CHEMISTRY

NCERT - NCERT CHEMISTRY(TELUGU)

GASEOUS STATE

Problem

1. Calculate the partial pressures N_2 and H_2 in a mixture of two moles of N_2 and two moles of H_2 at STP.

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2. If a gas diffuses at the rate of one-half as fast as O_2, find the molecular mass of the gas.

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3. 50 ml of gas A effuse through a pin -hole in 146 second . The same volume of CO_2 under identical condition effuse in 115 seconds . Calculate the molecular mass of A .

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4. One mole of carbon-dioxide was found to occupy a volume of 1.32 litre at 48°C and at a pressure of 16.4 atm. Calculate the pressure of the gas that would have been expected to behave ideally and non-ideally.

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5. Vanderwaal's constants for hydrogen chloride gas are a = 3.67 atm lit^{-2} and b =

40.8 ml mol^{-1}. Find the critical temperature and critical pressure of the gas.

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6. The critical temperature of hydrogen gas is $33.2^{\circ}C$ and its critical pressure is 12.4 atm. Find out the values of a' and b' for the gas.

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Self Test

1. Calculate the partial pressures of O_2 and H_2 in a mixture of 3 moles of O_2 and 1 mole of H_2 at S.T.P.

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2. If a gas diffuses at the rate of one quarter as fast as N_2 . Find the molecular mass.

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3. 75ml of gas A effuses through a pin hole in 73 seconds. The same volume of SO_2 under identical conditions effuses in 75 seconds. Calculate the molecular mass of A.

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Questions Choose The Correct Answer

1. The essential conditions for liquefaction of gases were discovered by Andrews in 1869 as a

result of his study of pressure-volume-temperature relationship for CO_2 . It was found that above a certain temperature, it was impossible to liquefy a gas whatever the pressure was applied. The temperature below which the gas can be liquefied by the application of pressure alone is called critical temperature (Tc). The pressure required to liquefy a gas at this temperature is called the critical pressure (Pc). The volume occupied by one mole of the substance at the critical temperature and pressure is called critical volume. Critical constants are related with van

der waals' constant as follows:

$$V_c = 3b,\ P_c = \frac{a}{27b^2},\ T_c = \frac{8a}{27Rb}$$

The values of critical volumes of four gases A, B, C and D are 0.025L, 0.312L, 0.245L and 0.432L respectively. The gas with larger molecular diameter will be :

A. P and $\frac{1}{V}$

B. PV and V

C. P and V

D. V and $\frac{1}{P}$

Answer:

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2. The critical temperature of a gas is that temperature

A. Above which it can no longer remain in the gaseous state

B. Above which it can not be liquified by pressure

C. At which it solidifies

D. At which volume of gas becomes zero.

Answer:

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3. If a gas expands at constant temperature.

A. Number of molecules of the gas decreases

B. The kinetic energy of the molecules decreases

C. The kinetic energy of the molecules remains constant

D. The kinetic energy of the molecules increases

Answer:

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4. Two samples of gases 'a' and 'b' are at the same temperature. The molecules of 'a' are

travelling 4 times faster than molecules of 'b'.

The ratio of M_a / M_b will be

A. $\frac{1}{16}$

B. 4

C. $\frac{1}{4}$

D. 16

Answer:

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Questions B Fill In The Blanks

1. The correction term for pressure deviation is .....in the Vanderwaal equation of state.

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2. The relation between inversion temperature and Vanderwaal's constants a' and b' is _____

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3. To liquefy Helium _____ method is exclusively used

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4. The adiabatic expansion of a real gas results in _____

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5. The rate of diffusion of gas is _____to square root of both _____ and molecular mass.

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Questions C Match The Following

1. Match the following

A	B
11. Ideal gas behaviour	(a) Critical temperature
12. Adiabatic demagnetization	(b) Liquid oxygen
13. CO_2 at 31.1°C	(c) Mole fraction of the gas
14. Joule Thomson Experiment	(d) Number of moles of the gas
15. Ratio of the partial pressure to the total pressure	(e) Low pressure and high temperature
	(f) Liquid Helium

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Questions D Write In One Or Two Sentence

1. State Boyle's law. Give its mathematical expression.

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2. Compare the partial pressures of gases A and B when 3 moles of A and 5 moles of B

mixed in constant volume, and $25^{\circ}C$ and 1 atm pressure.

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3. Derive the correction constant for volume of a real gas.

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4. A sample of an ideal gas escapes into an evacuated container, there is no change in the

kinetic energy of the gas. Why?

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5. What is the change in temperature when a compressed real gas is allowed to expand adiabatically through a porous plug

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6. State Boyle`s law and Charles law.

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7. What are measurable properties of gases?

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8. What is the molar volume of nitrogen at 500K and 600 atm according to ideal gas law?

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9. State Graham's law of diffusion.

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10. Give the values of R-gas constant in calories and Joules.

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11. What are the units of Vanderwaals constants a' and b' ?

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12. Write the significance of Vanderwaal's constants

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13. Write the limitations of vanderwaal equation of state.

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14. Define Joule-Thomson effect

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15. What is meant by inversion temperature ?

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Questions E Explain Briefly On The Following

1. At $27^{\circ}C$, H_2 is leaked through a tiny hole into a vessel for 20 minutes Another unknown gas at the same T and P as that of H_2 is leaked through the same hole for 20 minutes. After

effusion of the gas, the mixture exerts a pressure of 6 atm. The H_2 content of the mixture is 0.7 moles. If volume of the container is 3 litres what is the molecular weight of unknown gas ?

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2. Calculate the pressure exerted by 5 moles of CO_2 in one litre vessel at 47°C using Vanderwaal's equation. Also report the pressure of gas if it behaves ideally in nature.

Given that a=3.592 atm $lit^2 mol^{-2}$. b = 0.0427 lit mol^{-1}

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3. Calculate the total pressure in a 10 L cylinder which contains 0.4 g of helium, 1.6 g of oxygen and 1.4 g of nitrogen at 27° C. Also calculate the partial pressures of He gas in the cylinder. Assume Ideal behaviour for gases.

R = 0.082 L atm $k^{-1} mol^{-1}$

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4. The critical constants for water are $374^{\circ}C$, 218 atm and 0.0566 litre mol^{-1}. Calculate a' and b' of water

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5. Vanderwaal's constant in litre atmosphere per mole for carbon dioxide are a = 3.6 and b = 4.28×10^{-2}. Calculate the critical temperature and critical volume of the gas. R = 0.0820 lit atm $K^{-1}.Mol^{-1}$

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6. Explain the causes for deviation for real gases from ideal behaviour.

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7. Deduce the relationship between critical constants and Vanderwaal's constants.

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8. Describe Linde's process of liquefaction of gases with neat diagram.

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9. Describe Claude's process of liquefaction of gases with neat diagram.

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10. What is meant by adiabatic demagnetisation? Explain its use in liquefaction of gases.

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