WORKSHEET 1

CHAPTER 7 – STUDY OF GAS LAWS

A. Tick (✓) the correct option.

1. Standard temperature is equal to
   a. 273 °C. b. 100 °C. c. 273 K. d. 0 K.
2. All gases
   a. have high densities.
   b. have no definite shape and volume.
   c. are lighter than air.
   d. exhibit similar chemical behaviour.
3. The mathematical expression showing Charles' law relationship is
   a. $V \propto 1/P$. b. $T \propto P$. c. $V \propto T$. d. $dV \propto n$.
4. If volume available to the gas is increased, the pressure exerted by the gas molecules will
   a. increase.
   b. increase then decrease.
   c. decrease.
   d. decrease then increase.
5. Which of the following properties does not describe a gas?
   a. Pressure b. Volume c. Temperature d. Ductility

B. Fill in the blanks from the choices given within the brackets.

1. Pressure remaining constant, the ________ (mass/volume) of an enclosed gas is directly proportional to the kelvin temperature.
2. At kelvin zero, the molecular motion of gaseous molecules is ________ (zero/maximum)
3 100 K is equal to ________ (–173 °C/100 °C)
4. The graph plotted between volume and temperature at any given pressure is called ________ (isotherm/isobar)
5. 1 dm^3 of a gas is equal to ________ (1 litre/100 mL/100 cc)

C. Correct the following statements.

1. Temperature remaining constant, the volume of a fixed mass of gas is directly proportional to the pressure applied to it.
2. Pressure remaining constant, the volume of a fixed mass of gas is inversely proportional to its celsius temperature.
3. The standard pressure of a gas is 760 cm of mercury.
4. Absolute zero is the temperature of –273 K at which all gases are supposed to have zero volume.
5. 0 °C is equal to zero Kelvin.

Name: .... Teacher's signature: ....

Class: ....IX................. Date: ....

D. Match the following.

1.	Thermometric scale having lowest temperature zero K	Charles' law
2.	A relation between pressure and volume at constant temperature	Gas equation
3.	A temperature at which gas is supposed to have zero volume	Boyle's law
4.	A relation between volume and temperature at constant pressure	Kelvin zero
5.	Relation between pressure, volume and temperature of a gas	Kelvin scale

E. Answer the following questions.

1. The product of pressure and volume for a given mass of an enclosed gas is a constant quantity at some fixed temperature. Is this statement true? Which gas law represent the above statement?
2. a. Define absolute scale of temperature.

   b. Convert the following Kelvin temperature into celsius.

   i. 310 K ii. 973 K
3. a. State Boyle's law equation, stating clearly the meaning of symbols used.

   b. 5 dm^3 of dry oxygen is allowed to expand to 7 m^3. The pressure recorded is 700 mm of mercury. Find the initial pressure of the gas assuming temperature remains constant.
4. How did Charles' law lead to the concept of absolute scale of temperature?
5. a. State the gas equation stating clearly the meaning of the symbols used.

   b. How will the pressure change?

   i. If the temperature is doubled keeping the volume constant.

   ii. If the volume is made half of its original value keeping the temperature constant.

   c. A gas occupies 1.12 dm^3 at a temperature of 127 ºC and pressure 800 mm of mercury. Calculate its volume at S.T.P.

ANSWERS

WORKSHEET 1

A. Tick (✓) the correct option.

1. c 2. b 3. c 4. c 5. d

B. Fill in the blanks from the choices given within the brackets.

1. volume 2. zero 3. –173 ºC 4. isobar 5. 1 litre

C. Correct the following statements.

1. Temperature remaining constant, the volume of a fixed mass of gas is inversely proportional to the pressure applied to it.
2. Pressure remaining constant, the volume of a fixed mass of gas is directly proportional to its Kelvin temperature.
3. The standard pressure of a gas is 76 cm of mercury.
4. The absolute zero is the temperature of –273 ºC at which all gases are supposed to have zero volume.
5. 0 ºC is equal to 273 K.

D. Match the following.

1.	Thermometric scale having lowest temperature zero K	Kelvin scale
2.	A relation between pressure and volume at constant temperature	Boyle's law
3.	A temperature at which gas is supposed to have zero volume	Kelvin zero
4.	A relation between volume and temperature at constant pressure	Gas equation
5.	Relation between pressure, volume and temperature of a gas	Charles' law

E. Answer the following questions.

1. The statement is true. The statement represent Boyle's law.
2. a. A temperature scale at which the lowest possible temperature is 0° absolute corresponding to –273 ºC is called absolute scale of temperature.

   b. i. 310 K = 310 – 273 ºC = 37 ºC

   ii. 973 K = 973 – 273 ºC = 700 ºC
3. a. $P_1V_1 = P_2V_2$

   where, P_1 is initial pressure, V_1 is initial volume, P_2 is final pressure and V_2 is final volume for an enclosed gas whose temperature remains constant.

   b. **Given:**

   Initial volume, V_1 = 5 dm^3
   Final volume, V_2 = 7 dm^3
   Final pressure, P_2 = 700 mm of mercury
   Initial pressure, P_1 = ?

From Boyle's law equation,

$$P_1V_1 = P_2V_2$$

$$P_1 = \frac{P_2V_2}{V_1}$$

$$= \frac{700 \times 7}{5} = 980 \text{ mm of mercury}$$

4. From Charle's law equation,

$$\text{Volume, } V = V_0\left(\frac{273+t}{273}\right)$$

At temperature, t = –273 ºC

$$\text{Volume, } V = \left(\frac{273-273}{273}\right) = 0$$

Thus, the volume of a gas should become zero at –273 ºC. This implies that any further decrease in temperature is not possible because it will correspond to negative volume which is meaningless. Therefore, Lord Kelvin suggested a new scale of temperature in which the lowest possible temperature is 0º absolute corresponding to –273 ºC. This scale of temperature is called absolute scale of temperature.

5. a. Gas equation is $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

where, P_1 is initial pressure, V_1 is initial volume, T_1 is initial temperature, V_2 is final volume, P_2 is final pressure and T_2 is final kelvin temperature for an enclosed gas.

b. i. Pressure will be doubled

ii. Pressure remains the same

c. Initial pressure, P_1 = 800 mm

Initial volume, V_1 = 1.12 dm^3

Initial temperature, T_1 = 127 ºC = 127 + 273 = 400 K

Final pressure, P_2 = 760 mm

Final volume, V_2 = ?

Final temperature = 273 K

$$\because \quad \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$\Rightarrow \quad V_2 = \frac{P_1V_1 \times T_2}{T_1 \times P_2}$$

$$= \frac{800 \times 1.12 \times 273}{400 \times 760} = 0.8046 \text{ dm}^3$$