# ISLAMIC UNIVERSITY OF TECHNOLOGY

# PHYSICS LAB REPORT

# Experiment No. 04 Group/Batch No.: 03

# Student No.:

# Course Number: 4142

# Name of the Experiment:

# DETERMINATION OF THE PRESSURE CO-EFFICIENT OF A GAS AT CONSTANT VOLUME BY CONSTANT VOLUME AIR THERMOMETER

# Date of Performance: Name:

# Date of Submission: Department: C.S.E.

# Section:

Partner’s ID No.:

Theory: The law of pressure states that for rise in temperature for a given mass of gas, the increase in pressure has a constant ratio with the original pressure at , given the volume of the gas does not change. This ratio is called the pressure coefficient of the gas at constant volume.

If we take and to be the pressures of the gas at and respectively, then:

- (i)

where is the pressure coefficient of the gas. This can be re-written as:

- (ii)

This shows clearly that can be calculated if and are known.

For some gases, like carefully dried air, Boyle’s law is valid, since the gas behaves like an ideal gas.

Hence,

- (iii)

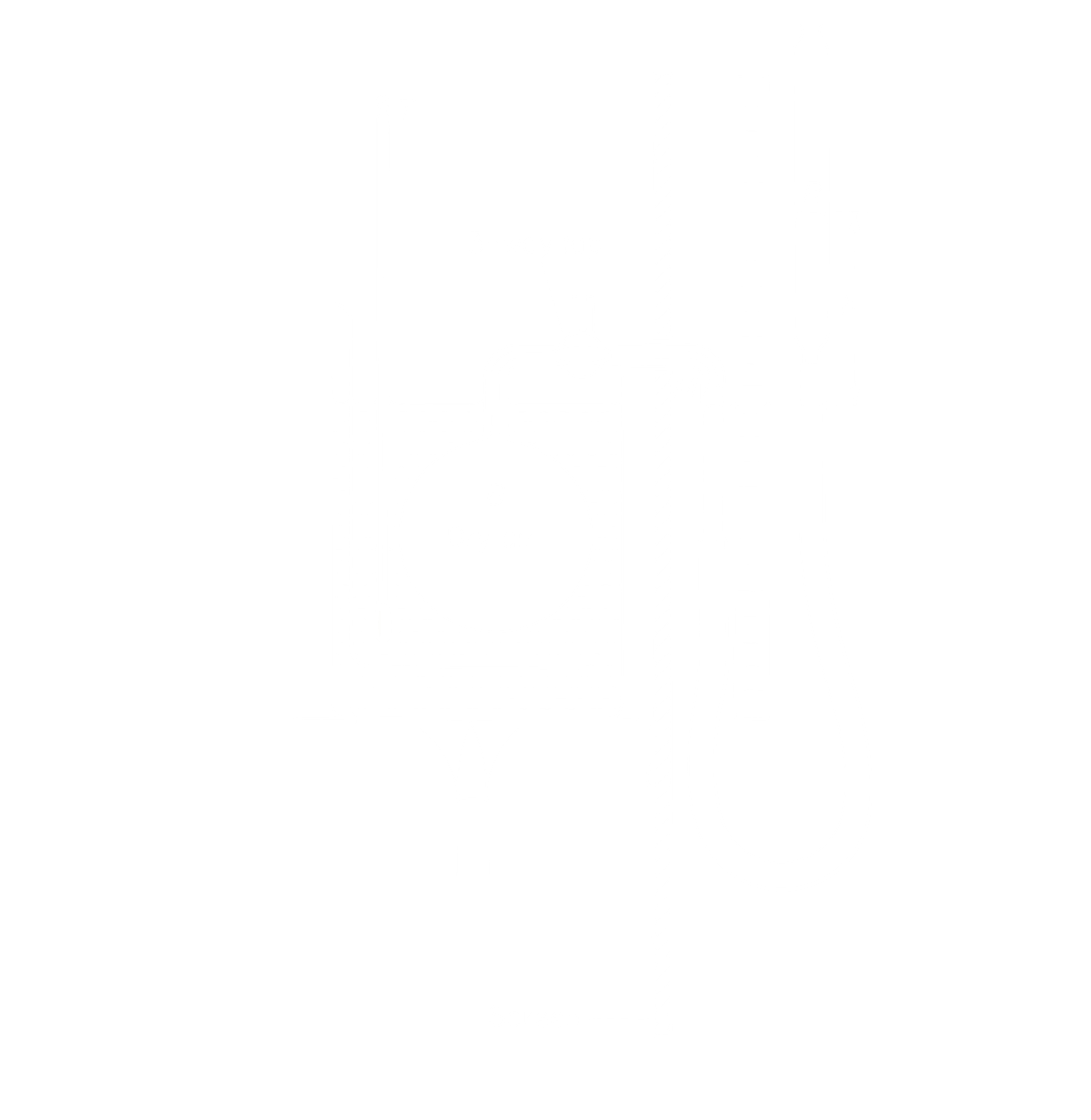
where and are the absolutel temperatures corresponding to and respectively.

So,

- (iv)

From this it is clear that should equal to .

Apparatus: Jolly’s Thermometer, Heating Bath, Thermometer



Procedure:

1. The Vernier constant of the scale of the barometer is determined in order to calculate the barometric pressure.
2. It is ensured that scale is vertical. Water at room temperature is poured into the beaker, immersing bulb , and a thermometer is attached very close to . Time is given for to acquire the temperature of the bath. is adjusted so the mercury level is at , fixing the volume of gas in . Readings are taken off the mercury levels at and , taking care to avoid parallax errors by using set squares. The temperature of the bath is also noted.
3. The bath is heated slowly to cause a temperature rise of and stirred to ensure even heating. The temperature is kept uniform for about minutes by manipulating the flame. The gas in the bulb will expand, causing the mercury level to drop below . is adjusted to bring it back to . The mercury level at and the temperature are noted.
4. Step (iii) is repeated 8 to 10 times, raising the temperature by each time.
5. At the end, the barometric pressure is noted again, and if different, the mean value is taken.
6. At each temperature, the difference in and () is noted. The pressure at each temperature is then found as , where is the barometric pressure.
7. A graph of pressure against temperature is drawn. The line of best fit is extrapolated to to determine . Another reading of at temperature is taken. Relation (ii) is used to determine and check if it is equal to .

Results:

1. Vernier constant of the barometer scale
2. Barometric height
3. Pressure temperature record:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Observation No. | Temperature in | Reading in of mercury level | | Difference in levels in | Gas Pressure in of mercury |
| Open Limb | Closed Limb |
|  |  |  |  |  |  |

Calculation:

of mercury

of mercury

per