CBSE TEST PAPER-02

CLASS - XI CHEMISTRY

(States of Matter: Gases and Liquids)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

1. Define Boyle's law. [1]

2. Why helium and hydrogen gases not liquefied at room temperature by applying very high pressure? [1]

3. At what temperature will the volume of a gas at 0^0 c double itself, pressure remaining constant? [2]

4. How is the pressure of a given sample of a gas related to temperature at volume? [1]

5. Define absolute zero temperature. [1]

6. 50 cm^3 of hydrogen gas enclosed in a vessel maintained under a pressure of 1400 Torr, is allowed to expand to 125 cm^3 under constant temperature conditions. What would be its pressure? [2]

7. State the law depicting the volume-temperature relationship. [2]

8. State Avogadro's Law. Is the converse of Avogadro's law true? [2]

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[ANSWERS]

Ans 1. At constant temperature, the pressure of a fixed amount (i.e; number of moles "n") of gas varies inversely with its volume.

Mathematically,

$p \propto \frac{1}{v}$ (at constant T and n)

=> $p = k_1 \frac{1}{v}$

Or, $pv = K_1$

Ans 2. Because their critical temperature is lower than room temperature and gases cannot be liquefied above the critical temperature even by applying very high pressure.

Ans 3. Let the volume of the gas at 0^0C = Vml.

Thus,

V_1 = Vml	V_2 = 2Vml
T_1 = o + 273 = 273k	T_2 = ?

By applying charles law

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\Rightarrow \frac{V}{273} = \frac{2V}{T_2}$$

$$T_2 = \frac{2Vx273}{V} = 546k$$

T_2 = 546 - 273 = **273^0C**

Ans 4. Pressure is directly proportional to the temperature , i.e; P ∝ T at fixed volume.

Ans 5. The lowest hypothetical or imaginary temperature at which gases are supposed to occupy zero volume is called Absolute zero.

Ans 6. Since, temperature is constant, we have

PV = constant

$\therefore P_1 V_1 = P_2 V_2$

$P_1 = 1400$; $P_2 = ?$

$V_1 = 50cm^3$; $V_2 = 125\ cm^3$

$\therefore P_2 = \frac{P_1 V_1}{V_2} = \frac{1400x50}{125} = 560 Torr$

The final pressure of the gas after expansion would be 560 Torr.

Ans 7. The law is known Charle's law.

"Pressure remaining constant , the volume of a given mass of a gas increases or decreases by 1/273 of its volume at 0^0C for every one degree centigrade rise or fall in temperature.

Mathematically, $V_t = V_o + \frac{V_o}{273}$ t

$= V_o (1+\frac{t}{273})$

$V_t = V_0\left(\frac{273+t}{273}\right)$

Where V_t is the volume of the gas at t^0C and V_o is its volume at 0^0C.

Ans 8. Avogadro's Hypothesis: This law was given by Avogadro in 1811. According to this law, "Equal volumes of all gases under the same conditions of temperature and pressure contain the same number of molecules."

Volume = a constant X Number of Moles (Temperature and pressure constant).

The converse of Avogadro's law is also true. Equal number of molecules of all gases occupy equal volume under the same conditions of temperature and pressure. It follows that one gram molecular mass of any gas (containing $6.023x10^{23}$ molecules) will occupy the same volume under the same conditions. The volume occupied by one gram molecular mass of any gas at 0^0C and 760 mm of Hg is 22.4 dm^3 (liters) is called the gram molecular volume or simply molar volume.