QB365 Question Bank Software Study Materials

Gaseous State Important 2 Marks Questions With Answers (Book Back and Creative)

11th Standard

Chemistry

Total Marks : 60

2 Marks

30 x 2 = 60

1) Give the mathematical expression that relates gas volume and moles.

Answer : According to Avogadro's hypothesis: V α n

$\therefore \frac{V_1}{n_1} = \frac{V_2}{n_2} =$ constant

V_1 & n_2 are the volume and number of moles of a gas and V_2 & n_2 are a different set of values of volume and number of moles of the same gas at same temperature and pressure.

2) Can a Van der Waals gas with a = 0 be liquefied? explain

Answer : For ideal gases, a = 0. The value of 'a' is a measure of the attractive forces between the molecules. There will not be any intermolecular forces of attraction. So it cannot be liquefied.

3) Give suitable explanation for the following facts about gases.
Gases don't settle at the bottom of a container.

Answer : Gases are very less denser. They have negligible intermoleculer forces of attraction between the molecules. They are in continuous kinetic motion. So they wont settle at the bottom due to gravitational forces. The material that is most dense will sink to the bottom; the less denser will go up.

4) Explain whether a gas approaches ideal behavior or deviates from ideal behaviour if
it is compressed to a smaller volume at constant temperature.

Answer : The gas deviates from ideal gas behaviour and will be a real gas only. In the compressed state, the inter moleculer forces will be very high as the molecules are very close.

5) Of two samples of nitrogen gas, sample A contains 1.5 moles of nitrogen in a vessel of volume of 37.6 dm^3 at 298K, and the sample B is in a vessel of volume 16.5 dm^3 at 298K. Calculate the number of moles in sample B.

Answer : n_A = 1.5 mol n_B = ?

V_A= 37.6 dm^3 V_B = 16.5 dm^3

(T = 298 K constant)

$\frac{V_A}{n_A} = \frac{V_B}{n_B}$

$n_A = \left(\frac{n_A}{V_A}\right) V_B$

$= \frac{1.5\text{mol}}{37.6\ \text{dm}^3} \times 16.5\ \text{dm}^3 = 0.66\text{mol.}$

= 0.66 mol.

6) Sulphur hexafluoride is a colourless, odourless gas; calculate the pressure exerted by 1.82 moles of the gas in a steel vessel of volume 5.43 dm^3 at 69.5°C, assuming ideal gas behaviour.

Answer : n =1.82 mole

V = 5.43 dm^3

T = 69.5 + 273 = 342.5

P = ?

PV = nRT

$P = \frac{nRT}{V}$

$P = \frac{1.82\ \text{mol} \times 0.821\ \text{dm}^3\ \text{atm mol}^{-1}\ \text{K}^{-1} \times 342.5\text{K}}{5.43\ \text{dm}^3}$

P = 9.425 atm.

7) Argon is an inert gas used in light bulbs to retard the vaporization of the tungsten filament. A certain light bulb containing argon at 1.2 atm and 18°C is heated to 85°C at constant volume. Calculate its final pressure in atm.

Answer : Given data P_1 = 1.2 atm

T_1 = 18° C

T_1 = 18 + 273 = 291 K

P_2 = ?

T_2 = 85° C

= 85 + 273 = 358 K

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

$P_2 = \frac{P_1 T_2}{T_1} = \frac{1.2 \times 358}{291}$

P_2 = 1.48 atm

8) A sample of gas has a volume of 3.8 dm^3 at an unknown temperature. When the sample is submerged in ice water at 0 °C, its volume gets reduced to 2.27 dm^3. What is its initial temperature?

Answer : V_1 = 3.8 dm^3 T_2 = 0°C = 273 K

T_1 = ? V_2 = 2.27 dm^3

$\frac{V_1}{T_1} = \frac{V_2}{T_2} T_1 = \left(\frac{T_2}{V_2}\right) \times V_1$

$\frac{273K}{2.27\ dm^3} \times 3.8\ dm^3$

T_1 = 457K

9) A tank contains a mixture of 52.5 g of Oxygen and 65.1 g of CO_2 at 300 K the total pressure in the tanks is 9.21 atm. calculate the partial pressure (in atm.) of each gas in the mixture.

Answer : No. of moles of Oxygen $= \frac{Mass}{MolarMass} = \frac{52.5}{32}$

= 1.640 moles

No. of moles of CO_2 = $\frac{Mass}{MolarMass} = \frac{65.1}{44}$

= 1.480 moles

Partial pressure = Mole fraction x Total Pressure

$\therefore \mathrm{P_{o_2}} = \left(\frac{1.641}{1.641+1.480}\right) 9.21 = \frac{1.641}{3.121} \times 9.21$

= 4.842 atm.

$\mathrm{P_{CO_2}} = \left(\frac{1.480}{1.641+1.480}\right) 9.21 = \frac{1.480 \times 9.21}{3.121}$

= 4.367 atm.

10) Give suitable explanation for the following facts about gases.
Gases diffuse through all the space available to them

Answer : There is a great deal of empty space between gas molecules which have a lot of kinetic energy (KE $\propto$ T). The molecules move very fast and collide with one another, causing them to diffuse or spread out until they are evenly distributed throughout the volume of the container.

11) Explain whether a gas approaches ideal behavior or deviates from ideal behaviour if
the temperature is raised while keeping the volume constant

Answer : P $\propto$ T at constant volume.

So, when T is raised P will also increases.

The gas deviates from ideal gas behaviour and will be a real gas only

12) Explain whether a gas approaches ideal behavior or deviates from ideal behaviour if
more gas is introduced into the same volume and at the same temperature

Answer : Pressure will increase and there will be more intermoleculer forces. So the gas deviates from ideal gas behaviour and will be a real gas only.

13) Why are the airplane cabins artificially pressurized?

Answer : The pressure decreases with the increase in altitude because there are fewer molecules per unit volume of air. Above 9200 m (30000 ft.) the pressure is so low that one could pass out for lack of oxygen. For this reason most airplanes cabins are artificially pressurized.

14) State the following laws:

(i) Avogadro's law

(ii) Gay-Lussac's law.

Answer : **(i) Avogadro's law**

Equal volumes of all the gases under the same conditions of temperature and pressure contain equal number of molecules.

V ∞ n (at constant P and T)

(ii) Gay-Lussac's law.

At constant volume, the pressure of a fixed amount of a gas is directly proportional to the temperature. P ∞ T (constant V)

15) On what basis do you classify gases into permanent and temporary gases? Explain these types with example.

Answer : Based on the values of the critical temperature, the gases are classified into permanent and temporary gases.

(i) Gases having very low critical temperature belong to permanent type.

Eg: H_2, N_2, He, etc.

(ii) Gases having critical temperature in the ordinary range of temperatures belong to the temporary type.

Eg: NH_2, CO_2, SO_2, HCI, etc.

16) State Avogadro's hypothesis.

Answer : Equal volumes of all gases under the same conditions of temperature and pressure contain equal number of molecules. The mathematical form of Avogadro's hypothesis may be expressed as

V∝n, $\frac{V_1}{n_1} = \frac{V_2}{n_2} = constant$

Where $V_1$and n_1 are the volume and number of moles of a gas and V_2 and n_2 are a different set of values of volume and number of moles of the same gas at same temperature and pressure.

17) Under what conditions, do real gases behave ideally?

Answer : The real gases behave ideally at low pressure and at high temperature.

18) State Dalton's law of partial pressure.

Answer : The total pressure of a mixture of gases is the sum of partial pressures of the gases present. Partial pressure of a gas is the pressure exerted by the gas when it is present alone in that volume.

19) Define rate of diffusion

Answer : It is defined as the number of molecules of a gas that get diffused in unit time.

rate of diffusion = $\frac{Volume\ of\ the\ gas\ diffused}{time\ taken}$

20) Mention the postulates of kinetic theory of gases which do not explain the behaviour of real gases.

Answer : The assumption that molecules in the gas phase occupy negligible volume (1) and that they do not exert any force on one another either attractive or repulsive (2) do not account for the behaviour of real gas.

21) Calculate the pressure exerted by 2 moles of sulphur hexafluoride in a steel vessel of volume 6 dm^3 at 70°C assuming it is an ideal gas.

Answer : We will use the ideal gas equation for this calculation as below:

$\frac{P=nRT}{V} = \frac{2mol \times 0.0821 Latm.K^{-1}.mol^{l} - 1 \times (70+273K)}{6dm^3}$

= 9.39 atm.

22) What is the reason behind the cause of ear pain while climbing a mountain? How it can be rectified?

Answer : (i) When one ascends a mountain in a plain, the external pressure drops while the pressure within the air cavities remains the same. This creates an imbalance.

(ii) The greater internal pressure forces the eardrum to bulge outward causing pain.

(iii) With time and with the help of a yawn or two, the excess air within your ear's cavities escapes thereby equalizing the internal and external pressure and relieving the pain.

23) What are the applications of Dalton's law of partial pressure?

Answer : (i) Physicians report the pressure of the patient's gases in blood, analyzed by hospital lab, the values are reported as partial pressures.

GAS	NORMAL RANGE
P_{CO_2}	35 - 45 mm of Hg
P_{O_2}	80 - 100 mm of Hs

(ii) When gas is collected by downward displacement of water, the pressure of dry vapour collected is computed using Dalton's law

$P_{\text{dry gas collected}} = P_{\text{Total}} - P_{\text{water vapour}}$

$P_{\text{water vapour}}$ = Aqueous tension.

24) Define Graham's law of diffusion.

Answer : Graham's law of diffusion: The rate of diffusion or effusion is inversely proportional to the square root of molecular mass of a gas through an orifice.

$\frac{r_A}{r_B} = \sqrt{\frac{M_B}{M_A}}$

r_A, r_B = rate of diffusion of gases A, B

M_A, M_B = Molecular mass of gases A, B.

25) CO_2 gas cannot be liquefied at room temperature. Give reason.

Answer : Only below the critical temperature, by the application of pressure, a gas can be liquefied. CO_2 has critical temperature as 303.98 K. Room temperature means (30 + 273 K) 303 K. At room temperature, (critical temperature) even by applying large amount of pressure CO_2 cannot be liquefied. Only below the critical temperature, it can be liquefied. At room temperature, CO_2 remains as gas.

26) What is Joule -Thomson effect ?

Answer : The phenomenon of lowering of temperature when a gas is made to expand adiabatically form a region of high pressure into a region of low pressure is known as Joule -Thomson effect.

27) Why the ideal gas equation is called the equation of state of gases.

Answer : The ideal gas equation is a relationship between four variables (P, V, T, n).Since it describes the state of any gas, it is referred to as the equation of state of gases.

28) State: Dalton's law of partial pressures write its mathematical form.

Answer : The total pressure of a mixture of non-reacting gases is the sum of partial pressures of the gases present in the mixture where the partial pressure of a component gas is the pressure that it would exert if it were present alone in the same volume and temperature. This is known as Dalton's law of partial pressures.

i.e., for a mixture containing three gases 1,2 and3 with partial pressures p_1, p_2 and p_3 in a container with volume V, the total pressure P total will be give by

$P_{\text{total}} = P_1 + P_2 + P_3$.

29) Mention the applications of Dalton's law.

Answer : In a reaction involving the collection of gas by downward displacement of water, the pressure of dry vapour collected can be calculated using Dalton's law.

$P_{\text{dry gas collected}} = P_{\text{total}} - P_{\text{water vapour}}$

$P_{\text{water vapour}}$ is generally referred as aqueous tension and its values are available for air at various temperatures.

30) State Boyle's law.

Answer : It is defined as the force per area (or) the force divided by the area to which the force is applied.

Unit: Nm^{-2} (or) $Kgm^{-1}S^{-2}$