CHEMISTRY

BOOKS - R SHARMA CHEMISTRY (HINGLISH)

STATES OF MATTER

Example

1. A manometer is connected to a gas containing bulb. The open arm reads $43.7cm$

whereas the arm connected to the bulb reads $15.6cm$. If the barometric pressure is $743mm$ mercury , calculate the pressure of the gas in bar?

Strategy : The pressure of the gas inside the bulb is greater than the external atmospheric pressure because the height of mercury column in the left arm is less than in the right arm.Therefore ,

$$p_{\text{gas}}(\text{in cm}) = p_{\text{atom}}(\text{in cm}) + hcm$$

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2. Suppose water is used in a barometer instead of mercury. If the barometric pressure is $760mmHg$, what is the height of the water column in the barometer at $0^\circ C$. The densities of water and mercury at $0^\circ C$ are $0.99987gcm^{-3}$ and $13.596gcm^{-3}$, respectively.

Strategy : The prtessure exerted by a column of liquid h whose density is d is hdg. Because the pressure are equal , we can equate the expressions for water (W) and mercury (M):

$h_W d_W g = h_M d_M g$

or $h_W d_W = h_M d_M$

Rearranging gives

$$\frac{h_W}{h_M} = \frac{d_M}{d_W}$$

This implies that the height of the liquid column in inversely proportional to its density . Solve the equation to find the height of the water column, h_W.

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3. An inflated ballon has a volume of $0.55L$ at sea level $(1.0atm)$ and is allowed to rise to a height of $6.5km$, where the pressure is about

$0.40atm$. Assuming that the temperature remains constant , what is the final volume of the ballon ?

Strategy : We know the volume at one pressure and want to know the volume at another pressure keeping temperature constant. This suggests the use of Boyle's law. We tabulate what is known and what is asked for and then solve Boyle's law equation for the unknown quantitu V_2.

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4. A sample of ozone gas occupies 117 mL at $100^\circ C$. At what temperature in degrees Celsius would it occupy $234mL$ if the pressure did not change?

Strategy : We know the volume of the gas at one temperature and we wish to know its temperature corresponding to a seconf volume(constant pressure). This implies the use of Charles'law, we must remember to carry out calculations with all temperatures expressed on the Kelvin scale , converting to or from Celsius as required.

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5. A ballon whose volume is $5.0L$ contains $7gofN_2$. What mass of the H_2 gas must be added to the ballon to expand its volume to $10L$ at the same temperature and pressure ?

Strategy : We know the two volumes at the same temperatures and pressure. We can find the moles of N_2 through its mass . To calculate the total moles of N_2 and H_2 , we apply Avogadro's law. Finally , we find the mass of H_2 through its moles.

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6. Calculate the temperature of $4.0mol$ of a gas occupying $5dm^3$ at 3.32 bar.

Strategy : List the variables with the proper units. Then solve the ideal gas equation for T by substituting the values.

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7. A small bubble rises from the bottom of a lake, where the temperature and pressure are

$8^{\circ}C$ and $6.4atm$, to the surface of the water , where the temperature is $25^{\circ}C$ and pressure is $1.0atm$. Calculate the final volume (in mL) of the bubble if its initial volume was $2.1mL$.

Strategy : The amount of gas in the bubble remains constant $(n_1 = n_2)$ but there is a change in all the three quantities p, V, and T. This suggests that we use the combined gas law. We tabulate what is known and what is asked for , solve the combined gas law for the unknown quantity V_2 and substitute the known values.

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8. A $0.109g$ sample of a pure gaseous compound occupies $112mL$ at $100^\circ C$ and 750 torr. What is the molecular mass of the compound ?

Strategy : We first use the ideal gas law , $pV = nRT$, to find the number of moles of the gas . Then knowing the mass of that number of moles of the gas , we calculate the molar mass which is numerically equal to the molecular mass . Alternatively , we use Eq.(5.21) directly to get the molar mass.

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9. Calculate the density of ammonia (NH_3) in grams per liter $\left(gL^{-1}\right)$ at $752mmHg$ and $55^{\circ}C$.

Strategy : convert the pressure to atmosphere and temperature to Kelvin . Then use Eq.(5.22) to calculate the density of ammonia gas.

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10. A neon (Ne) -dioxygen (O_2) mixture contains $160g$ neon and $96g$ dioxygen . If the pressure of the mixture of gases in the container is 30 bar, calculate the partial pressure of neon and dioxygen in the mixture.

Strategy : Calculate the number of moles of each component to get their mole fractions. Then use Eq.(5.24) to determine the partial pressure of any component and substract it from the total pressure to find the partial pressure of the component .

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11. Dioxygen gas can be prepared by heating potassium chlorate $(KClO_3)$ with magnese dioxide (MnO_2) as a catalyst:

$2KClO_3(S) \xrightarrow{\Delta} 2KCl(s) + 3O_2(g)$

The gas is colleted over water. If $156mL$ of gas is collted at $20^\circ C$ and $769mmHg$, what is the mass of dioxygen collected ?

Aqueous tension at $20^\circ C$ is $17mmHg$.

Strategy : The gaseous sample collected over water is dioxygen mixed with water vapour. To get mass of O_2, first find its partial pressure in

the mixture using Dalton's law (step 1). Then calculate the moles of O_2 from the ideal gas law (step 2). Finally, obtain the mass of O_2 from its moles (step 3).

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Follow Up Test 1

1. Which of the following interactions is not a part of the van der Walls forces?

A. Dipole-dipole forces

B. Dipole-induced dipole forces

C. Dispersion forces

D. Ion-dipole forces

Answer: D

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2. Intermolecular forces are

A. forces of attraction and repulsion between atoms or molecules

B. electrostatic forces between two oppositely charged ions

C. forces that hold the atoms of a molecular together

D. both (2) and (3)

Answer: A

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3. Hydrogen bonding is a particularly strong type of ..... interaction

A. dipole -induced dipole

B. dipole-dipole

C. ion-dipole

D. instantaneous dipole-induced dipole

Answer: B

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4. The approximate energy $\left(kJmol^{-1}\right)$ of hydrogen bonding is

A. $100 \rightarrow 1000$

B. $100 \rightarrow 50$

C. $0.1 \rightarrow 10$

D. $10 \rightarrow 40$

Answer: D

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5. Which of the following pairs exhibit only dispersion forces as the only intermolecular forces ?

A. HBr and H_2S

B. NH_3 and C_6H_6

C. Cl_2 and CBr_4

D. I_2 and NO_3^-

Answer: C

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6. Which of the following cannot form hydrogen bonds with water?

A. Ch_3OCH_3

B. Na^+

C. F^-

D. $HCOOH$

Answer: B

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7. Which of the following species are capable of hydrogen bonding among themselves?

A. H_2S

B. C_6H_6

C. CH_3OH

D. CH_4

Answer: C

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8. Which of the following elements cannot participate in hydrogen bond formation?

A. C

B. O

C. N

D. F

Answer: A

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9. Dispersion forces are weak attractive forces are important only over extremely short distances because they vary as

A. $1/d^6$

B. $1/d^4$

C. $1/d^7$

D. $1/d^5$

Answer: C

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10. ..... Between amino acid submits is very important in establishing the three-dimensional structure of proteins.

A. Dispersion forces

B. Dipole-induced dipole forces

C. Dipole-dipole forces

D. Hydrogen bonding

Answer: D

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Follow Up Test 2

1. Which of the following elements is a monoatomic gas ?

A. Chloride

B. Radom

C. Oxygen

D. Hydrogen

Answer: B

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2. Which of the following substances do not exist as a gas at $25^{\circ}C$ and $1atm$?

A. NH_3

B. HCl

C. $NaCl$

D. CH_4

Answer: C

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3. Which of the following gases is a deadly poison ?

A. O_2

B. H_2S

C. SO_2

D. HCN

Answer: D

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4. Which of the following gases is chemically inert?

A. Argon

B. Ozone

C. Hydrogen bromide

D. Nitric oxide

Answer: A

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5. Which of the following is a colorless gas ?

A. NO_2

B. F_2

C. HBr

D. Cl_2

Answer: C

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6. Which of the following is a vapor?

A. H_2O

B. HF

C. HCl

D. HI

Answer: A

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7. The lowermost layer of the atmosphere is called

A. stratosphere

B. troposphere

C. mesophere

D. thermosphere

Answer: B

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8. How many elements are found as gases under normal conditions $(1atm \text{ and } 25^{\circ}C)$?

A. 21

B. 15

C. 11

D. 7

Answer: C

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9. Which of the following is not physical characteristic of gases ?

A. Densities of gases can be increases by applying increased pressure.

B. Pressure must be xerted to confine gases.

C. Different gases in a mixture do not separate on standing .

D. A sample of a gas contains more molecules when hot than it contains when cold at the same pressure.

Answer: D

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10. The pressure of a gas can be expressed in many different units. The SI unit of pressure is

A. pascal

B. torr

C. bar

D. atm

Answer: A

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11. At sea leval, at a latitude of 45° , the average atmospheric pressure supports a column of mercury ..... mm high in a single

mercury barometter when the mercury is at $0^{\circ}C$.

A. 700

B. 760

C. 800

D. 786

Answer: B

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12. What is the pressure in atmosphers if the barometer reading is $688mmHg$?

A. $0.905atm$

B. $0.986atm$

C. $1atm$

D. $0.876atm$

Answer: A

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13. The atmospheric pressure on a certain day is $732mmHg$. What is the pressure in kPa?

A. $60kPa$

B. $80.6kPa$

C. $77.8kPa$

D. $97.6kPa$

Answer: D

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14. Which of the temperature scales has merged as a result of the study on gases?

A. Centigrade scale

B. Fahrenheit scale

C. Kelvin scale

D. Celsius scale

Answer: C

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Follow Up Test 3

1. On the basis of his experiments, Robert Boyle reached the conclusion that at constant temperature, the pressure of a fixed amount(number of moles,n) of gas varies.....

A. directly

B. inversely

C. abruptly

D. smoothy

Answer: B

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2. Mathematically, Boyle's law can be written as

(constant n, T)

(i) $p \propto \frac{1}{V}$, (ii) $V \propto \frac{1}{p}$

(iii) $p = cons\tan t / V$,(iv) $pV = Cons\tan t$

A. $(i), (iii), (iv)$

B. $(ii), (iii), (iv)$

C. $(i), (ii), (iii), (iv)$

D. $(iii), (iv)$

Answer: C

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3. Boyle showed that for a given sample of gas at a constant temperature, the product of pressure and volume ,$p \times V$, was always the

A. even number

B. odd number

C. whole number

D. same number

Answer: D

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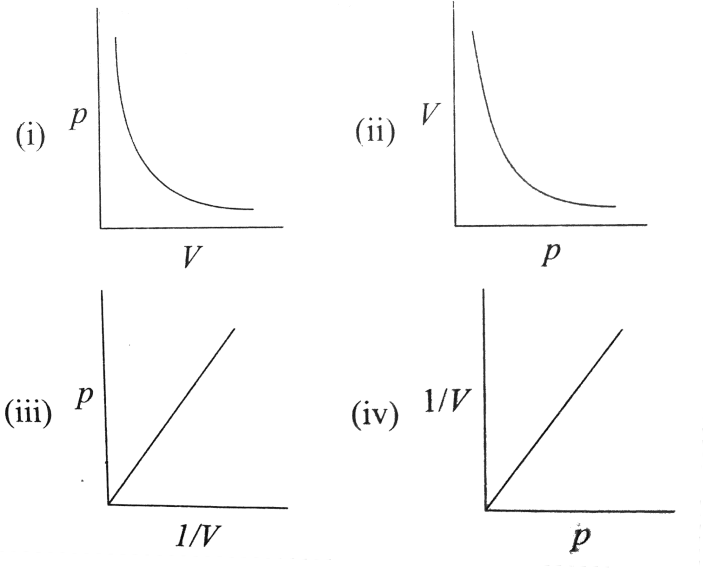
4. Which of the following graphs represents Boyle's law correctly?



(i)

A. $(i), (ii), (iii), (iv)$

B. $(i), (iii)$

C. $(ii), (iv)$

D. $(ii), (iii)$

Answer: A

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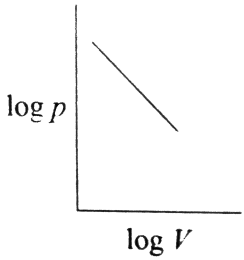
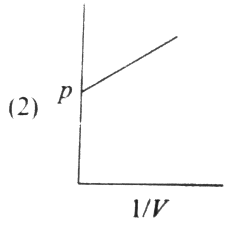
5. Which of the following plots does not represent Boyle's law?

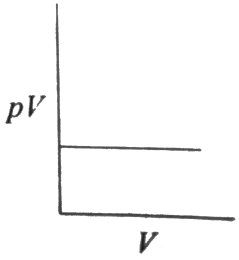
A.

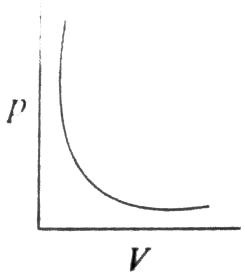


B.



C.



D. 

Answer: B

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6. In Boyle's law calculations, the pressure of the gas or applied pressure should be expressed in

(i) pascal ,(ii) atmosphere

(iii) bar ,(iv) torr

A. $(i), (ii), (iii)$

B. $(ii), (iii), (iv)$

C. $(i), (ii), (iii), (iv)$

D. $(i), (ii)$

Answer: C

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7. A sample of gas at room temperature is placed in an evacuated bulb of volume $0.51L$ and is found to exert a pressure of $24kPa$.

This bulb is connected to another evacuated bulb whose volume is $0.63L$, and the gas is allowed to fill both bulbs. What is the new pressure of the gas at room temperature ?

A. $9kPa$

B. $11kPa$

C. $7kPa$

D. $5kPa$

Answer: B

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Follow Up Test 4

1. For each degree rise in temperature , the volume of a gas increases by ..... Of the original volume of the gas at $0^{\circ}C$.

A. 273.15

B. $1/273.15$

C. $(273.15)^{2}$

D. $(1/273.15)^{2}$

Answer: B

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2. The volume of an ideal gas becomes zero at

A. $0^\circ C$

B. $273^\circ C$

C. $-273.15^\circ C$

D. $-273K$

Answer: C

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3. Theoretically , the lowest attainable temperature is

A. $0K$

B. $0^\circ C$

C. $0^\circ F$

D. none of these

Answer: A

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4. The volume of a gas is directly proportional to the temperature (constant n, p), if the temperature is expressed on the

(i) thermodynamic scale ,(ii) Kelvin scale

(iii) absolute scale , (iv) Celsius scale

A. $(i), (ii), (iii), (iv)$

B. $(ii), (ii), (iii)$

C. $(ii), (iii)$

D. $(i), (ii)$

Answer: B

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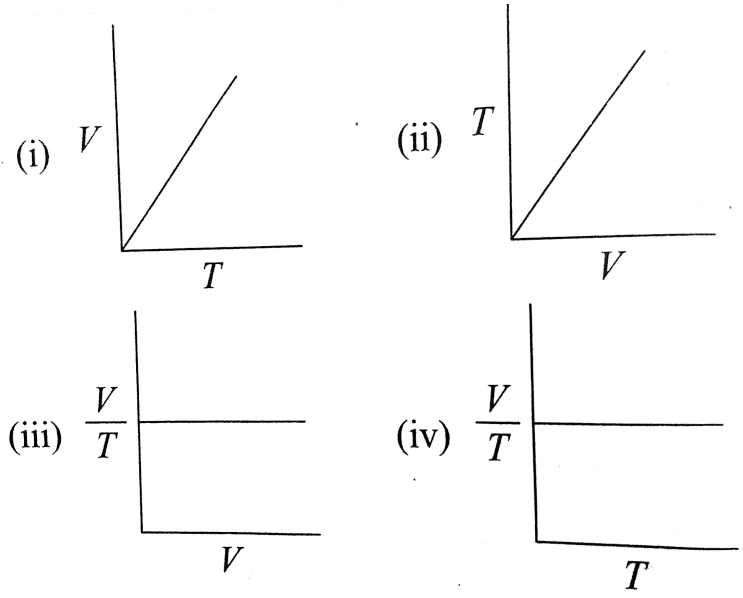
5. which of the following graphs represents Charles' law correctly ?



A. $(i), (iii)$

B. $(ii), (iv)$

C. $(i), (ii), (iii), (iv)$

D. $(iii), (iv)$

Answer: C

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6. Which of the following expressions represents Charles' law?

A. $V_t = V_0(1 + \alpha T)$

B. $V_t = V_0(1 + \alpha / T)$

C. $V_0 = V_t(1 + \alpha / t)$

D. $V_t = V_0(1 + \alpha t)$

Answer: D

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Follow Up Test 5

1. Gay-Lussac's law (or Amonton's law) states that at constant volume, the pressure of a fixed amount of a gas changes by ..... of its pressure at $0^\circ C$ for every 1° change in temperature.

A. $1/273$

B. $1/373$

C. $1/173$

D. $1/573$

Answer: A

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2. At the same temperature and pressure , equal volumes of different gases contain the same number of

A. electrons

B. protons

C. molecules

D. nuclei

Answer: C

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3. According to Avogadro,s law, $V = k_4 T$. The value of k_4 (proportionality constant) depends upon

(i) temperature

(ii) pressure

(iii) volume

(iv) nature of gas

A. $(i), (ii), (iii)$

B. $(ii), (iii), (iv)$

C. $(i), (ii)$

D. $(i), (ii), (iv)$

Answer: C

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4. Avogadro's law explains

A. law of conservation of mass

B. law of constant composition

C. law of multiple proportions

D. law of combining volumes

Answer: D

5. We can reexpress Avogadro's law as follows : ..... at a given temperature and pressure is a specific constant independent of the nature of the gas.

A. gas volume

B. molar gas volume

C. normal gas volume

D. molar gas volume

Answer: B

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6. The volume occupied by a mole of gas (molar volume,V_m) at STP is called the standard molar volume of an ideal gas is taken

to be ..... liters per mole at $0^{\circ}C$ and 1^{-} pressure.

A. 22.7

B. 22.4

C. 24.7

D. 21.3

Answer: A

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7. According to Avogadro's law , the volume percentages are equal to

A. mass percentages

B. number percentages

C. mole percentages

D. none of these

Answer: C

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8. What should be the number of moles of H_2 in $0.224L$ of $H_2(g)$ at $STP(273K, 1atm)$? Assume the gas to behave ideally.

A. 0.001

B. 0.1

C. 1.0

D. 0.01

Answer: D

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Follow Up Test 6

1. Equation of state of an ideal gas is

A. $pV = RT/n$

B. $pV = nRT$

C. $pn = VRT$

D. $pT = nRV$

Answer: B

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2. The universal gas constant (also called molar gas constant) R is equivalent to

A. work done per mole

B. work done per degree

C. work done per degree

D. work done

Answer: C

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3. Which of the following is the correct value of R in SI units ?

A. $0.083\bar{d}m^3K^-mol^{-1}$

B. $1.98calK^{-1}mol^{-1}$

C. $8.314 \times 10^7 ergK^{-1}mol^{-1}$

D. $8.314JK^{-1}mol^{-1}$

Answer: D

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4. The volume occupied by $7.40 g of CO_2$ (at STP) is

A. $3.8L$

B. $4.5L$

C. $5.6L$

D. $2.9L$

Answer: A

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5. At a given temperature, the density of an ideal gas is proportional to

A. p^2

B. p

C. $\sqrt{p}$

D. $1/p$

Answer: B

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6. At $0^{\circ}C$, the density of a gaseous oxide at 2 bar is the same as that of dinitrogen at 5 bar. The molar mass of the oxide is

A. $60gmol^{-1}$

B. $50gmol^{-1}$

C. $70gmol^{-1}$

D. $30gmol^{-1}$

Answer: C

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7. The presence of $1g$ of an ideal gas A at $27^\circ Cis2^{-}$. When $2g$ of another ideal gas B is added to the same flask at the same temperature, the pressure becomes 3^{-}. The relationship between their molar masses is

A. $M_A = \frac{1}{4}M_B$

B. $M_A = M_B$

C. $M_A = \frac{1}{2}M_B$

D. $M_A = 4M_B$

Answer: A

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8. Density of a gas is found to be $5.46/dm^3$ at $27^\circ C$ at 2 bar pressure What will be its density at STP ? .

A. $6gdm^{-3}$

B. $4gdm^{-3}$

C. $5gdm^{-3}$

D. $3gdm^{-3}$

Answer: D

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9. $2.9g$ of a gas at $95^\circ C$ occupied the same volume as $0.184g$ of hydrogen at $17^\circ C$ at same pressure What is the molar mass of the gas ? .

A. $40gmol^{-1}$

B. $50gmol^{-1}$

C. $60gmol^{-1}$

D. $30gmol^{-1}$

Answer: A

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10. A mixture of hydrogen and oxygen at 1 bar pressure contains 20% of hydrogen by weight. Calculate the partial pressure of hydrogen.

A. 1.0^{-}

B. 0.2^{-}

C. 0.8^{-}

D. 0.5^{-}

Answer: C

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11. In the mixture of nonreacting ideal gases, the partial pressure of gas, mole fraction of gas, and total pressure of mixture are related as

A. $p_{gas} = \frac{ptotal}{\chi_{gas}}$

B. $p_{gas} = \chi_{gas} p_{total}$

C. $p_{gas} = p_{total} \chi_{gas}^2$

D. $p_{gas} = \dfrac{\chi_{gas}}{p_{total}}$

Answer: B

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12. The vapor density of a gas depends upon the

A. total number of electrons in the molecules

B. total number of neutrons in the molecules

C. total number of molecules

D. molecular mass of the gas

Answer: D

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13. Dalton's law of partial pressure is not applicable to a mixture of ..... at room temperature.

A. Xe and O_2

B. NH_3 and Cl_2 (in excess)

C. SO_2 and O_2

D. CO_2 and CO

Answer: B

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Follow Up Test 7

1. Which of the following is not a correct postulate of the kinetic molecular theory of gases ?

A. Molecules of gases remain in continuous motion.

B. while moving, they collide with each other and with the walls of the container.

C. Collisions of gas molecules are inelastic.

D. Speeds and energies of the molecules of the gas at any instant are not the same.

Answer: C

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2. The average speed of gas molecules is equal to

A. $\left(\frac{8RT}{\pi M}\right)^{1/2}$

B. $\left(\frac{3RT}{M}\right)^{1/2}$

C. $\left(\frac{2RT}{M}\right)^{1/2}$

D. $\left(\frac{RT}{M}\right)^{1/2}$

Answer: A

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3. The distribution of speeds of molecules of a gas depends on

(i) temperature , (ii) volume

(iii) pressure , (iv) molecular mass

A. $(i), (ii), (iii)$

B. $(i), (iv)$

C. $(i), (ii), (iii), (iv)$

D. $(i), (iii)$

Answer: B

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4. Three gases CO_2, O_2 , and Cl_2 are at the same temperature. Which of the following

relations for the average translational kinetic energy per mole (E_A) is true?

A. $E_K(CO_2) > E_K(O_2) < E_K(Cl_2)$

B. $E_K(CO_2) > E_K(O_2) > E_K(Cl_2)$

C. $E_K(CO_2) < E_K(O_2) < E_K(Cl_2)$

D. $E_K(CO_2) = E_K(O_2) = E_K(Cl_2)$

Answer: D

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5. According to the kinetic theory of gases, the pressure exerted by the gas is directly proportional to the ..... Of the molecules.

A. root mean square speed

B. mean square speed

C. mean speed

D. most probable speed

Answer: B

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6. Which of the following relationships is valid for the root mean square speed (u_{rms}), average speed (u_{av}), and the most probable speed (u_{mp})?

A. $u_{mp} > u_{av} > u_{rms}$

B. $u_{av} > u_{mp} > u_{rms}$

C. $u_{rms} > u_{av} > u_{mp}$

D. $u_{rms} > u_{mp} > u_{av}$

Answer: C

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7. The root mean square velocity of an ideal gas to constant pressure varies with density (d) as

A. $1/\sqrt{d}$

B. $\sqrt{d}$

C. d

D. d^2

Answer: A

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8. At constant volume, for a fixed number of moles of a gas, the pressure of the gas increases with the rise in temperature due to

A. decrease in mean free path

B. increase in molecular attraction

C. increase in rate of collisions amongst molecules

D. increase in average molecular speed

Answer: D

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9. The ratio between the three speeds, $u_{mp} : u_{av} : u_{rms}$ is given as

A. $1 : 1.224 : 1.128$

B. $1 : 1.128 : 1.224$

C. $1.224 : 1.128 : 1$

D. $1.128 : 1.224 : 1$

Answer: B

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10. Which of the following is used in deriving the kinetic gas equation ?

A. most probable speed

B. Average speed

C. Root mean square speed

D. Mean square speed

Answer: C

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11. Which of the following relationships is valid

?

where K is a proportionality constant.

A. $\frac{pV}{T} = \frac{2}{3}K$

B. $\frac{pV}{T} = \frac{3}{2}K$

C. $\frac{pV}{T} = 2K$

D. $\frac{pV}{T} = 3K$

Answer: A

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12. For an ideal gas, pressure (p) and interal energy (E) per unit volume are related as

A. $p = \frac{3}{2}E$

B. $p = \frac{2}{3}E$

C. $p = \frac{1}{2}E$

D. $p = \frac{1}{3}E$

Answer: B

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13. The maximum in the curves describing the Maxwell-Boltzmann distribution of speeds corresponds to

A. root mean square speed

B. mean square speed

C. average speed

D. most probable speed

Answer: D

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Follow Up Test 8

1. The plot of pV versus p is a straight line for ..... At $273K$.

(i) H_2

(ii) CO

(iii) CH_4

(iv) He

A. $(i), (ii), (iii), (iv)$

B. $(i), (iv)$

C. $(ii), (iii)$

D. $(ii), (iii), (iv)$

Answer: B

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2. Real gases do not follow the ideal gas equation perfectly under all conditions . They show deviation from the ideal behavior when

A. pressure is high and temperature is low

B. pressure is low and temperature is high

C. both pressure and temperature are high

D. both pressure and temperature are low

Answer: A

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3. Which of the following two assumptions of the kinetic molecular theory do not hold good for real gases ?

(i) There is no force of attraction between the molecules of a gas.

(ii) The particles of a gas are always in constant and random motion in all possible directions in straight lines.

(iii) At any particulat time, different particle sin the gas have different speeds and hence, different kinetic energies.

(iv) The volume of the molecules of a gas is negligibly small in comparision to the space occupied by the gas.

A. $(i), (ii), (iii)$

B. $(ii), (iii)$

C. $(i), (iv)$

D. $(i), (ii), (iii), (iv)$

Answer: C

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4. Which of the following represents the van der Walls equation for n moles of a real gas ?

A. $\left(p + \frac{na}{V^2}\right)(V - nb) = nRt$

B. $\left(p+\frac{a}{nV^2}\right)(V-nb)=nRt$

C. $\left(p+\frac{a}{V^2}\right)(V-b)=nRt$

D. $\left(p+\frac{n^2a}{V^2}\right)(V-b)=nRt$

Answer: D

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5. The units of the van der Waals constant a are

A. $molL^{-1}$

B. $atmL^{-2}mol^{2}$

C. $atmL^{2}mol^{-2}$

D. $Lmol^{-1}$

Answer: C

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6. The value of van der Waals constant a is the maximum for

A. chlorine

B. nitogen

C. Hydrogen bromide

D. helium

Answer: A

Watch Video Solution

7. The van der Waals constant b is realted to the volume occupied by the molecules of a gas. It is known as the excluded volume by the molecules of a gas. It is known as the excluded

volume or noncompressible volume of the gas. It is equal to ..... times the actual volume of one mole of gas molecules.

A. three

B. four

C. five

D. two

Answer: B

Watch Video Solution

8. At high pressure , the van der Waals equation is reduced to

A. $pV = nRT$

B. $\left(p + \frac{n^2 a}{V^2}\right)V = nRt$

C. $p + \frac{n^2 a}{V^2} = nRt$

D. $p(V - nb) = nRt$

Answer: D

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9. Which of the following equations represents the compressibility factor?

A. $Z = \frac{nRT}{pV}$

B. $Z = \frac{pV}{nRT}$

C. $Z = \frac{pV}{nR}$

D. $Z = \frac{pV}{nT}$

Answer: B

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10. The compressibility factor for an ideal gas is

A. $\propto$

B. 1.5

C. 1.0

D. 2.0

Answer: C

Watch Video Solution

11. At very low pressures , all real gases $(N_2, H_2, O_2, etc.)$ have

A. $Z > 1$

B. $Z < 1$

C. $Z = 1$

D. $Z \approx 1$

Answer: D

Watch Video Solution

12. Up to what pressure a gas will follow the ideal gas law depends upon the nature of the gas and its temperature . The temperature at which a real gas obeys the ideal gas law over an appreciable range of pressure is called

A. Boyle's temperature

B. Charle 's temperature

C. Avogadro's temperature

D. Gay-Lussac's temperature

Answer: A

Watch Video Solution

13. The compressibility factor of gases is less than unity at STP. Therefore,

A. $V_m = 44.82L$

B. $V_m = 22.4L$

C. $V_m < 22.4L$

D. $V_m > 22.4L$

Answer: C

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14. Compressibility factor $(Z = pV_m / RT)$ of a real gas at low T and low p is usually less than one. It is due to the fact that in the van der Waals gas,

A. both the constants a and b are negligible

B. the constant a (i.e., molecular attraction) is not negligible whereas the constant b (i.e., molecular volume) is negligible

C. the constant a is negligible and the constant b is not negligible

D. both the constants a and b are not negligible

Answer: B

Watch Video Solution

Follow Up Test 9

1. Which of the following gases can be liquefied easily ?

A. NH_3

B. H_2

C. N_2

D. O_2

Answer: A

Watch Video Solution

2. Thilorier's mixture is a freezing mixture of

A. ice and salt

B. liquid helium and oxygen

C. solid carbon dioxide and ether

D. none of these

Answer: C

 Watch Video Solution

3. Which of the following were called permanent gases ?

(i) H_2 , (ii) O_2

(iii) N_2 , (iv) CH_4

A. $(i), (ii), (iii)$

B. $(i), (ii), (iii), (iv)$

C. $(ii), (iii), (iv)$

D. $(i), (ii)$

Answer: B

Watch Video Solution

Watch Video Solution

4. Which of the following defines the critical temperature of a substances gt

A. The temperature above which a substance can exist only as gas

B. The maximum temperature at which a gas can be liquefied

C. The temperature above which a liquid cannot exist

D. All of these

Answer: D

Watch Video Solution

5. The critical pressure for real gases is given by

A. $\frac{8a}{27Rb}$

B. $\frac{a}{27b^2}$

C. $\frac{2a}{Rb}$

D. $3b$

Answer: B

Watch Video Solution

6. Which of the following gases has the least value of critical temperature (T_c) and critical pressure (p_c) ?

A. He

B. H_2

C. N_2

D. CO_2

Answer: A

Watch Video Solution

7. A gas below its ..... is called a vapor.

A. Boyle's temperature

B. inversion temperature

C. criticial temperature

D. boiling temperature

Answer: C

Watch Video Solution

8. When helium gas (at room temperature) undergoes the Joule-Thomson expansion , heating of the gas is observed because

A. helium is an ideal gas

B. the inversion temperature of helium gas is very high

C. helium is a noble gas

D. the inversion temperature of helium gas is very low

Answer: D

Watch Video Solution

Follow Up Test 10

1. Which of the following is not true for liquids ?

A. They have no definite shape (assume shapes of containers).

B. They have definite volume (are only very slightly compressible).

C. They have high density .

D. They are not fluids.

Answer: D

Watch Video Solution

2. Which of the following is correct regarding the liquid state?

(i) A liquid can exist only between the boiling and melting point of a substance .

(ii) Liquids diffuse slowly through other liquids.

(iii) liquids consist of disordered clusters of particles that are quite close together, particles have random motion in three dimensions.

(iv) A liquid resembles a gas near the critical temperature and resembles a solid near the melting point of the substance.

A. $(i), (ii), (iii)$

B. $(i), (ii), (iii), (iv)$

C. $(i), (iii), (iv)$

D. $(ii), (iii)$

Answer: B

Watch Video Solution

3. At any given temperature , a certain number of molecules in a liquid posses sufficient kinetic energy to escape from the surface. This process is called

A. evaporation

B. vaporization

C. boiling

D. both (1) and (2)

Answer: D

Watch Video Solution

4. The rate of evaporation ..... As temperature increases.

A. increases

B. decreases

C. first increases , then decreases

D. does not change

Answer: A

Watch Video Solution

5. Evaporation results in a ..... temperature in the liquid.

A. higher

B. lower

C. no change

D. lower or higher

Answer: B

Watch Video Solution

6. As the concentration of molecules in the vapor phase increases, some molecules return to the liquid phase , a process called

A. solidfication

B. crystallization

C. diffusion

D. condensation

Answer: D

 Watch Video Solution

7. Which of the following statements is correct anout a volatile liquid at constant temperature in a closed container before equilibrium is reached ?

A. Rate of evaporation (R_E) increases with time while rate of condensation (R_C) decreases with time.

B. R_E decreases with time while while R_C increases with time.

C. R_E is constant while R_C increases with time.

D. R_E is constant of vapor while R_C decreases with time.

Answer: C

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8. The partial pressure of vapor molecules above the surface of a liquid at equilibrium at

a given temperature is the ..... of the liquid at that temperature.

A. equilibrium vapor pressure

B. saturated vapor pressure

C. vapor pressure

D. all of these

Answer: D

 Watch Video Solution

9. Vapor pressure of a liquid changes with ..... of the liquid.

A. volume

B. surface area

C. temperature

D. all of these

Answer: C

Watch Video Solution

10. Which of the following is the most volatile liquid?

A. Diethyl ethyl

B. Methyl alcohol

C. Benzene

D. Water

Answer: A

Watch Video Solution

11. The boiling point of a liquid is the temperature at which the vapor pressure of the liquid is equal to

A. 760 torr

B. external force

C. 750 torr

D. 700 torr

Answer: B

Watch Video Solution

12. Which of the following is correct regarding boiling and evaporation ?

(i) Both boiling and evaporation take place in closed as well as open containers.

Evaporation takes place only from the surface of liquid, while boiling involves the formation of bubbles below the surface.

(iii) Evaporation takes place at all temperatures , while boiling takes place only at one particular temperature.

(iv) Boiling point decreases if the external

pressure is low but evaporation increases if the external pressure is low

A. $(i), (ii), (iii)$

B. $(ii), (iii), (iv)$

C. $(i), (ii), (iii), (iv)$

D. $(i), (ii)$

Answer: C

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13. At the boiling point , bubbles form within the liquid because

A. the dissolved air is being expelled

B. the vapor pressure inside the bubbles just exceeds the external pressure.

C. the vapor pressure inside the bubbles is significantly greater than the external pressure.

D. the vapor pressure inside the bubbles is less than the external pressure.

Answer: B

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14. The quantitative relationship between the vapor pressure p of a liquid and the absolute temperature T is given by the Clausius - Clapeyron equation,

$$In_p = -\frac{\Delta_{vap}H}{RT} + C$$

where In is the natural logarithm , R is the gas constant $\left(8.314JK^{-1}mol^{-}\right)$, and C is a constant . The plot of

A. In_p against $1/T$ will be a straight line

B. In_p against T will be a straight line

C. In_p against $1/T$ will be a parbola

D. In_p against T will be a parabola

Answer: A

Watch Video Solution

15. At the critical temperature , the substance exists as a

A. liquid

B. gas

C. both (1) and (2)

D. fluid

Answer: D

Watch Video Solution

Follow Up Test 11

1. Which of the following phenomena are caused due to the characteristic property of liquids called surface tension ?

A. Small drops of mercury form spherical beads instead of spreading on the surface.

B. Particles of soil at the bottom of river remain separated but they stick

together when taken out.

C. A liquid rise (or fall) in a thin capillary as soon as the capillary touches the surface of the liquid.

D. All of these.

Answer: D

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2. Drops of liquid tend to assume spherical shapes because

A. a sphere has the least possible surface area

B. a sphere has only one orientation

C. a sphere is symmetrical in shape

D. a sphere is three-dimensional

Answer: A

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3. Dimensions of surface energy are

A. J

B. Jm^{-2}

C. Jm^{-1}

D. Jm

Answer: B

Watch Video Solution

4. Dimensions of surface tension are

A. kgs^{-1}

B. kgs

C. kgs^{-2}

D. kgs^{2}

Answer: C

Watch Video Solution

5. Sharp glass edges are ..... For making them smooth.

A. cooled

B. hammered

C. polished

D. heated

Answer: D

Watch Video Solution

6. Which of the following liquids has the maximum surface tension at a given temperature ?

A. Benzene

B. Methyl alcohol

C. Water

D. Diethyl ether

Answer: C

 Watch Video Solution

7. Surface tension of a liquid ..... as the temperature is raised.

A. decreases

B. increases

C. remains the same

D. is reduced to zero

Answer: A

 Watch Video Solution

8. A liquid is kept in a glass container. If the force of adhesion is greater than the force of cohension , then

A. the angle of contact will be acute

B. the shape of the meniscus will be concave

C. the liquid will wet the glass

D. all the above will happen

Answer: D

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Follow Up Test 12

1. A liquid distributed by stirring comes to rest after some time due to its property of

A. viscosity

B. surface tension

C. compressibility

D. volatility

Answer: A

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2. Flow of a liquid in which there is a regular gradation of velocity in passing from one layer to the next is called ..... Flow.

A. lateral

B. turbulent

C. laminar

D. steady

Answer: C

Watch Video Solution

3. The coefficient of viscosity η of a liquid can be defined from the equation

A. $F = \eta u \frac{dA}{dx}$

B. $F = \eta A \frac{du}{dx}$

C. $F = \eta A \frac{dx}{du}$

D. $F = \eta u \frac{dx}{dA}$

Answer: B

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4. The SI unit of viscosity coefficient is

A. Nsm^{-2}

B. Pas

C. $kgm^{-1}s^{-1}$

D. All of these

Answer: D

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5. In cgs system , the unit of coefficient of viscosity is poise(P). One poise is equivalent to

A. $10kgm^{-1}s^{-1}$

B. $1kgm^{-1}s^{-1}$

C. $10^{-1}kgm^{-1}s^{-1}$

D. $10^{2}kgm^{-1}$

Answer: C

Watch Video Solution

6. Which of the following has the highest viscosity ?

A. Glycerol

B. Mercury

C. Water

D. Blood

Answer: A

Watch Video Solution

7. Glass is a

A. solid

B. fluid

C. liquid

D. none of these

Answer: C

Watch Video Solution

8. The viscosity of liquids..... as the temperature rises.

A. increases

B. decreases

C. may increase or decrease

D. remains unchanged

Answer: B

 Watch Video Solution

Question Bank Level I

1. Helium is used in balloons in place of hydrogen because it is

A. lighter than hydrogen

B. incombustible

C. more abundant than hydrogen

D. radioactive

Answer: B

Watch Video Solution

2. The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is called

A. Boyle's temperature

B. reduced temperature

C. criticial temperature

D. inversion temperature

Answer: A

Watch Video Solution

3. The slope of the plot between pV and p at constant temperature is

A. negative

B. positive

C. $1/2$

D. zero

Answer: D

Watch Video Solution

4. Air at sea level is dense. This is a practical application of

A. Charle's law

B. Gay-Lussac's law

C. Boyle's law

D. Dalton's law

Answer: C

Watch Video Solution

5. A gas will approach ideal behaviour at

A. high temperature and high pressure

B. low temperature and low pressure

C. low temperature nad high pressure

D. high temperature and low pressure

Answer: D

 Watch Video Solution

Question Bank Level Ii

1. The ratio between the root mean square speed of H_2 at $50K$ and that of O_2 at $800K$ is

A. 2

B. 4

C. 1

D. $1/4$

Answer: C

Watch Video Solution

2. The term that is correct for the attractive forces present in a real gas in the van der Waals equation is

A. $-nb$

B. $-\frac{an^2}{V^2}$

C. $\frac{an^2}{V^2}$

D. nb

Answer: C

Watch Video Solution

3. Surface tension vanishes at

A. critical point

B. triple point

C. boiling point

D. condensation point

Answer: A

Watch Video Solution

4. The ratio of root mean square velocity of average velocity of a gas molecule at a particular temperture is

A. $1.086 : 2$

B. $1 : 1.086$

C. $2 : 1.086$

D. $1.086 : 1$

Answer: D

Watch Video Solution

5. In order to increase the volume of a gas by 10% , the pressure of the gas should be

A. decreased by 1%

B. decreased by 10%

C. increased by 10%

D. increased by 1%

Answer: B

Watch Video Solution

6. The density of a gas is $1.964 g 1 dm^{-3} at 273 K$ and $76 cm Hg$. The gas is

A. CH_4

B. CO_2

C. Xe

D. C_2H_6

Answer: B

Watch Video Solution

7. The ratio of the rate of diffusion of helium and methane under indentical conditions of pressure and temperature will be

A. 2

B. 1

C. 4

D. 0.5

Answer: A

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8. N_2 is found in a litre flask under $100kPa$ pressure and O_2 is found in another $3litre$ flask under $20KPa$ pressure. If the two flask are connected, the resultant pressure is

A. $365kPa$

B. $420kPa$

C. $265kPa$

D. $310kPa$

Answer: C

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9. Hydrogen diffuses six times faster than gas A. The molar mass of gas A is

A. 36

B. 72

C. 24

D. 6

Answer: B

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10. What is the kinetic energy of $1g$ of O_2 at $47^\circ C$?

A. $3.24 \times 10^2 J$

B. $2.24 \times 10^2 J$

C. $1.24 \times 10^2 J$

D. $1.24 \times 10^3 J$

Answer: C

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11. The ratio of most probable velocity to that of average velocity is

A. $\pi / 2$

B. $\sqrt{\pi} / 2$

C. $2 / \sqrt{\pi}$

D. $2 / \pi$

Answer: B

Watch Video Solution

12. As the temperature is raised from $20^\circ C$ to $40^\circ C$ the averge kinetic energy of neon atoms changes by a factor .

A. $\sqrt{313/293}$

B. $1/2$

C. $313/293$

D. 2

Answer: C

Watch Video Solution

13. The value of van der Waals constant a for the gases O_2, N_2, NH_3, and CH_4 are 1.360, 1.390, 4.170, and $2.253 L^2 atm mol^{-2}$, respectively. The gas which can most easily be liquefied is

A. CH_4

B. N_2

C. NH_3

D. O_2

Answer: C

Watch Video Solution

14. A helium atom is two times heavier than a hydrogen molecule. At $298K$, the average kinetic energy of a helium atom is

A. the same as that of a hydrogen molecule

B. four times that of a hydrogen molecule

C. half that of a hydrogen molecule

D. two time that of a hydrogen molecule

Answer: A

Watch Video Solution

15. At what temperature will the rms velocity of SO_2 be the same as that of $O_2 at 303K$?

A. $606K$

B. $403K$

C. $273K$

D. $303K$

Answer: A

Watch Video Solution

Question Bank Level Iii

1. Two glass bulbs A and B are connected by a very small tube having a stop cock. Bulb A has a volume of 100 cm^3 and contained the gas, while bulb B was empty. On opening th stop cock. The pressure fell down to 40%. The volume of the bulb B must be:

A. 200

B. 125

C. 66

D. 75

Answer: C

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2. Which one of the following statement is not true about the effect of an increase in temperature on the distribution of molecular speed of gas ? .

A. The area under the distribution curve remains the same as under the lower temperature.

B. The distribution becomes broader.

C. The most probable speed increases.

D. The fraction of the molecules with the most probable speed increases.

Answer: D

 Watch Video Solution

3. In van der Waals' equation of state of the gas law the constnat 'b' is a measure of .

A. intermolecular attraction

B. volume occupied by the molecules

C. intermolecular repulsion 0

D. intermolecular collisions per unit volume

Answer: B

 Watch Video Solution

4. The kinetic theory of gases presumes the collisions between the molecules to be perfectly elastic because

A. collisions will not split the molecules

B. the molecules are tiny

C. the molecules are rigid

D. the temperature remains constant irrespective of collisions

Answer: B

 Watch Video Solution

Question Bank Level Iv

1. Equal weights of methane and hydrogen are mixed in an empty container at $25^{\circ}C$. The fraction of the total pressure exerted by hydrogen is

A. $8/9$

B. $1/9$

C. $16/17$

D. $1/2$

Answer: A

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2. A quantity of 2 mol of NH_3 occupies 5L at $27^\circ C$. Calculate the pressure of the gas using the van der Waals equation if $a = 4.17\text{atm}\ \ L^2\ \ \text{mol}^{-2}$ and $b = 0.3711 L\text{mol}^{-1}$.

A. $9.2atm$

B. $9.74atm$

C. $10.33atm$

D. $9.33atm$

Answer: D

Watch Video Solution

3. For a monatomic gas, kinetic energy $= E$.

The relation with rms velocity is

A. $u = \left(\frac{2E}{m}\right)^{1/2}$

B. $u = \left(\frac{E}{2m}\right)^{1/2}$

C. $u = \left(\frac{3E}{2m}\right)^{1/2}$

D. $u = \left(\frac{E}{3m}\right)^{1/2}$

Answer: A

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4. The relationship between the coefficient of viscosity of a liquid and temperature can be expressed as

A. $\eta = Ae^{RT/E}$

B. $\eta = Ae^{E/RT}$

C. $\eta = Ae^{ERT}$

D. $\eta = ET/R$

Answer: B

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5. Positive deviation from ideal behaviour takes place because of

A. finite size of atoms and $pV/nRT < 1$

B. molecular interaction between atoms and $pV/nRT > 1$

C. finite size of atoms and $pV/nRT > 1$

D. molecular interaction between atoms and $pV/nRT < 1$

Answer: C

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6. If the rms speed of gas molecules is $xcms^{-1}$ at a pressure of p atmospheres, then the rms speed at a pressure of $2p$ atmospheres and constant temperature will be

A. $x/4$

B. $4x$

C. $2x$

D. x

Answer: D

Watch Video Solution

Archives

1. Dipole-induced dipole interaction are present in which of the following pairs

A. Cl_2 and CCl_4

B. HCl and He atoms

C. SiF_4 and He atoms

D. H_2O atoms

Answer: B

Watch Video Solution

2. A liquid is in equilibrium with its vapour at its boiling point. On average, the molecules in the two phases have equal

A. total energy

B. potential energy

C. intermolecular forces

D. kinetic energy

Answer: D

Watch Video Solution

3. What is the dominant intermolecular forces or bond that must be overcome in converting liquid CH_3OH to gas ?

A. Dipole-dipole interaction

B. Covalent bond

C. London forces

D. Hydrogen bonding

Answer: D

Watch Video Solution

4. A $4.0dm^3$ flask containing N_2at4 bar was connected to a $6.0dm^3$ flask containing helium at 6 bar , and the gases were allowed to mix isothermally. The total pressure of the resulting mixture will be

A. $10.0bar$

B. $5.2bar$

C. $1.6bar$

D. $5.0bar$

Answer: B

Watch Video Solution

5. If a gas expands at constant temperature, it indicates that

A. kinetic enrgy of the molecules decreases

B. pressure of the gas increases

C. kinetic energy of the molecules remains the same

D. number of molecules of the gas increase

Answer: C

Watch Video Solution

6. Graph between p and V at constant temperature is

A. straight

B. curved increasing

C. straight line with slope

D. none of these

Answer: D

Watch Video Solution

7. If the ration of the masses of SO_3 and O_2 gases confined in a vessel is $1:1$, then the ratio of their partial pressure would be

A. $5:2$

B. $1:2$

C. $2:5$

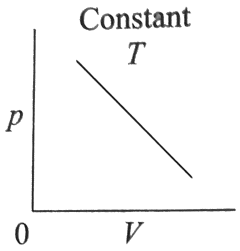
D. $2:1$

Answer: C

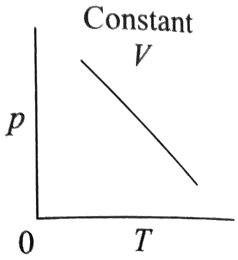
Watch Video Solution

8. Which of the following diagrams correctly decribes the behavior of a fixed mass of an ideal gas ? (T is measured in K)

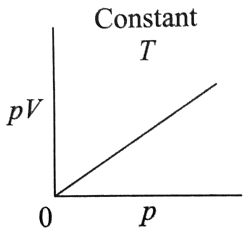
A.



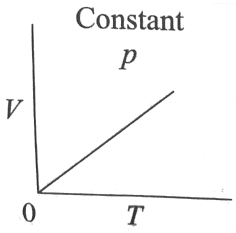
B.



C.



D.



Answer:

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9. A $4:1$ mixture of helium and methane is confined in a vessel at 10 bar pressure . Due to a hole in the vessel, the gas mixture effusing out initially is

A. $8:1$

B. $8:3$

C. $4:1$

D. $1:1$

Answer: A

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10. A gas is liquefied

A. above critical temperature and below critical pressure

B. below critical temperature and above critical pressure

C. below critical temperature and pressure

D. above critical temperature and pressure

Answer: B

Watch Video Solution

11. Steam distillation is based on

A. Boyle's law

B. Charle's law

C. Dalton's law of partial pressures

D. Avogadro's law

Answer: C

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12. Dominance of strong repulsive forces among the molecules of the gas ($Z =$ compressibility factor)

A. depends on Z and is indicated by $Z = 1$

B. depends on Z and is indicated by $Z > 1$

C. depends on Z and is indicated by $Z < 1$

D. is independent on Z

Answer: B

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13. If the v_{rms} is $30R^{1/2}$ at $27^{\circ}C$ then calculate the molar mass of gas in kilogram.

A. 1

B. 2

C. 4

D. 0.001

Answer: A

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14. Equation for Boyle's law is

A. $\frac{dp}{p} = -\frac{dV}{V}$

B. $\frac{dp}{p} = +\frac{dV}{V}$

C. $\frac{d^2p}{p} = -\frac{dV}{dT}$

D. $\frac{d^2p}{p} = +\frac{d^2V}{dT}$

Answer: A

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15. The rate of diffusion of methane is twice that of X . The molecular mass of X is

A. 16

B. 32

C. 80

D. 64

Answer: D

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16. The factor responsible for lower mercury level in a capillary tube is

A. high density

B. surface tension

C. liquid state

D. viscosity resistance

Answer: B

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17. The liquid crystal method is applicable to locate a vein in the body because

A. blood pressure of vein is high enough

B. temperature of vein is slightly lower than that of the skin

C. the electrical field produced is sufficient to produce the polarity

D. geometry of hemoglobin molecule is like a liquid crystal

Answer: B

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18. A abd B are ideal gases. The molecular weights of A and B are if the ratio of $1:4$. The pressure of a gas mixture containing equal weights of A and B is p atmospheres. What is the partial pressure (in atm) of B in the mixture ?

A. $p/5$

B. $p/2$

C. $p/2.5$

D. $3p/4$

Answer: A

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19. Triple point of water is

A. $273K$

B. $373K$

C. $203K$

D. $193K$

Answer: A

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20. Containers A and B have same, gases. Pressure, volume and temperature of A are all twice that of B, then the ratio of number of molecules of A and B are

A. $1:2$

B. $2:1$

C. $1:4$

D. $4:1$

Answer: B

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21. The volume occupied by 4.4 g of CO_2 at STP is

A. $2.4L$

B. $2.24L$

C. $44L$

D. $22.4L$

Answer: B

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22. Molar volume of CO_2 is maximum at

A. NTP

B. $0^\circ C$ and $2.0atm$

C. $127^\circ C$ and $1atm$

D. $273^\circ C$ and $2.0atm$

Answer: C

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23. The rate of diffusion of a gas is proportional to

A. $\frac{p}{\sqrt{d}}$

B. $\sqrt{\frac{p}{d}}$

C. $\frac{p}{d}$

D. $\frac{\sqrt{p}}{d}$

Answer: B

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24. The kinetic energy of $4mol$ of nitrogen gas at $127^{\circ}C$ is ..... $cal\left(R = 2calmol^{-1}K^{-1}\right)$

A. 4400

B. 3200

C. 4800

D. 1524

Answer: C

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25. Absolute temperature is the temperature at which

A. all molecular motion ceases

B. volume becomes zero

C. mass becomes zero

D. none of these

Answer: A

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26. The process of converting vapor into liquid is known as

A. condensation

B. vaporization

C. freezing

D. melting

Answer: A

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27. $0.5mol$ of H_2, SO_2, and CH_4 is kept in a container. A hole was made in the container. After $3hours$, the order of partial pressure in the container will be

A. $p_{SO_2} > p_{CH_4} > pH_2$

B. $p_{H_2} > p_{SO_2} > p_{CH_4}$

C. $p_{CH_4 > P_SO_2 > P_{H_2}}$

D. $p_{H_2} > p_{CH_4} > p_{SO_2}$

Answer: A

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28. A bottle of dry ammonia and a bottle of dry hydrogen chloride connected through a long tube are opened simultaneously at both ends.

The white ammonium chloride ring first formed will be

A. at the center of the tube

B. near the hydrogen chloride bottle

C. near the ammonia bottle

D. throughout the length of the tube

Answer: B

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29. The kinetic energy of two moles of $N_2 at 27^\circ C is \left(R = 8.314 JK^{-1} mol^{-1}\right)$

A. $5491.6J$

B. $6491.6J$

C. $7482.6J$

D. $8880.4J$

Answer: C

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30. Which is distilled first ?

A. Liquid CO_2

B. Liquid N_2

C. Liquid O_2

D. Liquid H_2

Answer: D

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31. The rates of diffusion of gases A and B of molecular mass 36 and 64 are in the ratio

A. $9:16$

B. $4:3$

C. $3:4$

D. $16:9$

Answer: B

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32. When the temperature is raise, the viscosity of liquid decreases, this is because,

A. decreased volume of liquid

B. increase in temperature increases the average kinetic energy of molecules which overcomes the attractive force between them

C. decreased covalent and hydrogen bond forces

D. increased attraction between the molecules

Answer: B

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33. van der Waal's equation reduces itself to the ideal gas equation at

A. high pressure and low temperature

B. low pressure and low temperature

C. low pressure and high temperature

D. high pressure alone

Answer: C

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34. If the four tubes of a car are filled to the same pressure with N_2, O_2, H_2, and helium separately , then which one will be filled first ?

A. N_2

B. O_2

C. H_2

D. He

Answer: C

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35. If the average velocity of N_2 molecules is $0.3ms^{-1}at27^{\circ}C$, then the velocity of $0.6ms^{-1}$ will take place at

A. $273K$

B. $927K$

C. $1000K$

D. $1200K$

Answer: D

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36. The volume of $2.8g$ of carbon monoxide at $27^\circ C$ and $0.821atm$ pressure $\left(R = 0.821\text{atm}K^{-1}\text{mol}^{-1}\right)$

A. $0.3L$

B. $1.5L$

C. $3L$

D. $30L$

Answer: C

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37. The rms velocity of CO_2 at temperature T(in Kelvin) is x cm s^{-1}. At what temperature

(in Kelvin) would the rms velocity of nitrous oxide be $4xcms^{-1}$?

A. $16T$

B. $2T$

C. $4T$

D. $32T$

Answer: A

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38. The temperature below which a gas does not obey ideal gas laws is

A. inversion temperature

B. critical temperature

C. neutral temperature

D. Curie point

Answer: B

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39. Which of the following has maximum root mean square velocity at the same temperature ?

A. SO_2

B. CO_2

C. O_2

D. H_2

Answer: D

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40. Equal volumes of gases at the same temperature and pressure contain equal number of particles. This statement is a direct consequence of

A. perfect gas law

B. partial law of volumes

C. Charle's law

D. ideal gas equation

Answer: D

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41. Use of hot air ballons in sports and meteorological observations in an application of

A. Boyle's law

B. Newton's law

C. Kelvin's law

D. Charle's law

Answer:

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