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Special Online Speed Test

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ), 2023 අගෝස්තු

General Certificate Of Education (Adv. Level) Examination, August 2023

රසායන විද්‍යාව I Chemistry I	02	S/E	I

Universal gas constant $R = 8.314\ J\ K^{-1}\ mol^{-1}$ Plank's constant $h = 6.626\times10^{-34} J\ s$

Avogadro constant $N_A = 6.022\times10^{23}\ mol^{-1}$ Velocity of light $c = 3\times10^{8} m\ s^{-1}$

Gas Laws Term Test Spotlight 02

❖ **Answer all the Questions.**

1. Which of the following statement / statements is/are assumptions in the kinetic theory of gases ?

a) The mean kinetic energy of molecules at a certain pressure is a constant
b) The velocity of molecules increases with absolute temperature.
c) Molecular collisions are elastic.
d) There are no intermolecular forces.

2. (i) State the Dalton's law of partial pressures.

(ii) At 27°C and at a pressure of 1.0×10^5 Pa, a sample of O_2 gas exists in a rigid vessel of volume $4.9884 dm^3$. At the same temperature, another 0.02mol of He gas was introduced to the vessel. Part of the Oxygen gas was converted in to Ozone gas by using an electrical method.. When the temperature of the system reached to the initial value, the new pressure of the system reached to 10.5×10^4 Pa.

(I) Calculate the initial number of moles of Oxygen gas in the system.
(II) Find the total pressure exerted by Oxygen and Ozone gases.
(III) Calculate the number of Oxygen moles converted in to Ozone gas.
(IV) Calculate the final mole fractions of Helium , Ozone and Oxygen gases in the system.
(V) State the assumptions you made during the calculations.
(VI) By considering gases of Oxygen , Helium and Ozone, draw a graph to show the deviation of the real gases from the ideal gas behavior, using compressorbility factor.

3. **Volume of O_2 gas collected by downward displacement of water at 27 °C and 1.2×10^5 Pa pressure was $240 cm^3$. What is the volume of O_2 if it was dried under 1.2×10^5 Pa pressure at 27 °C (saturated vapour pressure of H_2O at 27 °C is 2×10^4 Pa)**

1) $480\ cm^3$ 2) $360\ cm^3$ 2) $240\ cm^3$ 2) $200\ cm^3$ 2) $120\ cm^3$

4. If mean kinetic energy of an ideal gas at absolute temperature T is $\bar{E}$ and Avogadro's constant is L, show that the universal gas constant, $R = \frac{2\bar{E}L}{3T}$.

Which of the following statements is true regarding a real gas?

(1) Inter molecular attraction forces are not present between real gas molecules.
(2) Compressibility factor can be 1 at a certain pressure.
(3) Only noble gases can act as real gases.
(4) Compressibility factor of any real gas is always greater than 1.
(5) Volume of a mass of real gas is greater than a volume of a similar mass of ideal gas at a certain temperature and pressure.

5. (c) (i) Write the balanced chemical equation for the combustion of the gaseous organic compound $C_nH_{3n}O_m$

.....

(ii) What is the decrease of the number of gas molecules in the above reaction.

.....

(iii) A volume of $10cm^3$ of the above organic compound was mixed with $50cm^3$ of oxygen gas and ignited using an electric method. The volume of the gas mixture at room temperature after the combustion was $40.0cm^3$. This mixture was then passed through a solution of KOH. The volume measured after passing through KOH was $20cm^3$. All measurements were taken at room temperature and pressure. Calculate the molecular formula of the organic compound.

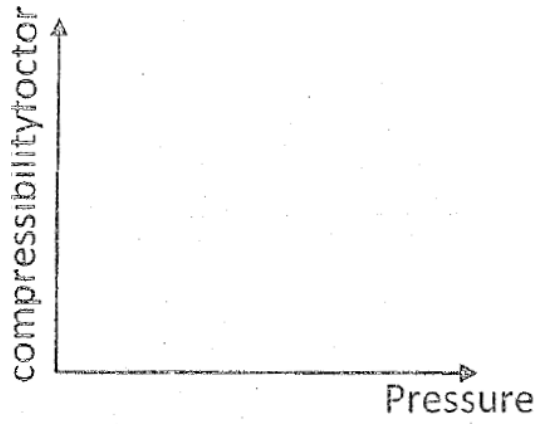
6. i) State two physical condition at which the behavior of real gases approaches that of ideal gases and explain how they approach the behavior of ideal gases in each of these situations.

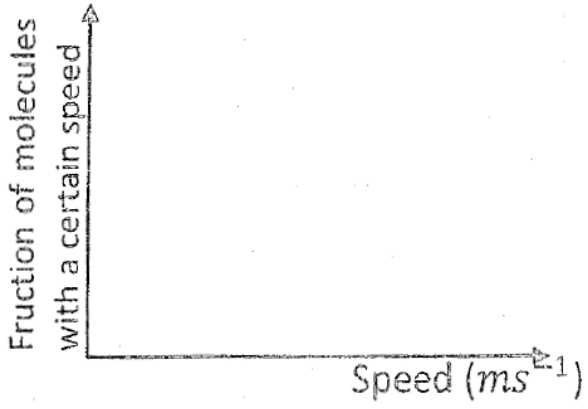
ii) write the vander Waals equation which include the amendments for the deviations of real gases from the ideal behavior.

iii) Explain how the amendments have been included in the vander Waals equation.

7. (i) Sketch below the variation of the compressibility factor with pressure for an ideal gas and for a real gas. State for the reasons for the difference in the sketches you drew for the two types of gases.

(ii) Sketch below Maxwell- Boltzmann curves for a gas at two different temperatures T_1K, T_2K ($T_1 < T_2$) state the reason for the difference in the sketch.





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