

251-419

Boyle's Law Apparatus



Instruction Manual

INTRODUCTION

Boyle's Law demonstrates the relationship between the pressure of the gas and its volume whilst it is held at constant temperature $PV=k$ is constant, where P is pressure, V is volume and k is constant. This instrument demonstrates Boyle's law at a higher pressure than normal to void usage of mercury. A small metal reservoir is connected to a vertical glass tube which is sealed at the upper end. This heavy wall high pressure glass tube is placed inside a plastic tube for double protection. A metric scale is fitted behind the glass tube so the volume of the air space can be measured. The metal reservoir contains coloured fluid, when the reservoir is pressurised by air pump; the fluid is forced up the glass tube and can be seen compressed inside the tube.

OPERATION

1. Carefully unpack the apparatus and place on the flat surface

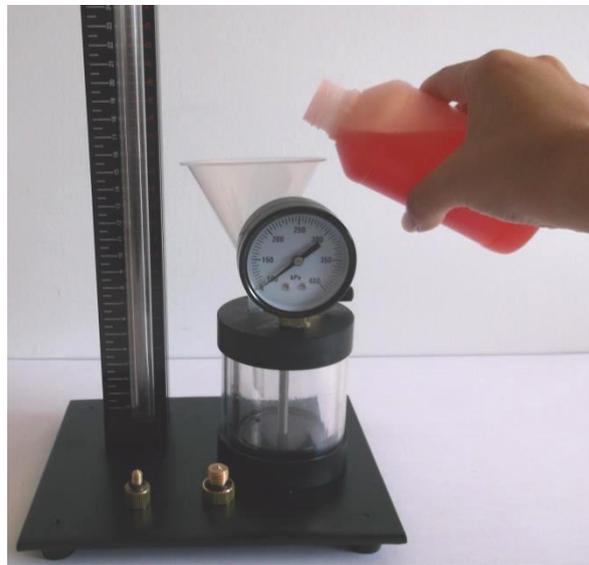


2. Unscrew two valves to equalise the pressure. First screw from reservoir and second one from the top of the column as presented below.





3. Place the funnel into reservoir via filling hole and pour 100-150ml of the red oil provided.



4. The oil level in the tube should now be at the same level as the reservoir.



5. Place the screws back and tighten them firmly.



6. Remove the cap on the inlet valve.



7. Fit the pump nozzle onto the inlet valve correctly



8. Ensure the air valve is open. Turn Anticlockwise to open.



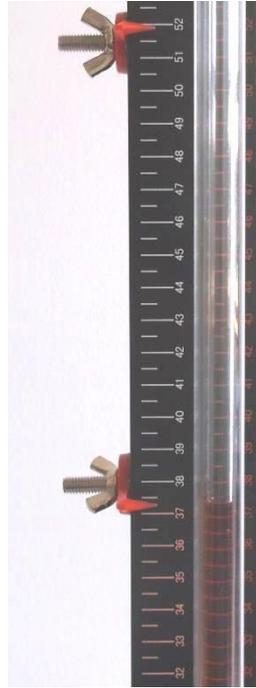
9. Secure the pump moving the lever away from the hose and start pumping. Once up to the desired pressure close the air valve to stop the air leaking out.



10. Please note, gauge provided, displays the pressure from 100kPa and will require large volume of oil to be pumped into the tube to exceed the pressure of 100kPa

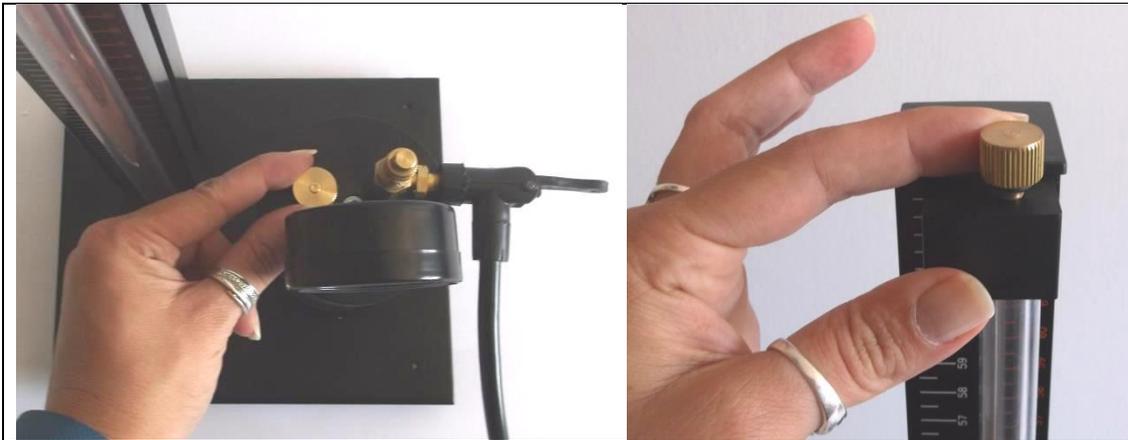


11. Perform the experiment between marked volumes to achieve the best results. Lower mark is recommended at the point where pressure is over 100kPa and the higher point between 15-20 units above.

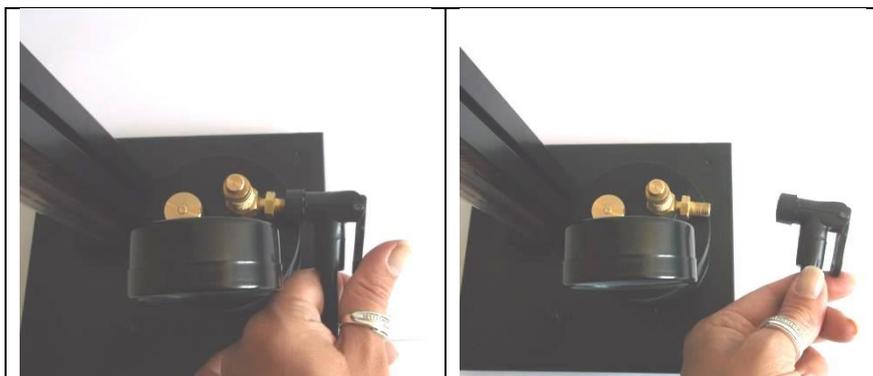


12. Take the pressure readings from the gauge and the corresponding volume readings.

13. Once experiment completed slowly unscrew valves to release the pressure



14. Once the valves are opened and pressure equalised, it's safe to detach the pump.



RESULTS AND CALCULATIONS:

1. Once the set of readings have been taken, fill out the table below:

Experiment No.	Volume (V)	Pressure (P)

2. Use your readings to calculate and fill out the columns below:

Experiment No.	$1 / V$	$P \times V$

3. Plot a graph of Volume against the pressure

4. Plot a graph of reciprocal of the volume against the pressure

5. Note your observations and conclusions.