



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

PRESCRIBED EXPERIMENT

TERM 3

PHYSICAL SCIENCES

GRADE 11

BOYLE'S LAW

SURNAME	
FIRST NAME	
NAME OF SCHOOL	
NAME OF CIRCUIT	

MARKS: 50

TIME: 2 hours

Learner's Mark

50

This practical assessment is consisting of 7 pages and 1 graph paper

TERM 3 EXPERIMENT**KNOWLEDGE AREA: CHEMISTRY****TITLE: BOYLE'S LAW****AIM:**

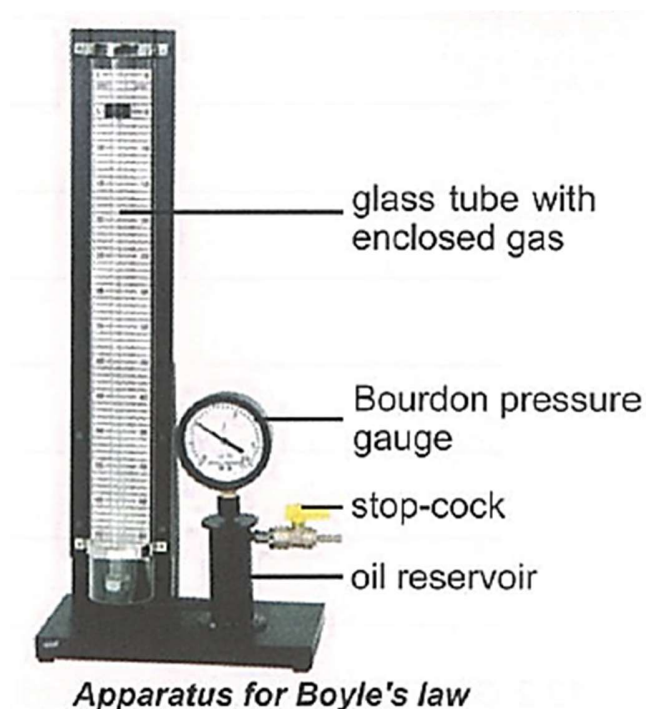
To investigate the relationship between the volume and the pressure of an enclosed gas.

APPARATUS:

Apparatus for Boyles law
Bicycle pump or compressor

METHOD:

Use the apparatus for Boyles law and conduct the following practical.



1. Connect a bicycle pump or compressor to the inlet of the stop-clock.
2. Increase the pressure by pumping air into the apparatus.
3. Remove the pump or compressor.
4. Read the volume of the enclosed gas and the pressure gauge and fill that in on a table.
5. Allow a small amount of air to slowly escape through the stop-clock.
6. Take again the volume and pressure readings and record it on an appropriate table.
7. Repeat the procedure to obtain several readings and record it.

SECTION A**PRACTICAL SETUP AND MEASUREMENTS.**

Skills	0 Marks	1 Mark	2 Marks	Marks obtained
Setting up equipment	The apparatus is incorrectly set up	An attempt has been made to set up the apparatus correctly	The apparatus has been set up correctly and readings was reliable	
Reading and following instructions	Learners are unable to follow instructions and to conduct the experiment	Learners need to be assisted to complete the experiment	Learners follow instructions and conduct the experiment without help from teacher	
Observation and data collection	Data collected is inaccurate and there is no attempt to record the data in an appropriate table	Data is recorded in a appropriate table but is incorrect or insufficient	Data recorded is correct, sufficient and in an appropriate manner	
Observation of precautions	Do not adhere to precautions	Adhere to precautions and work with care		

(7)**PART B ANALYSIS OF RESULTS****QUESTION 1**

- 1.1 Explain the term *closed system*. (1)
- 1.2 Write an investigative question for this experiment. (1)
- 1.3 Which factor must be controlled? (1)
- 1.4 Which liquid is used in this apparatus? (1)
- 1.5 Explain why the pressure must be increased or decrease gradually. (1)

[5]

QUESTION 2

Study the following information obtained during a similar experiment and answer the questions that follow.

Pressure (p) in kPa	Volume (V) in cm ³	$\frac{1}{V}$ in cm ⁻³	pV in (....)
150.0	20		
157.9	19		
166.7	18		
176.5	17		
142.9	21		
136.4	22		

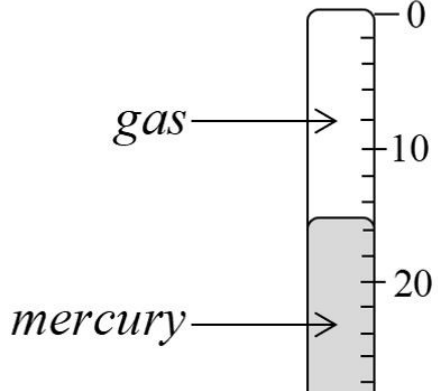
- 2.1 Write down the unit for **pV**. (1)
- 2.2 Complete the calculations in the table above and use it to draw a graph of **p versus $\frac{1}{V}$** on the graph paper provided on **page 8**. (4)
- 2.3 What can you conclude about the values of **pV** in the last column in the table? (1)
- 2.4 Write down the mathematical relationship between **p** and $\frac{1}{V}$ from your graph. (1)
- 2.5 State *Boyle's law* in words. (2)
- 2.6 Use the kinetic model of gases and explain Boyle's law. (4)

[13]

PART C CONTEXTUANAL QUESTIONS/POST-TEST**QUESTION 3**

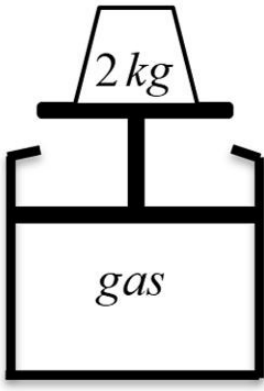
Consider the following two scenarios **A** and **B**.

Scenario A



An experiment was performed to investigate the relationship between the volume and pressure of a fixed mass of gas at constant temperature. The above tube shows an enclosed volume of gas measured in cm^3 at 0°C and a pressure of 100 kPa.

Scenario B



An airtight cylinder with a movable piston on which mass pieces can be placed is shown above. The cylinder contains a gas.

Consider scenario A

- 3.1 Write the reading off the volume of the gas in the tube. (1)
- 3.2 Calculate the volume when the pressure is decreased to 75 kPa at the same temperature. (3)

Consider scenario B

- 3.3 Explain why the gas in the cylinder exerts pressure on it. (2)
- The 2 kg mass piece is replaced with a 1 kg mass piece.
- 3.4.1 What will be observed? (1)
- 3.4.2 How will the volume of the enclosed gas be affected? (1)
- [8]**

QUESTION 4

A sealed gas syringe contains oxygen gas at a certain temperature and pressure.

The volume of the gas decreases due to the plunging action.

If it is assumed that the temperature of the gas was kept constant; how will the following be affected?

Answer by indicating **INCREASE**, **DECREASE** or **REMAIN THE SAME** next to the question number (4.1 – 4.3)

4.1 number moles of gas. (2)

4.2 the average kinetic energy of the gas particles. (2)

4.3 the strength of the forces between the gas molecules. (2)

4.4 Motivate your answers for:

a) Question 4.1

b) Question 4.2

c) Question 4.3 (3)

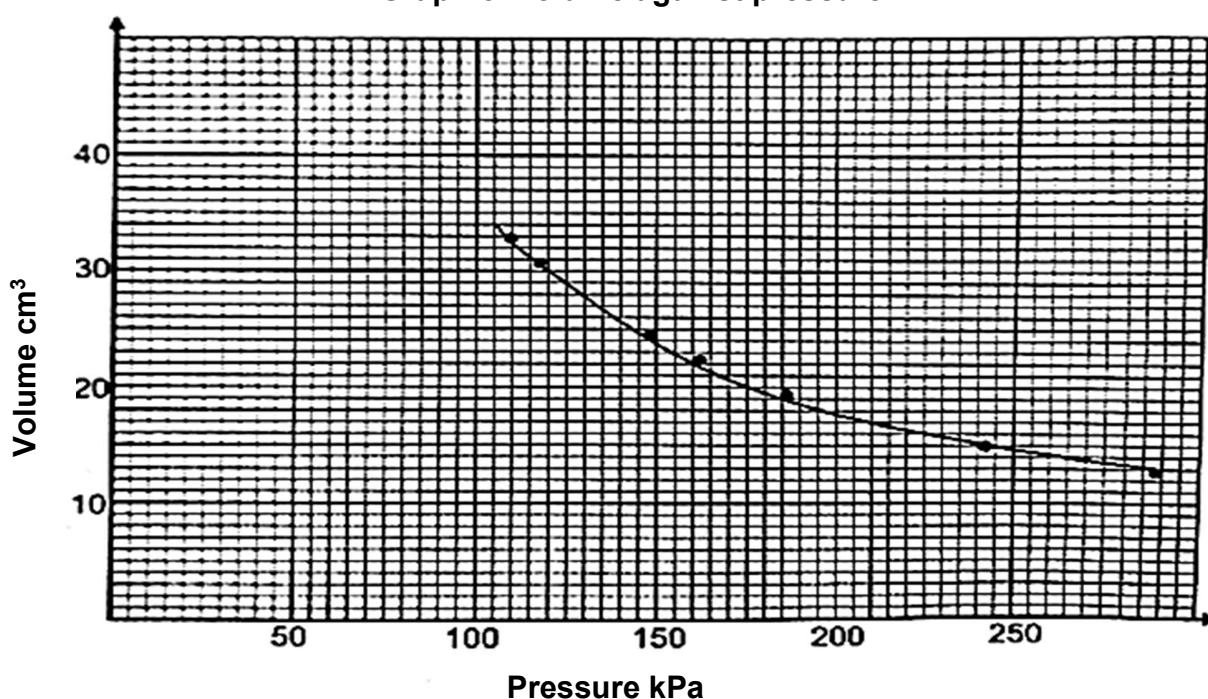
4.5 How does the pressure of a gas changes if its volume is doubled at constant temperature? (2)

[11]

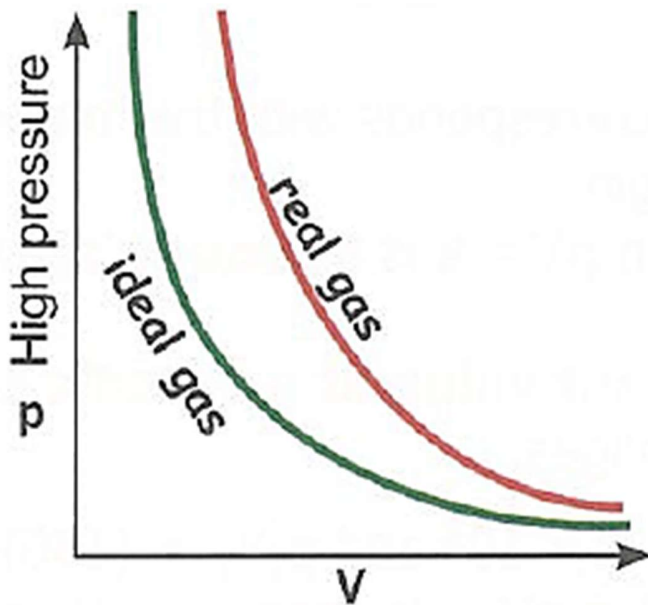
QUESTION 5

A fixed mass of oxygen was used to verify one of the gas laws. The results obtained is shown in the graph below.

Graph of volume against pressure



- 5.1 From the graph, write down the volume oxygen in cm^3 , when the pressure is 120 kPa. (1)
- 5.2 Calculate the pressure, in kPa, exerted on the gas when it is compressed to 5 cm^3 . (3)
- 5.3 Study the graph of pressure against volume below.



- 5.3.1 Explain why the volume of the real gas deviates from that of the ideal gas at high pressure.

(2)
[6]

TOTAL: 50

NAME AND SURNAME: _____

QUESTION 2.2

1

