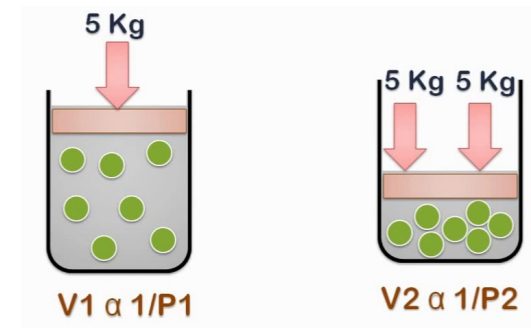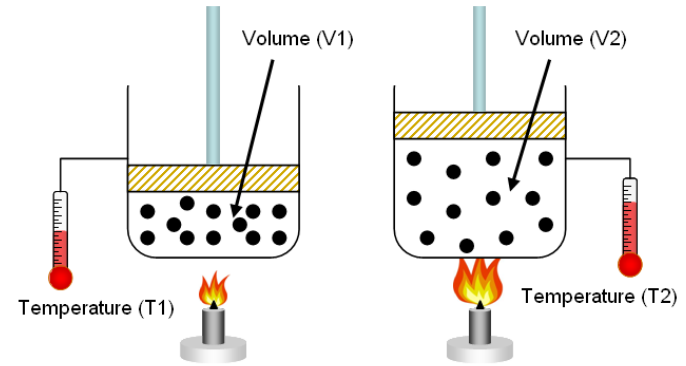# Gas Law's

Outline

- Introduction

- Charles' Law

- Boyle's Law

Introduction

- **Gas Law's**

  There are three gas laws, let start with ideal gas equation.

$$PV = nRT$$

P is pressure of gas

V volume of gas

n is number of moles

T is temperature & **R** is universal gas constant its value is **8.3145J/mol.**
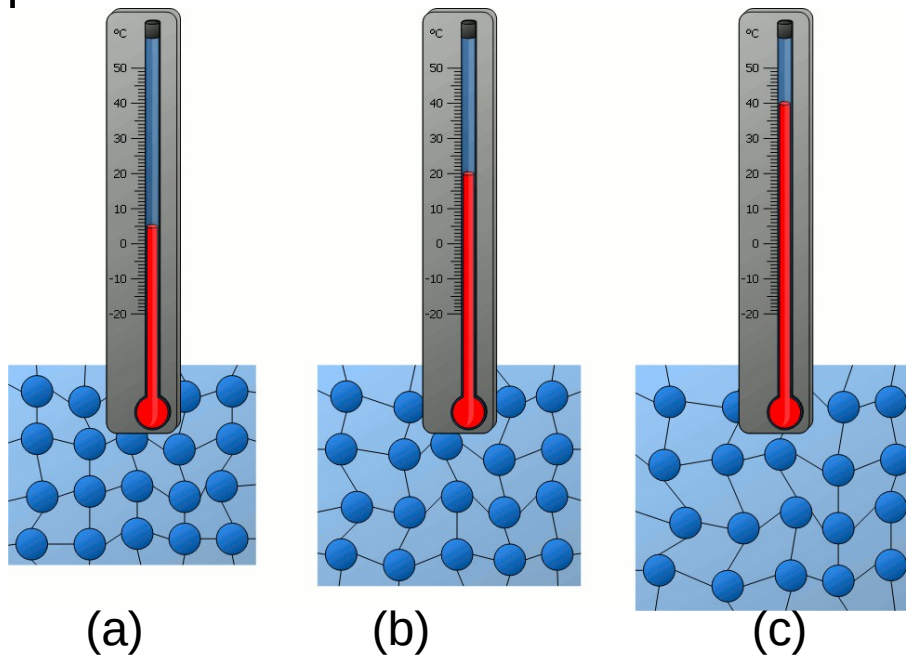
Charles' Law

- Introduction to Charles' Law.

  Charles' law states that at a constant pressure, the volume of a fixed mass varies directly with the absolute temperature.

  V = Const. T

  P = constant

- When T increase V increased (T↑, V↑)

- When T reduce V reduced (T↓, V↓)

(a)   (b)   (c)

Experimental setup

- Equipment Required
1) Gas Law Apparatus
I. Base apparatus
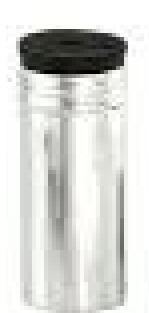II. air chamber
III. Tube for connection
1) container of hot water
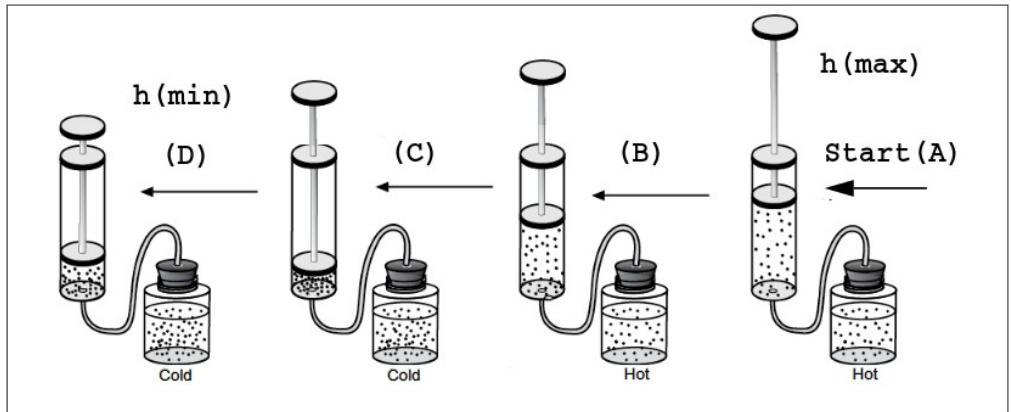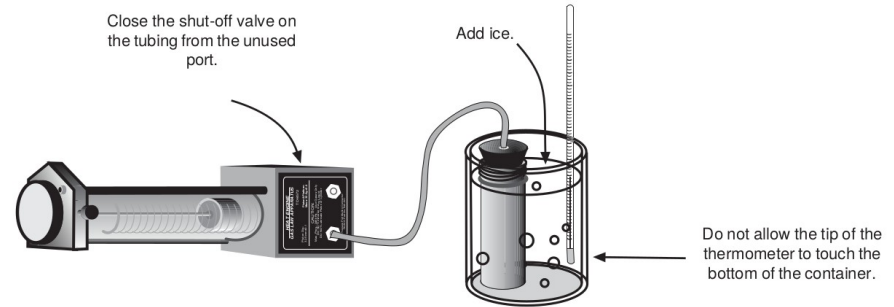2) container of ice water
3) Thermometer

Verification of Charles law.

1) Position base apparatus in horizontal direction.

2) Connect tube with base apparatus and then to air chamber.

3) Put air chamber into hot water.

4) Note down position or height of piston (h) and temperature (T).

5) Add cold water or ice if available into hot water to lower its temperature.

6) Note new temperature and height of piston.

7) Repeat **step 5** until you get 6 to 7 values of (T & h) to make graph.

Close the shut-off valve on the tubing from the unused port.

Add ice.

Do not allow the tip of the thermometer to touch the bottom of the container.

h(min)

(D)

(C)

(B)

h(max)

Start(A)

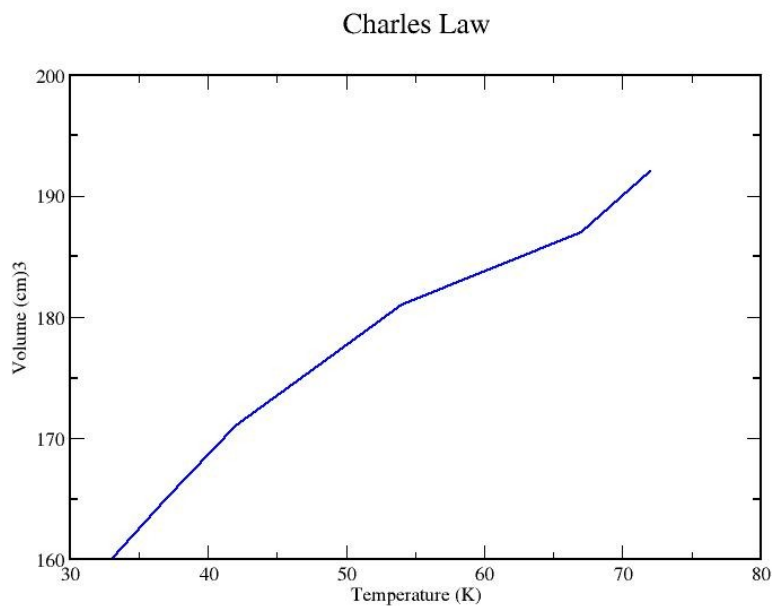Cold   Cold   Hot   Hot

Verification of Charles law.

- **V =** Const. **T**

- we need values for Temperature and their corresponding volume.

- We will note down values of compression or expansion to find V by using formula (3.14 r^2h) piston.
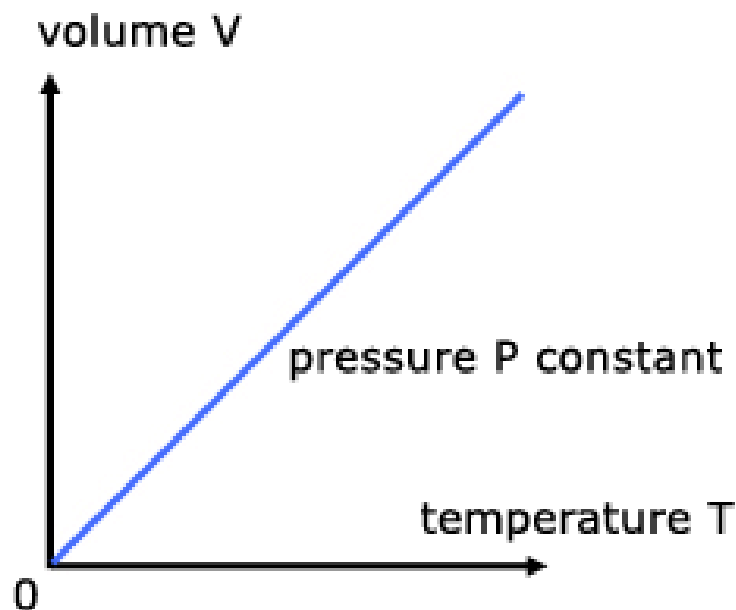
Diameter of the piston = 32.5 mm

Serial number	Extension mm	Volume mm³	Temperature K
1.	18.3	15204	348
2.	16.1	13390	340
3.	14.5	12028	333
4.	13	10784	327
5.	11.7	9680	322
6.	9.5	7880	313

Verification of Charles law.

- Experimental Results
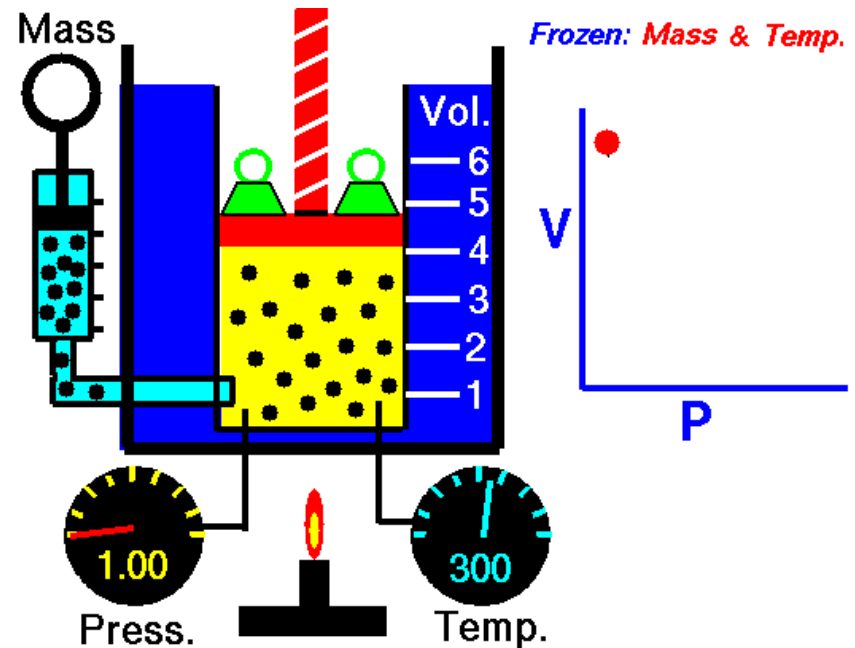- Theoretical Results

Verification of Boyle's Law

Introduction to Boyle's Law.

•Boyle's law states that the product of the volume of a gas times its pressure is a constant at a fixed temperature, pressure will be inversely related to the volume

V = Const. 1 / P

T = constant

•When V increase P reduced (P↓, V↑)

•When V reduce P increased (P↑, V↓)

Apparatus

- Syringe

- Pipe for connection

- Pressure sensor

- Interface

- Computer with data studio

Verification of Boyle's law.

1) Setup will be arranged by lab assistant according to figure.

2) Open "Data Studio" on computer to which interface is connected.

3) Click on create experiment.

4) Click on **'start'** button on screen, screen will show graph for **P** and **t.**

5) As plunger of syringe pushed pressure increased.

6) Note value of volume from syringe and pressure from computer screen.

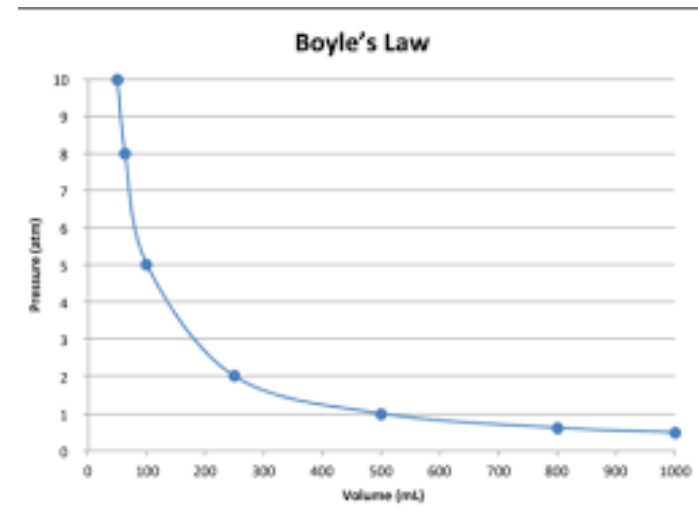7) Repeat **step 5 to 6** until you get 6 to 7 values of (V & P) to make graph.

pressure sensor port
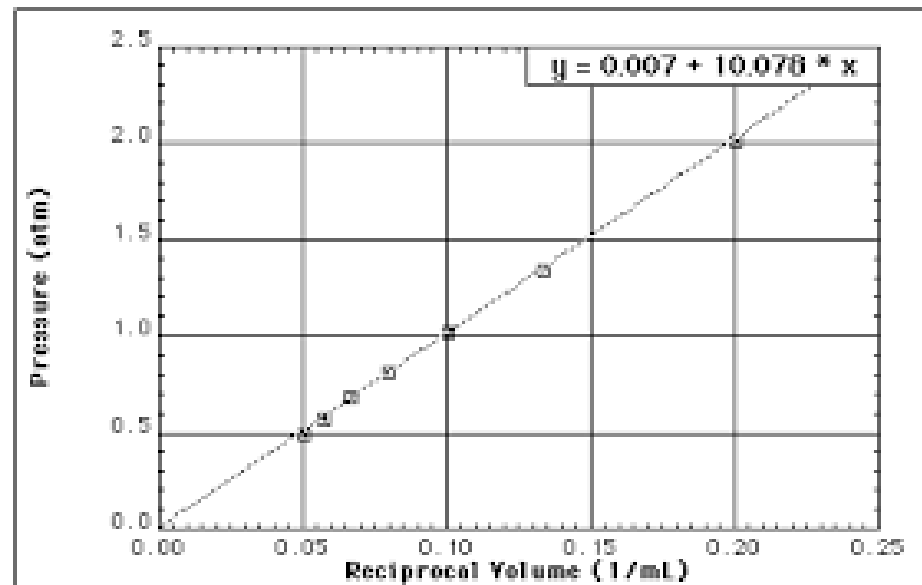
pressure coupler
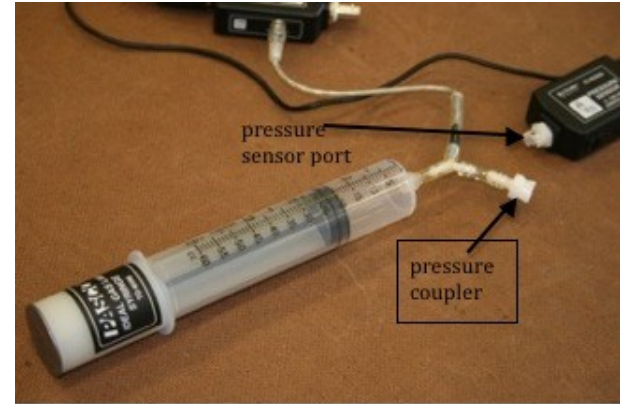
Results
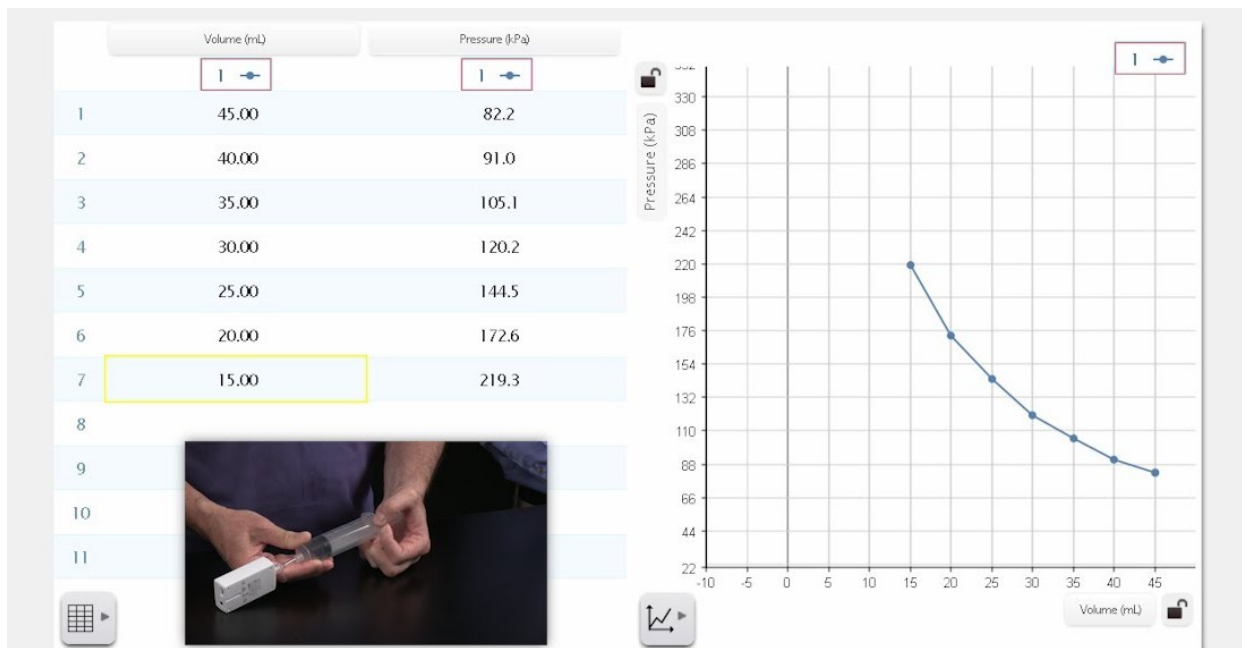
- Experimental

- Theoretical

Results

- Graph shown on right is plotted for inverse of Volume.

- There is direct relation between P and 1/V

Assignment

- Why we have placed base apparatus in horizontal position in charle's law experiment?

- Define 3rd gas law "Gay-Lussac's law"?

Dead line : 22-04-2020 Time 2 O'clock
Email : sperveen.msphy17sns@student.nust.edu.pk

Note
(Do not forget to mention in subject section while composing email)
Group in lab
School & section
Experiment name