible.***

- What is a mixture in contrast to a pure substance?

mixture: 2 or more substances mixed together can be combined in any ratio

compound: 2 or more elements chemically bonded bonded in a fixed ratio

- What is an element? In contrast, what is a compound?

simplest form of matter

two or more elements bonded together

- What is an atom? In contrast, what is a molecule?

one single particle of an element

two or more atoms (same or different) H_2 CO_2 bonded together

Opener: Particle Survey ***Be as concise as possible.***

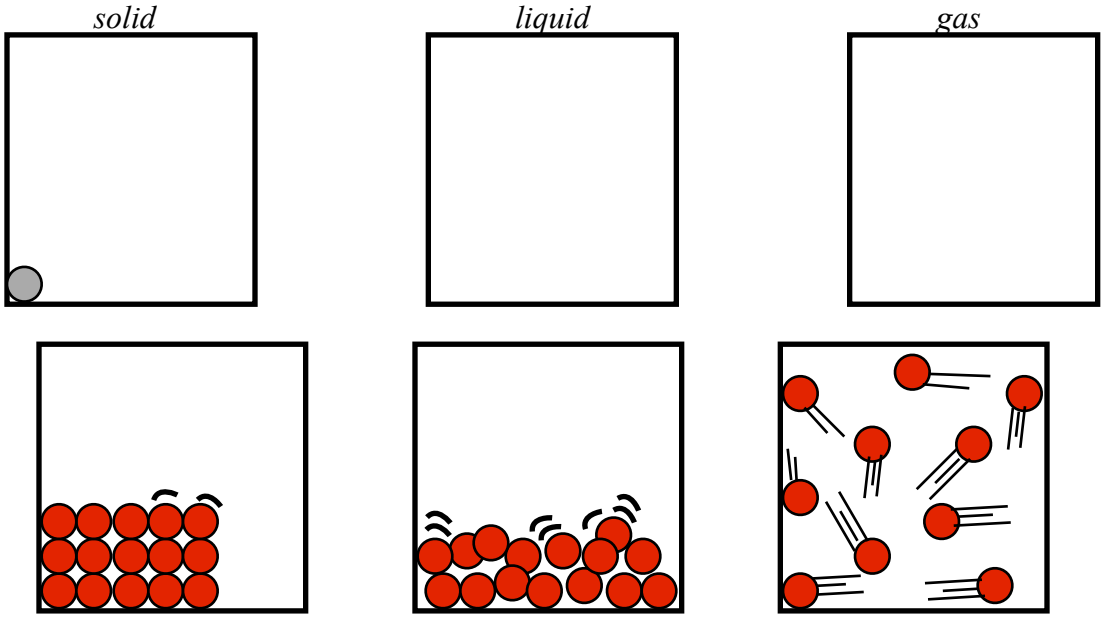
- What is a mixture in contrast to a pure substance?

- What is an element? In contrast, what is a compound?

- What is an atom? In contrast, what is a molecule?

Opener: Solids, Liquids, and Gases IN PENCIL please

- Using somewhere between 10−15 circles to represent molecules in each box, sketch an appropriate particulate diagram for a solid, liquid , and gas. Think about how and why you place the molecules. Consider the containers to be closed, and a *side* view.



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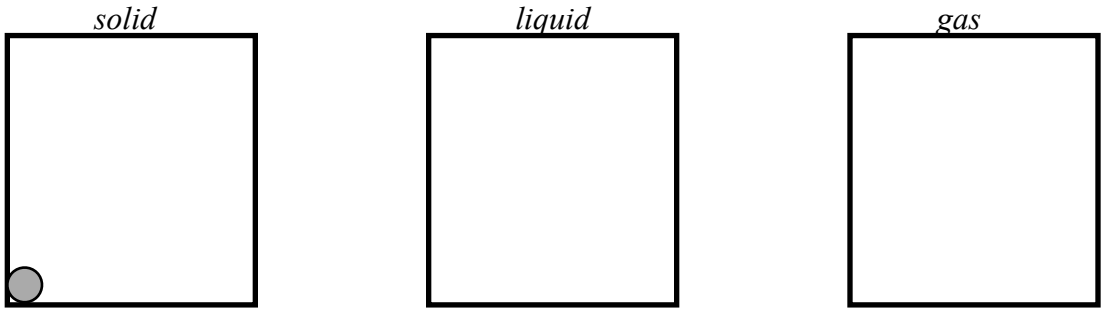
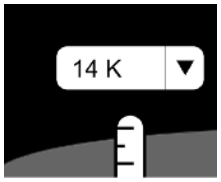
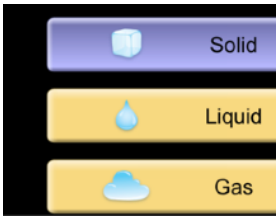


Opener: Solids, Liquids, and Gases PhET simulation

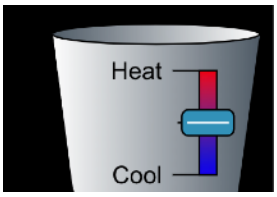
- Google: PhET states of matter basics
- Click on States
- Use the drop down menu to change temp to Celsius



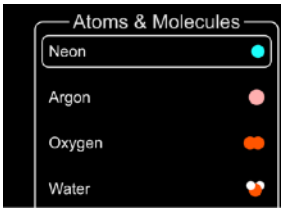
- The substance selected should be neon.
  1. Are the particles atoms or molecules? How can you tell?
- Observe the difference in the arrangement of the neon particles when you click liquid then gas.
- What was the temperature for each phase? Change to water and what temps?
  2. solid _____ liquid _____ gas _____
     neon / water *neon / water* *neon / water*
  3. Why different temps for neon compared to water?



- Click back on neon or argon solid. Now use the heat / cool control at the bottom to convert the neon or argon to liquid and then gas.
  4. Can you have both liquid and gas at the same time? Is this normal?

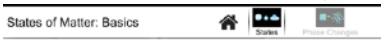


- Click gas and stop and observe. Follow a single molecule to observe closely.
  5. Are all the particles moving at the same speed?
  6. What happens to the speeds of two particles when they collide?



- Change to water.
  7. Are the particles atoms or molecules? How can you tell?
- Observe the difference in the arrangement of the water particles when you click liquid then gas.
  8. What do you notice about the arrangement of water particles as solid compared to liquid? Are the particles closer or further apart as solid?
  9. Take special note of the total volume of space taken up by the particles as solid and as liquid. Which volume is greater? What does that tell you about the density of ice compared to liquid water?
  10. In addition to movement from place to place, what other motion do water molecules participate in?

- *Finished? Go ahead and play around with phase changes with the menu at the bottom.*



Opener: Particles

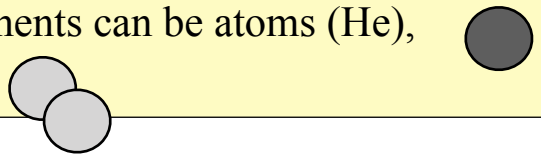
1. Barney says that the particles of an element are always atoms. Do you agree with him? Justify, and help your justification with specific example(s).

2. Wilma says that the particles of a compound are always molecules. Do you agree with her? Explain why you agree or disagree.

Opener: Particles

- Barney says that the particles of an element are always atoms. Do you agree with him? Justify, and help your justification with specific example(s).

No the particles of some elements can be atoms (He), some can be molecules (O_2)



- Wilma says that the particles of a compound are always molecules. Do you agree or disagree with her? Explain why you agree or disagree.

Yes since all compounds are made of two or more different atoms of different elements, the particles of compounds must be molecules

Opener: Pressure and Volume Calculations

Hopefully you have learned something about the relationship between pressure and volume for a fixed amount of gas at a constant temperature. Choose the appropriate equastion from the two equations below to calculate the resulting pressure when 15 ml of gas at 625 mmHg is expanded to 30. ml of gas.

Circle the equation that you should use to arrive at the right answer.

$P_1V_1 = P_2V_2$ or $\frac{P_1}{V_1} = \frac{P_2}{V_2}$

Same amount of molecules!

$625\ mmHg \cdot 15\ ml = P_2 \cdot 30\ ml$

$\frac{625 \cdot 15}{30}$ $P_2 = 312.5\ mmHg$

SF 310 mmHg

Opener: Pressure and Volume Calculations

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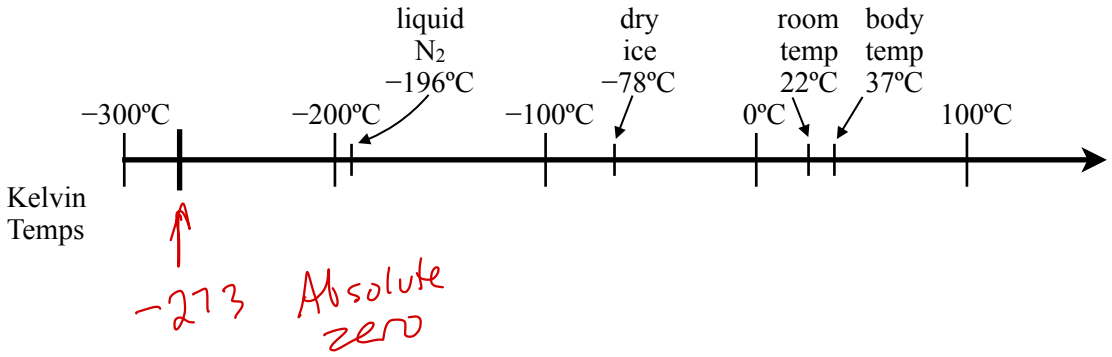
$P_1V_1 = P_2V_2$ or $\frac{P_1}{V_1} = \frac{P_2}{V_2}$

Opener: The Kelvin Temperature Scale

What Celsius temperature is the coldest possible temperature?

We have a name for this very cold temperature. What is the name?

Locate this very cold temperature on the scale shown below.



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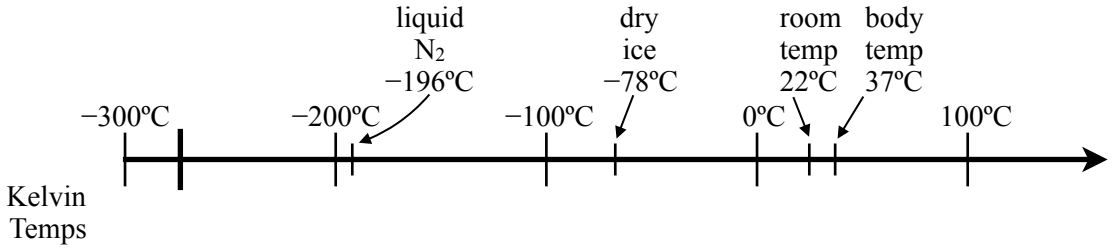

Opener: Pressure and Temperature Calculations

Hopefully you have learned something about the relationship between pressure and temperature for a fixed amount of gas at a constant volume.

Choose the appropriate equation from the two equations below to calculate the resulting pressure when 15 ml of gas in a glass flask at 25ºC and at 625 mmHg is heated to 50.ºC.

Circle the equation that you should use to arrive at the right answer. *(Send in an answer – no units)*

must change to Kelvin

Why is there no need to put volume in the formula?

$$P_1T_1 = P_2T_2 \quad or \quad \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$\frac{625\ mmHg}{298K} = \frac{P_2}{323K}$$

Volume is constant

$P_2 = 677\ mmHg$

Opener: Pressure and Temperature Calculations

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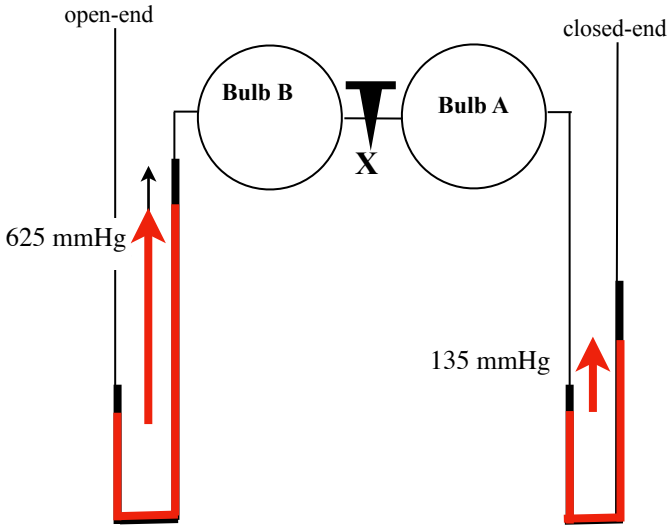
Choose the appropriate equation from the two equations below to calculate the resulting pressure when 15 ml of gas in a glass flask at 25ºC and at 625 mmHg is heated to 50.ºC.

Circle the equation that you should use to arrive at the right answer.

$$P_1T_1 = P_2T_2 \quad or \quad \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

Opener: $P_1V_1 = P_2V_2$ and Manometers

1. At the start, valve at X is closed. Barometer in the room measuring air pressure reads 760 mmHg.
   a. What is the pressure in A?
   b. What is the pressure in B?
   c. When Valve X is opened, determine the pressure in Bulbs A & B.
   d. Make new marks on the columns of mercury to represent the levels after the valve X is opened.



Gas A is 0 mmHg
Gas A has a pressure of 270 mmHg as evidenced by the closed-end side

After Valve is open the pressure of the gas in a container that is twice the volume will be half the pressure or 135 mmHg total in bulbs A and B, closed side drops down to 135 mmHg
On open end, air is wining by 625

Opener: $P_1V_1 = P_2V_2$ and Manometers

1. At the start, valve at X is closed. Barometer in the room measuring air pressure reads 760 mmHg.
   a. What is the pressure in A?
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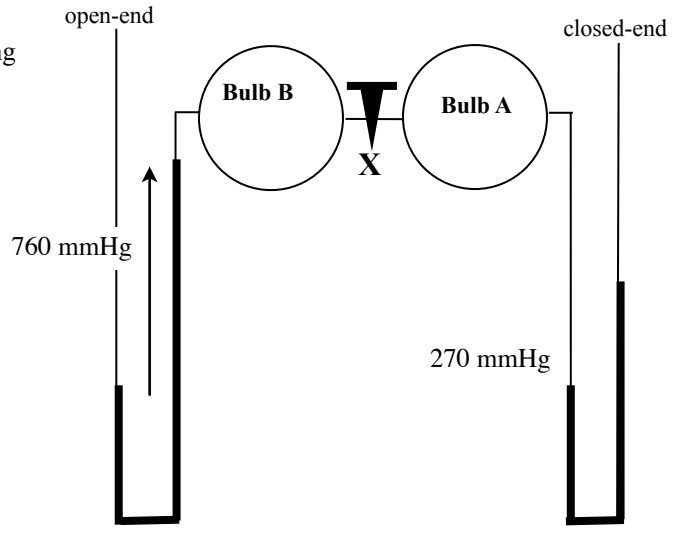


New Scenario: $P_1V_1 = P_2V_2$ and Manometers

2. Assume a completely new situation. Different air pressure.
Valve X is closed and Bulb B is empty.

The size of bulb A is 300 ml and Bulb B is 100 ml.

a. What is the pressure in Bulb A?

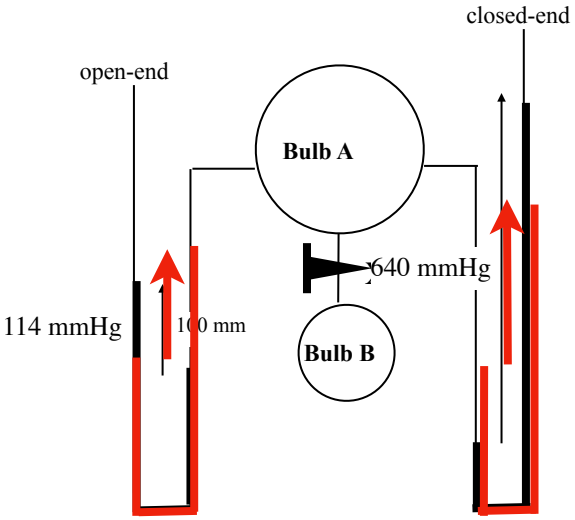
b. What is the outside air pressure?

c. What is the new pressure in Bulbs B and A when valve X is opened?

d. Draw the new mercury levels on both sides.

Gas A is 853 mmHg
Gas A is winning by 261, Air is 854 – 100 = 754 mmHg

After Valve is open, closed side drops down to 640 mmHg
On open end, air is wining by 114mmHg



$$P_A V_A = P_{AB} V_{AB}$$
$$853 torr \times 300 ml = P_{AB} \times 400 ml$$
$$P_{AB} = 640 torr$$

New Scenario: $P_1V_1 = P_2V_2$ and Manometers

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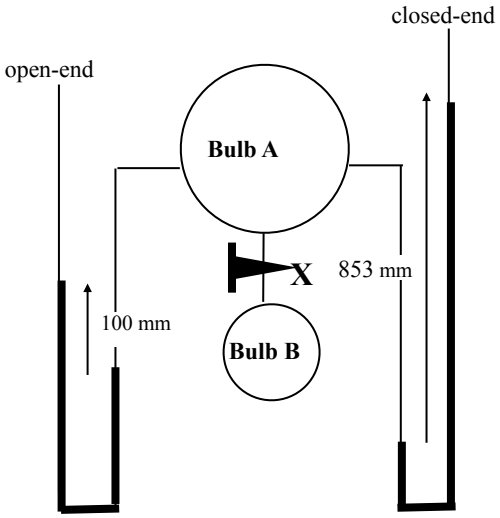
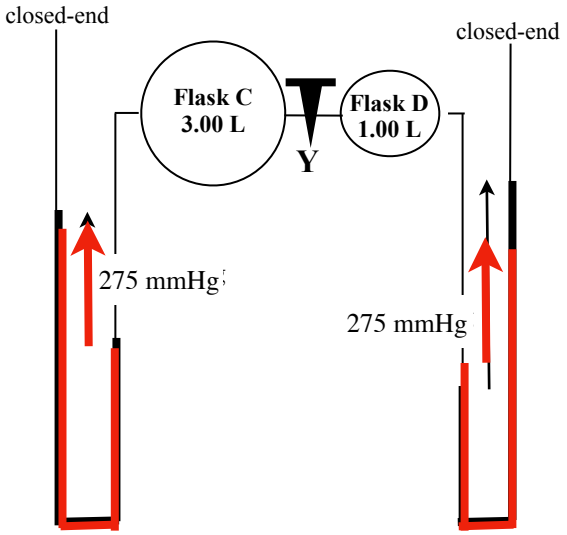


Pressure, Volume, and Manometers

3. Is valve Y open or closed? How can you tell?
   a. Do you need to know air pressure?
   b. What is the pressure in Flask C?
   c. What is the pressure in Flask D?
   d. Does Flask D have more or less particles than Flask C? Show a calculation to confirm.
   e. When Valve X is opened, determine the pressure caused by the gas from flask A.
   f. When Valve X is opened, determine the pressure caused by the gas from flask A.
   g. What is the total pressure in the 7.00 L container after the valve is opened.
   h. Make new marks on the columns of mercury to represent the levels after the valve X is opened.



Valve X must be closed since the mercury is different in the two manometers.
Gas C is 200. mmHg
Gas D has a pressure of 500. mmHg

$$\frac{P_C V_C}{n_C T} = \frac{P_D V_D}{n_D T}$$
$$\frac{200torr \times 3L}{1} = \frac{500torr \times 1L}{n_B}$$
$$n_D = 0.83 Times Less Particles$$

$$P_C V_C = P_? V_{CD}$$
$$200torr \times 3L = P_? \times 4L$$
$$P_? = 150torr$$

$$P_D V_D = P_? V_{CD}$$
$$500torr \times 1L = P_? \times 4L$$
$$P_? = 125torr$$

$$P_{total} = P_{gasC} + P_{gasD}$$
$$150torr + 125torr = 275torr$$

Pressure, Volume, and Manometers

3. Is valve Y open or closed? How can you tell?
   a. Do you need to know air pressure?
   b. What is the pressure in Flask C?
   c. What is the pressure in Flask D?
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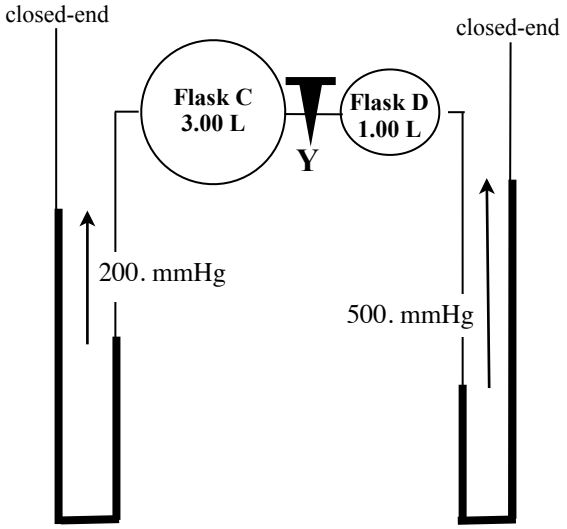

Opener: $P_1V_1 = P_2V_2$ and Manometers

4. Barometer in the room measuring air pressure reads 750 mmHg.
   a. Is valve X open or closed, how can you know?
   b. What is the pressure in A?
   c. What is the pressure in B?
   d. Which flask has more molecules? or the same? If more, how many times more?
   e. When Valve X is opened, determine the pressure caused by the gas from flask A.
   f. When Valve X is opened, determine the pressure caused by the gas from flask A.
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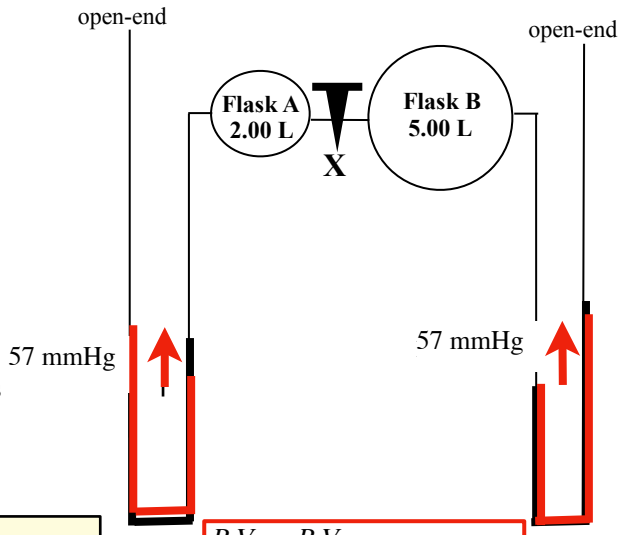

Valve X must be closed since the mercury is different in the two manometers.
Gas A is 700. mmHg
Gas B has a pressure of 850. mmHg

$$P_A V_A = P_? V_{AB}$$
$$700torr \times 2L = P_? \times 7L$$
$$P_? = 200torr$$

$$P_B V_B = P_? V_{AB}$$
$$850torr \times 5L = P_? \times 7L$$
$$P_? = 607torr$$

$$P_{total} = P_{gasA} + P_{gasB}$$
$$200torr + 607torr = 807torr$$

$$\frac{P_A V_A}{n_A T} = \frac{P_B V_B}{n_B T}$$
$$\frac{700torr \times 2L}{1} = \frac{850torr \times 2L}{n_B}$$
$$n_B = 2.8 Times More Particles$$

Opener: $P_1V_1 = P_2V_2$ and Manometers

4. Barometer in the room measuring air pressure reads 750 mmHg.
   a. Is valve X open or closed, how can you know?
   b. What is the pressure in A?
   c. What is the pressure in B?
   d. Which flask has more molecules? or the same? If more, how many times more?
   e. When Valve X is opened, determine the pressure caused by the gas from flask A.
   f. When Valve X is opened, determine the pressure caused by the gas from flask B.
   g. What is the total pressure in the 7.00 L container after the valve is opened.
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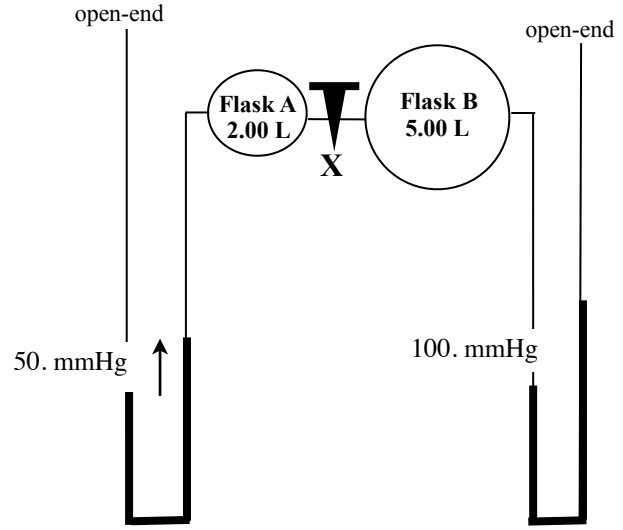

Opener: Combined Gas Law

Suppose you had a 355 ml container with 5 g of oxygen gas at 25.0ºC and 2.50 atm of pressure. If you added more oxygen so the container weighed twice as much, and you expanded the container to 3055 ml, and cooled the container to −75.0ºC, what would the pressure be inside? *Submit your answer with your clicker.*

don't forget Kelvin

$$\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$$

$$\frac{2.5\text{atm}\ \ 355\text{ml}}{5\text{g}\ \ 298\text{K}} = \frac{P_2\ \ 3055\text{ml}}{10\text{g}\ \ 198\text{K}}$$

$$P_2 = 0.39\ \text{atm}$$

Opener: Combined Gas Law

Suppose you had a 355 ml container with 5 g of oxygen gas at 25.0ºC and 2.50 atm of pressure. If you added more oxygen so the gas weighed twice as much, and you expanded the container to 3055 ml, and cooled the container to −75.0ºC, what would the pressure be inside? *Submit your answer with your clicker.*

Opener: Compounds & Mixtures

- Compare and contrast compounds and mixtures by filling out the table below

	Compound	Mixture
made of what?		
put together how ?		
quantities?		
example?		heterogeneous
		homogeneous

Opener: Compounds & Mixtures

- Compare and contrast compounds and mixtures by filling out the table below

	Compound	Mixture
made of what?	different elements	elements or compounds or both
put together how ?	chemically combined	physically mixed
quantities?	in fixed ratio	in any ratio
example?	H_2O, CO_2, CO, NaCl	heterogeneous: oil & water, salad
		homogeneous: salt water, air, brass, vinegar