

US DEPARTMENT OF EDUCATION TITLE V GRANT

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Lab instructions and record keeping for lab activities and mixed reception mystery



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## Tuesday Afternoon: Gases and Breathing

Every normal thing around us can be explained by laws of chemistry and physics. For example, the gas law relates pressure, volume, amount of molecules, and temperature to each other by this equation

$$PV=nRT$$

Or

Pressure (P) x Volume (V)= number of molecules (n) x the gas constant(R) x temperature in Kelvin(T)

### Introduction

Inhale. Exhale. Breathing is automatic. But how do we breathe? The breathing process can be explained by applying gas laws, specifically the pressure-volume relationship. In this lab, you will simulate the breathing process with a syringe serving as your lungs and the syringe piston as your diaphragm. Using a fixed amount of gas, you will vary the volume and measure the resulting pressure of gas.

### Materials

syringe, Vernier pressure sensor, LabPro, computer

### Procedure

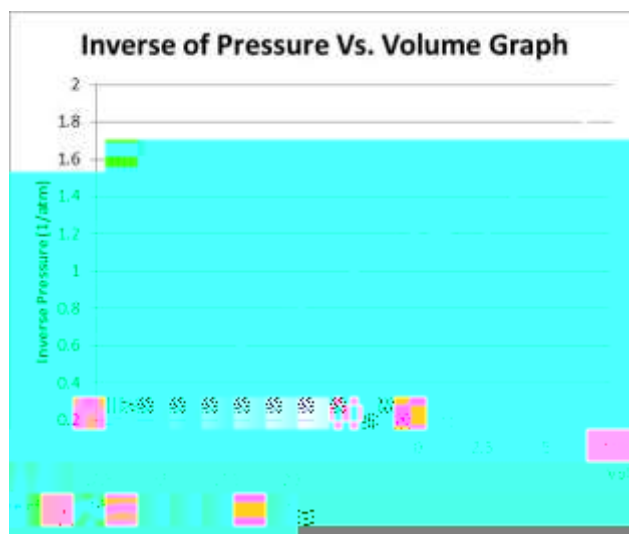
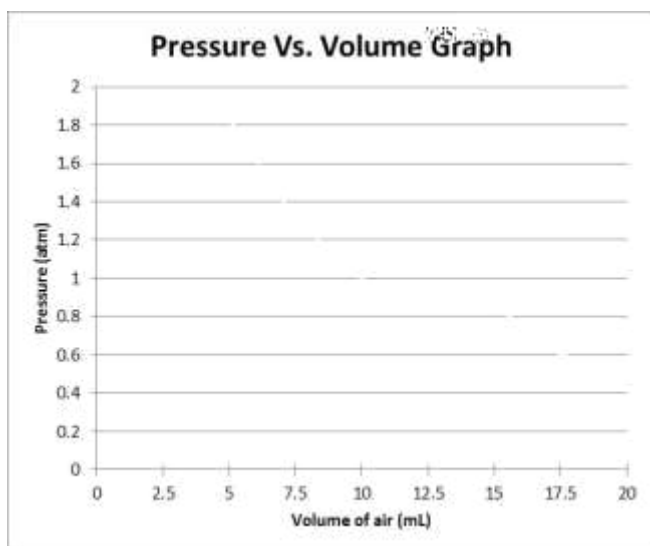
Pressure-volume relationship of a gas.



b. Repeat for volumes 7.5 ml, 10.0 ml, 12.5 ml, 15.0 ml, 17.5 ml, and 20.0 ml.

Table 1

Volume (ml)	Pressure (atm)	Inverse of pressure (1/atm)
5.0		
7.5		
10.0		
12.5		
17.5		
20.0		



c. Click the "Stop" button when you have finished collecting data.

4. Plot the data by hand on the graphs above. Which one is linear? Does your graph make sense in light of the following?

With number of moles and temp constant, the equation simplifies to

$$PV = \text{constant}$$

Or

$$V = 1/P \times \text{constant}$$

Demonstration:

Increasing the number of moles of gas

Dry Ice is frozen CO<sub>2</sub>. As it Sublimes, the solid turns to gas, in a sealed container more gas in the same volume is expected to do what to the pressure. Where the volume is not held constant (balloon receiver), what is expected to happen to the volume.

In the first case, the constants are R (the gas constant), V (the volume in the flask) and T (consider dry ice temp negligible with no insulation) so the equation becomes

$$P = n \times \text{constant}$$

In the second case, the constants are R (the gas constant), P (the atmospheric pressure) and T (consider dry ice temp negligible with no insulation) so the equation becomes

$$V = n \times \text{constant}$$



Wednesday Afternoon: Density of solids/ how to count by mass.

Lab 2. Properties of Substances: Density

KEY POINTS:



2. Guess the bank.

Each group should devise a method to estimate the value of the piggy bank by weight.

Fact: the piggy bank weighs exactly \_\_\_\_\_ g empty (given by instructor)

A sample of pennies is counted and weighed by each group

Number of pennies \_\_\_\_\_

Weight \_\_\_\_\_



## Thursday Lab – Unknown solids

Lab Activity for Science Academy: Identification of white solids

You are working for a large baking operation. There was a flood in the storage area and several labels washed off the 50 gallon drums of some of the baking ingredients. Your task is to figure out what was in the barrels.

Here are the labels that were found on the floor: sugar; baking soda; white flour; salt. Using your problem solving skills, how can you easily and quickly discover what each drum contains?

You will be giving known samples of each of the ingredients in small containers labeled with the name of the ingredient. You will also have access to samples of each of the barrels. They are marked with assigned numbers. Can you match each of the barrels with their correct name?

Hints: (instructor can provide these clues if necessary)












## Mixed Reception Worksheet

Each group has one worksheet, so work on them together. Take notes on them and use them to help you solve the problem. We are going to collect them, but the task at hand is solving a murder, not filling out a worksheet.

**While you watch the introduction video**, note below your preliminary thoughts about which person/ETBop( )6(t)-0u(w)15()5pn/(E44e39hi)74(i)5(7(c(r)-3(y)11susB3eche)33(m)7(,)-4( )-4(an)3(d)13Tm(yan)



**While you interview suspects and gather evidence,** make notes below about each suspect . do you personally suspect them? What reasons might they have had to commit the crime, and most importantly, how might they have done it? What were their means?

 <p>Dr Yervin</p>	<p>Do you suspect this person?          What is their motive?          How might they have done it?</p>
 <p>Sam</p>	<p>Do you suspect this person?          What is their motive?          How might they have done it?</p>
 <p>Joanna</p>	<p>Do you suspect this person?          What is their motive?          How might they have done it?</p>
 <p>Vince</p>	<p>Do you suspect this person?          What is their motive?          How might they have done it?</p>
 <p>Nelson</p>	<p>Do you suspect this person?          What is their motive?          How might they have done it?</p>



**While you gather evidence,**



 <p>Pills from Rajon Office</p>	
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Use this page for additional notes, calculations, and conclusions you make as you analyze the evidence and form your conclusion.

Y @}Á[ ~ q^Á^aa^Á[ Á^] [ !Á[ ~ !Áa aa \*•Éc Call a teacher over. V@^ q/Á c'ça, Á[ ~ Áe Á[ ~ Á report the cause of death, the guilty party, and the evidence that lead you to your findings.



An unknown substance was present in Nelson's blood. What was this substance and how did it get into his blood? What evidence do you have to support this?

The molecular weight of the unknown substance in Nelson's blood is 765.82? Why?

What is the MW of the allergy drug?

What is the MW of the anti-venom?

The coroner says that Nelson died from peanut allergy, yet he was taking a drug for this. Can you explain why he would still die from peanuts?

Did Nelson take his medication that day? Was the correct concentration of medication present in his blood?

You found an abstract on Sam's desk. Is this evidence relevant to your solution? Why or why not?

How did Sam know that giving Nelson the antivenom would kill him?

There were pills found in Joanna's office. Is this evidence relevant to your solution? Why or why not?



Are Joanna's emails important evidence in support of your solution?

Was any of the food left at the crime-scene important evidence for your case? Why or why not?

Who did it?

Why did they do it?

How did they do it?