

# Boyles Law U-Tube Lab

## **Background:**

The early gas laws were developed at the end of the 18th century, when scientists began to realize that relationships between the pressure, volume and temperature of a sample of gas could be obtained which would hold for all gases. Gases behave in a similar way over a wide variety of conditions because to a good approximation they all have molecules which are widely spaced, and nowadays the equation of state for an ideal gas is derived from kinetic theory. The earlier gas laws are now considered as special cases of the ideal gas equation, with one or more of the variables held constant.

The Irish chemist Robert Boyle (1627-1691) was the first person to quantitatively study the compressibility of gases. After many experiments he determined that the volume of a sample of gas at a given temperature varies with the applied pressure. The mathematical relationship between the volume of a gas and the applied pressure at a fixed temperature is known as Boyle's Law.

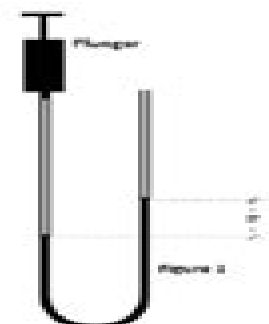
An open ended manometer is a way to indirectly measure the pressure of a gas sample. The pressure a gas sample exerts pushes the water on one side of the manometer and the atmospheric pressure pushes the water on the other end. The difference in the water levels is then used to calculate the pressure of the gas sample. In this lab, you will use a manometer to identify the mathematical relationship between the pressure of a gas and its volume.

## **Materials:**

- 1 U-Tube apparatus
- White board marker
- 1 Ruler
- 1 Ringstand and clamp
- 60 mL syringe

## **Procedure: Part 1 Pressure and Volume**

1. Record the atmospheric pressure and temperature of the room as provided by your instructor.
2. Observe the water levels in the U tube (manometer). Answer the following questions in the analysis section of your lab report:
  - a.) Why are the water levels equal?
  - b.) How much pressure is pushing down on each side of the manometer?
3. Set the plunger at the 32.00 mL mark and carefully connect to the rubber tubing.
4. Adjust syringe until water levels in the manometer are again equal.
5. Push the plunger in until the volume of the gas in the plunger reads 20.0 mL. Answer the following questions in the analysis section of your lab report:
  - c.) What happened to the water levels?
  - d.) What happened to the gas pressure on the side with the syringe?
  - e.) Based on your observations, describe the relationship that exists between the volume and the pressure of a gas?
  - f.) What two variables remained constant throughout this trial?
6. Using a white board marker and a ruler, record the height difference (h) of the water levels as shown in figure 1 in millimeters. If the level of the liquid is higher on the plunger side than the level on the side with the atmospheric pressure only, the difference will be a negative value. If it is lower on the plunger side, then the difference will be positive (as seen in figure 1). Erase all marks when done.
7. Pull the plunger out 4.00 mL and repeat step 6.
8. Repeat step 6 until the volume is 42.00 mL using the volumes of 28.0 mL, 32.0 mL, 36.0 mL, 40.0 mL and 44.0 mL. Remember: Mark the fluid levels, measure the differences, and erase before moving on.



## **Graph:**

Using the provided graph paper, generate a graph of volume vs. total pressure. Be sure to include all the components of a good graph:

- Title
- Labeled axis with units
- Properly scaled axis
  - Remember: the axis does not need to start at 0 when graphing data.
  - X Axis = Independent Variable
  - Y Axis = Dependent Variable
- Properly plotted points.
- Best fit line or curve.

# Lab Answers For Boyles Law Lab Manual

**Padhraic Smyth**

A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the author's name.

## Lab Answers For Boyles Law Lab Manual:

**Instructors Manual to Lab Manual** Ralph Petrucci, William Harwood, Geoffrey Herring, 2001      **The Essential Lab Manual** Karen Timberlake, 2002-06-24 Drawing from the successful main Laboratory Manual the Essential Laboratory Manual includes twenty one experiments which have been revised and updated Suitable for a one or two term lab course

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Tate, 2019-07-24 Use research and brain based teaching to engage students and maximize learning Lessons should be memorable and engaging When they are student achievement increases behavior problems decrease and teaching and learning are fun In 100 Brain Friendly Lessons for Unforgettable Teaching and Learning 9 12 best selling author and renowned educator and consultant Marcia Tate takes her bestselling Worksheets Don t Grow Dendrites one step further by providing teachers with ready to use lesson plans that take advantage of the way that students really learn Readers will find 100 cross curricular sample lessons from each of the eight major content areas Earth Science Life Science Physical Science English Finance Algebra Geometry Social Studies Plans designed around the most frequently taught objectives found in national and international curricula Lessons educators can immediately replicate in their own classrooms or use to develop their own 20 brain compatible research based instructional strategies that work for all learners Five questions that high school teachers should ask and answer when planning brain compatible lessons and an in depth explanation of each of the questions Guidance on building relationships with students that enable them to learn at optimal levels It is a wonderful time to be a high school teacher This hands on resource will show you how to use what we know about educational neuroscience to transform your classroom into a place where success is accessible for all      **Lab Manual T/a Human Physiology** Bill W. Tillery, 2001-03      Exploring Anatomy & Physiology in the Laboratory, 4th Edition Erin C Amerman, 2022-01-14 Over three previous editions Exploring Anatomy Physiology in the Laboratory EAPL has become one of the best selling A P lab manuals on the market Its unique straightforward practical activity based approach to the study of anatomy and physiology in the

laboratory has proven to be an effective approach for students nationwide This comprehensive beautifully illustrated and affordably priced manual is appropriate for a two semester anatomy and physiology laboratory course Through focused activities and by eliminating redundant exposition and artwork found in most primary textbooks this manual complements the lecture material and serves as an efficient and effective tool for learning in the lab

**Laboratory Manual [in] Engineering Physics ...** Seville Chapman,1947 **Chemistry** McGraw-Hill Staff,2001-07 **Introduction to Chemistry, Laboratory Manual** T. R. Dickson,1994-12-23 Teaches chemistry by offering a dynamic provocative and relevant view of the topic and its importance to society and our daily lives Three themes are stressed throughout the text developing chemical thinking and a chemical vision learning problem solving methods and utilizing group work and discussion activities These themes involve and engage the students in their own learning processes they are challenged to be active The presentation of topics has been altered to include a new chapter which introduces the students to scientific thinking and shows that chemistry involves interesting and relevant topics The reorganization presents many core concepts in the first five chapters preparing students for later chapters In addition the author has added vignettes throughout the chapters referring to health technology the environment and society as well as to specific tools of direct use to students Proceedings of the ... Annual Conference ... Indiana Science Teachers' Association,1897 **Physics Laboratory Experiments** Jerry D. Wilson,1990 **A Manual for High Schools, with Special Reference to Science and Agriculture** Josiah Main,1909 **Chemistry** Karen Timberlake,1999 Suitable for one or two term lab courses covering general organic and biological chemistry this new edition written by Karen Timberlake features many improvements to the insightful experiments that have made it the leading lab manual Each experiment encourages critical thinking with laboratory goals discussion of related concepts clear instructions new pre lab questions and comprehensive report pages Forty one experiments illustrate the basic principles of chemistry

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complex physiological processes Many of the illustrations are the same as the illustrations by William Ober and Claire Garrison that appear in Martini Fundamentals of Anatomy Physiology Seventh Edition making this lab manual a perfect companion to that textbook     **Prentice Hall Chemistry** Antony C. Wilbraham,2008

## Unveiling the Power of Verbal Art: An Emotional Sojourn through **Lab Answers For Boyles Law Lab Manual**

In a global inundated with screens and the cacophony of fast conversation, the profound energy and psychological resonance of verbal art usually diminish in to obscurity, eclipsed by the constant assault of sound and distractions. However, located within the musical pages of **Lab Answers For Boyles Law Lab Manual**, a captivating function of literary beauty that impulses with fresh emotions, lies an unforgettable trip waiting to be embarked upon. Written by way of a virtuoso wordsmith, that interesting opus instructions visitors on a mental odyssey, softly revealing the latent potential and profound influence embedded within the complicated web of language. Within the heart-wrenching expanse of this evocative analysis, we can embark upon an introspective exploration of the book is central themes, dissect their interesting writing model, and immerse ourselves in the indelible effect it leaves upon the depths of readers souls.

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