Simulation – Apparent Molecular Weight of Air

Name: _____ **Lab TA:** _____

Lab Day

Mon	Tue(am)	Tue(pm)	Wed	Thu(am)	Thu(pm)	Fri
○	○	○	○	○	○	○

Grade

	>95	>90	>85	>80	>70	<70
Report:						

Report Submitted on Time (Check Box)

Yes	No

Some Useful Values You May Need:

R (The Ideal Gas Constant): $0.08205\ L.atm.mol^{-1}K^{-1}$

Convert ^0C to K: $0^0C + 273.15 = 273.15\ K$

Data Collection:

Exp 6a: Study the Relationship Between Volume and Temperature for a Sample of Air

Erlenmeyer Flask Volume*1 mL	Volume of air in the syringe mL	Total volume of air mL	Temperature °C	Temperature K
182.00			21.5	
182.00			0.0	
182.00			30.0	
182.00			40.0	
182.00			50.0	
182.00			60.0	
182.00			80.0	

***1.** *A 150mL Erlenmeyer Flask is graduated up to 150mL but has a total volume of 182.00mL. There is additional ungraduated space above the 150mL graduation. Check it out in the Simulation.*

Exp 6b: Study the Relationship Between Volume and Pressure for a Sample of Air

Erlenmeyer Flask Volume*2 mL	Volume of Water Added mL	Volume of air mL	Pressure atm	1/Pressure atm^{-1}
314.00	0.00			
314.00	20.00			
314.00	40.00			
314.00	60.00			
314.00	80.00			
314.00	100.00			

***2.** *A 250mL Erlenmeyer Flask is graduated up to 250mL but has a total volume of 314.00mL. There is additional ungraduated space above the 250mL graduation. Check it out in the Simulation*

Exp 6c: Measure the Mass of Air

Mass of evacuated flask (addition of 0.0001 atm air). _____ g
This is the Simulations way of removing all the air from the 250mL Erlenmeyer Flask. Check it out for yourself by attaching the pressure gauge, it will read 0.000 atm.

Measurement	Mass of flask and air g	Pressure atm
2		
3		
4		
5		
6		

Calculations:

Exp 6a: Study the Relationship Between Volume and Temperature for a Sample of Air

1. In Excel, create a graph of **total volume of air** (y-axis) **versus** the **temperature** (x-axis).
There is no need to include this graph with your report. Simply answer the following.

a) Was this graph linear? (**Yes or No**) _____

b) Give the **equation for this line**. _____

c) What was the **y intercept for this line**? _____
Simplist way to do this, set x=0 in your equation and solve for y.

d) Does it appear that Air is behaving ideally from this graph? (Yes or No) _____

Exp 6b: Study the Relationship Between Volume and Pressure for a Sample of Air

1. In Excel, create a graph of **1/pressure** (y-axis) **versus volume of air** (x-axis).
There is no need to include this graph with your report. Simply answer the following.

a) Was this graph linear? (**Yes or No**) _____

b) Give the **equation for this line**. _____

c) What was the **y intercept for this line**? _____
Simplist way to do this, set x=0 in your equation and solve for y.

d) Does it appear that Air is behaving ideally from this graph? (Yes or No) _____

2. **Based** on the **graphs** you obtained from **Exp 6a and Exp 6b is it safe to assume that air**, under the conditions of this experiment**, is behaving ideally** and thus safe to proceed to determining its Molecular Weigth (Molar Mass) using PV=nRT? _____

Exp 6c: Measure the Mass of Air

2a. Calculate and record the following data in the table below. To calculate the number of moles and molar mass use the equations derived from the ideal gas law.

Measurement	Mass of air g	Moles of air mol	Molar Mass of air $g.mol^{-1}$
2			
3			
4			
5			
6			

2b. What was **your average Molar Mass of air**? _____

Post-Lab Question:

There is no right or wrong answer to the following questions, as far as grading goes, just want you to attempt to evaluate the Simulation.

1. **Experiment 6b** used **the addition of water to the Erlenmeyer** to **decrease the volume that the air could occupy**. Do you see any experimental problem with this?

_____

_____

_____

_____

2. In the **background text** a section was devoted to the **Kinetic and Molecular Theory of Gases**, which in turn led us to scenarios where the **Ideal Gas Law breaks down**. You were **encouraged to do a web** search using the words "**Real Gas Equations**". In the **space below name a Real Gas Law you found** and **the equation** associated with it?

Pick the simplist one possible to type in the space provided as some of these equations are cumbersome to write.