CBSE TEST PAPER-03

CLASS - XI CHEMISTRY

(States of Matter: Gases and Liquids)

General Instruction:

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

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1. Define an ideal gas. [1]

2. Deduce the relation pv = nRT where R is a constant called universal. [2]

3. At 25^0C and 760 mm of Hg pressure a gas occupies 600ml volume. What will be its pressure at a height where temperature is 10^0C and volume of the gas is 640mL. [2]

4. Calculate the volume occupied by 5.0 g of acetylene gas at 50^0C and 740mm pressure. [2]

5. What is aqueous tension? [1]

6. What is the value of R at STP? [1]

7. Explain how the function pv/RT can be used to show gases behave non-ideally at high pressure. [2]

8. Molecule A is twice as heavy as the molecule B. which of these has higher kinetic energy at any temperature? [1]

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[ANSWERS]

Ans 1. A hypothetical gas whose molecules occupy negligible space and have no intermolecular interactions, and which consequently obeys the gas law (PV=nRT) perfectly is called an ideal gas. It also shows perfect elastic collisions with the walls of system kept in or contained in.

Ans 2. According to Boyle's law,

$V \alpha \frac{1}{p}$ (at constant T and n)

According to charle's law,

$V \alpha T$ (at constant p and n)

According to Avogadro's law,

$V \alpha n$ (at constant T and p)

By combining the three laws,

$V \alpha n \text{ x } \frac{1}{p} \text{ x T}$

$or, \text{ V} \alpha \frac{nT}{p}$ or $pV = nRT$

Where R is a constant called universal gas constant.

Ans 3. P_1 = 760mm Hg, V_1 = 600mL

T_1 = 25 + 273 = 298 k

V_2 = 640 mL and T_2 = 10 = 273 = 283 k

According to combined gas law,

$$\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$$

$$p_2 = \frac{p_1T_2V_1}{T_1V_2}$$

$$= \frac{760x283x600}{640 \text{ x } 298}$$

$P_2 = \underline{\underline{676.6mm}}$ of Hg

Ans4. Molar mass of acetylene (C_2 H_2)

M = (2x12+2x1) g/mol

= 26 g/mol

Mass of acetylene, m = 50g.

Temperature, T = (50^0C + 273) = 323k

Pressure, p = 740mm Hg

$= \frac{740}{760} mm = 0.9737 \text{ atm}$

Pv = nRT = $\frac{m}{M} RT$

(As, no.of moles, n= mass/molecular mass)

v = $\frac{mRT}{pM} = \frac{5x0.082x323}{26x0.9737}$

$\underline{\underline{v = 5.23\text{L}}}$

Ans5. .**Aqueous tension** is the pressure exerted by the water vapor above the surface at any temperature where water and vapour are in equilibrium with each other. Hence it is also called water vapour pressure.

Ans6. At S. T. P, R = 8.20578 x 10^{-2} L at m k^{-1} mol^{-1}.

Ans7. The ratio pv/RT is equal to the number of moles of an ideal gas in the sample. This number should be constant for all pressure, volume and temperature conditions. If the value of this ratio changes with increasing pressure, the gas sample is not behaving ideally.

Ans8. Kinetic energy of a molecule is directly proportional to temperature and independent of mass so both the molecules will have the same kinetic energy.