CHEMISTRY

BOOKS - SURA CHEMISTRY (TAMIL ENGLISH)

GASEOUS STATE

Evaluation Choose The Best Answer

1. Gases deviate from behavior at high pressure. Which of the following statement(s) is correct for non-ideality?

A. at hgih pressure the collision between the gas molecule become enormous

B. at high pressure the gas molecules move only in one direction

C. at high pressure, the volume of gas become insignificant

D. at high pressure the intermolecular interactions become significant

Answer: D

2. Rate of diffusion of a gas is

    A. directly proportional to its density

    B. directly proportional to molecular weight

    C. directly proportional to its square root of

       its molecular weight

    D. inversely proportional to the square root of

       its molecular weight

Answer: D

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3. Which of the following is the correct expression for the equation of state of van der Waals gas?

A. $\left(P + \dfrac{a}{n^2 V^2} \right)(V - nb) = nRT$

B. $\left(P + \dfrac{na}{n^2 V^2} \right)(V - nb) = nRT$

C. $\left(P + \dfrac{na^2}{V^2} \right)(V - nb) = nRT$

D. $\left(P + \dfrac{n^a a^2}{V^2} \right)(V - nb) = nRT$

Answer: C

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4. When an iden gas undergoes unrestrained expansion, no cooling occurs because the molecules

A. are above inversion temperature

B. exert no attractive forces on each other

C. do work equal to the loss in kinetic energy

D. collide without loss of energy

Answer: B

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5. Equal weights of methane and oxygen are mixed in an empty container at 298K. The fraction of total pressure exerted by oxygen is

A. $\dfrac{1}{3}$

B. $\dfrac{1}{2}$

C. $\dfrac{2}{3}$

D. $\dfrac{1}{3} \times 273 \times 298$

Answer: A

6. The temperatures at which real gases obey the ideal gas laws over a wide range of pressure is called

   A. Critical temperature

   B. Boyle temperature

   C. Inversion temperature

   D. Reduced temperature

Answer: B

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7. In a closed room of $1000m^3$ a perfume bottle is opened up. The room develops a smell. This is due to which property of gases?

    A. Viscosity

    B. Density

    C. Diffusion

    D. None

Answer: C

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8. A bottle of ammonia and a bottle of HCl connected through a long tube are opend 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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9. The value of universal constant depends upon

A. Temperature of the gas

B. Volume of the ags

C. Number of moles of the gas

D. units of Pressure and volume.

Answer: D

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10. The value of the gas constant R is

A. $0.082 dm^2 atm$

B. $0.987 \text{cal mol}^{-1} K^{-1}$

C. $8.3 Jmol^{-1} K^{-1}$

D. $8 \text{erg mol}^{-1} K^{-1}$

Answer: C

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11. Use of hot air balloon in sports and metorological observation is an application of

A. Boyle's law

B. Newton's law

C. Kelvin's law

D. Brown's law

Answer: A

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12. Consider the following statements

(i) Atmospheric pressure is less at the top of a mountain than sea level

(ii) Gases are much more compressible than solide or liquids

When the atmospheric pressure increases the height of mercury column rises.

A. I and II

B. II and III

C. I and III

D. I, II and III

Answer: D

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13. Compressibility factor for CO_2 at 400 K and 71.0 bar is 0.8697. The molar valume of CO_2 under these conditions is

    A. $22.04 dm^3$

    B. $2.24 dm^3$

    C. $0.41 dm^3$

    D. $19.5 dm^3$

Answer: C

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14. If temperature and volume of an ideal gas is increased to twice its values, the initial pressure P becomes

A. 4P

B. 2P

C. P

D. 3P

Answer: C

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15. At identical temperature and pressure, the rate of diffusion of hydrogen gas is $3\sqrt{3}$ times that of a hydrocarbon having molecular formula C_nH_{2n-2}. What is the value of n ?

A. 8

B. 4

C. 3

D. 1

Answer: B

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16. Equal moles of hydrogen and oxygen gas are placed in a container, with a pin-hole through which both can escape what fraction of oxygen esacpes in the time required for one-half of the hydrogen to escape.

A. $\dfrac{3}{8}$

B. $\dfrac{1}{2}$

C. $\dfrac{1}{8}$

D. $\dfrac{1}{4}$

Answer: C

17. The variation of volume V, with temperature T, keeping pressure constant is called the coefficient of thermal expansion is $\alpha = \frac{1}{V} \left(\frac{\delta V}{\delta T} \right)_P$. For an ideal gas α is equal to

A. T

B. $\dfrac{1}{T}$

C. P

D. none of these

Answer: B

18. Foure gases P, Q, R and S have almost same values of 'b' but their 'a' values (a, b are Vander Waals Constants) are in the order $Q < R < S < P$. At a particular temperature, among the foure gases the most easily liquefiable one is
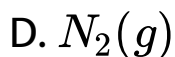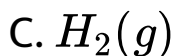
A. P

B. Q

C. R

D. S

Answer: A

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19. Maximum deviation from ideal gas is expected from

A. $CH_4(g)$

B. $NH_3(g)$

C. $H_2(g)$

D. $N_2(g)$

Answer: B

20. The units of Vander Waals constant 'b' and 'a' respectively

    A. $molL^{-1}$ and $Latm^2mol^{-1}$

    B. mol L and L atm mol^2

    C. mol^{-1} L and L^2 atm mol^{-2}

    D. none of thess

Answer: C

21. Assertion : Critical temperature of CO_2 is 304K, it can be liquefied above 304K.

Reason : For a given mass of gas, volume is to directly proportional to pressure at constant temperature

  A. both assertion and reason are true and reason is the correct explanation of assertion

B. both assertion and reason are turee but reason is not the correct explanation of assertion

C. assertion is true but reason is false

D. both assertion and reason are false

Answer: D

22. What is the density of N_2 gas at $227°C$ and 5.00 atm pressure?

$$\left(R = 0.82.\ L\ \text{atm}\ K^{-1}mol^{-1}\right)$$

A. 1.40 g/L

B. 2.81g/L

C. 3.41g/L

D. 0.29g/L

Answer: C

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23. Which of the following diagrams correctly describes behaviour of a fixed mass of an ideal

gas? (T is measured in K)

A.

B.

C.

D.

Answer: C

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24. 25g of each of the following gases are taken at $27°C$ and 600 mm Hg pressure. Which of

these will have the least volume ?

A. HBr

B. HCl

C. HF

D. HI

Answer: D

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Evaluation Answer These Questions Briefly

1. State Boyle's law.

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2. Name two items that can serve as model for Gay Lusaac' law and explain.

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3. Give the mathematical exprssion that relates gas volume and moles.

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4. What is an ideal gas? Why do the real gases show deviations from ideal behaviour?

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5. Can a Van der Waals gas with a=0 be liquefied? Explain.

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6. Suppose there is a tiny sticky area on the wall of a container of gas. Molecules hitting this area stick there permanently. Is the pressure greater or less than on the ordinary area of walls?

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7. Explain the following observations

Aerated water bottles are kept under water during summer

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8. Explain the following observations

Liquid ammonia bottle is cooled before opening the seal

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9. Explain the following observations

The tyre of an automobile is inflated to slightly lesser pressure in summer than in winter

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10. Explain the following observations

The size of a weather ballonn becomes larger and larger as it asecnds up into larger altitude

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11. Given suitable explanation for the following facts about gases.

Gases don't settle at the botton of a container.

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12. Given suitable explanation for the following facts about gases.

diffuse through all the space available to theml.

13. Suggest why there is no hydrogen (H_2) in our atmosphere. Why does the moon have no atmosphere?

14. Explain whether a gas approaches ideal behavior or deviates from ideal behavaiour if It is compressed to a smaller volume at constant temperature.

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15. Explain whether a gas approaches ideal behavior or deviates from ideal behavaiour if the temperature is raised at while keeping the volume constant

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16. Explain whether a gas approaches ideal behavior or deviates from ideal behavaiour if more gas is introduced into the same volume, and at the same temperature

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17. Which of the following gases would you expect to deviate from ideal behaviur under conditaions of low temperature F_2, Cl_2 or Br_2 ? Explain.

18. Distinguish between diffusion and effusion.

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19. Aerosol cans carry clear warning of heating of the can. Why?

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20. Would it be easier ot drink water with a straw on the top of Mount Everest?

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21. Write the Van der Waals equation for a real gas. Explain the correction term for pressure and volume.

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22. Derive the values of critical constants in terms of van der Waals constants.

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23. Why do astronauts have to wear protective suits when they are on the surface of moon?

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24. When ammonia combines with HCl, NH_4Cl is formed as white dense fumes. Why do more

fumes appear near HCl?

25. A sample of gas at $15°C$ at 1 atm has a volume of $2.58dm^3$. When the temperature is raised to $38°C$ at 1 atm does the volume of the gas increase? If so, calculate the final volume.

26. A sample of gas has a volume of $8.5dm^3$ at an unknown temperature. When the sample is

submered in ice water at $0°C$, its volume gets reduced to $6.37dm^3$. What is its initial temperature?

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

28. Sulphur hexafluoride is a colourless, odouriess 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.

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29. Argon is an inert gas used in light bulbs ot 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.

30. A small bubble rises from the bottom of a lake where the temperature and presssure are $6°C$ and 4atm. To the water surface, where the temperature is $25°C$ and pressure is 1 atm. Calculate the final volume in (ml) of the bubble, if its initial volume is 1.5 mL.

31. Hydrochloric acid is treated with a metal to produce hydrogen gas. Suppose a student carries out this reaction and collects a volume of $154.4 \times 10^{-3} dm^3$ of a gas at a pressure of 742 mm of Hg at a temperature of 298 K. What mass of hydrogon gas (in mg) did the student collect?

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32. It takes 192 sec for an unknown gas to diffuse through a porous wall and 84 sec for N_2 gas to

efffuse at the same temperature and pressure. What is the molar mass of the unknown gas?

33. A tank contains a mixture of 52.5g 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.

34. A combustible gas is stroed in a metal tank at a pressure of 2.98 atm at $25°C$. The tank can withstand a maximum pressure of 12 atm after which it will explode. The building in which the tank has been stored catches fire. Now predict whether the tank will blow up first or start melting? (Melting point of the metal =1100 K).

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1. Which of the following correctly represents Boyle's Law?

A.

B.

C.

D. All of these

Answer: A

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2. What is the density of oxygen gas at $227°C$ and 4 atm pressure (R=0.082 L atom $K^{-1}mol^{-1}$)

    A. 3.12 g/L

    B. 3.41 g/L

    C. 2.81 g/L

    D. none of these

Answer: A

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3. 56 g nitrogen and 96 g of oxygen are mixed isothermally and the mixture exerts a total pressure of 10 atm. The partial pressure of nitrogen and oxygen are respectively.

A. 4,6

B. 8,2

C. 6,4

D. 2,8

Answer: A

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4. Pressure is _____.

A. Force/area

B. force $\times$ Area

C. Area/force

D. Force /area $\times$ volume

Answer: A

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5. The unit of pressure is_____

    A. Pascal

    B. Torr

    C. Bar

    D. all of above

Answer: D

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6. Consider the following statements

(1) Gases are the most compressible state of matter.

2. Gases take the shape of the container.

3. The density of gases is higher than that of liquids

Which of the following statmenet(s) given above is/are corrent?

   A. 1&3

   B. only 1

   C. 2&3

D. 1&2

Answer: D

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7. The instrument used for measuring atmsopheric pressure is _____

    A. Beckmann thermometer

    B. Galvanometer

    C. Barometer

    D. all the above

Answer: C

8. The standard atmospheric pressure is the pressure that supports a column of mercury exactly_____ high at $0°C$ at sea level.

A. 760 mm

B. 76 cm

C. both a & b

D. 760 cm

Answer: C

9. If the volume of a fixed mass of a gas is reduced to half at constant temperature, the gas pressure _____

A. remains constant

B. doubles

C. reduces to half

D. becomes zero

Answer: B

10. Density of a gas is _____

    A. directly proportional to pressure

    B. indirectly proportional to pressure

    C. directly proportional to volume

    D. both b and c

Answer: A

11. The hydrgen ballon was invented by _____

A. Robert Boyle

B. J.A.C. Charles

C. Maxwell

D. Gay Lussac

Answer: B

12. V/T =constant is _____ law.

A. Gay Lussac

B. Boyle's

C. Dalton's

D. Charles

Answer: D

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13. 273 K is equal to _____ degree centigrade.

A. 0

B. 100

C. 373

D. 1

Answer: A

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14. The absolute zero is _____

A. $-273°C$

B. $273°C$

C. 0K

D. both a and c

Answer: D

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15. Give the mathematical exprssion that relates gas volume and moles.

A. Boyle's law

B. Charles law

C. Avogadro's hypothesis

D. Gay Lusassc's law

Answer: C

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16. The parameters that describe the gaseous state are _____

A. volume

B. pressure

C. temperature

D. all the these

Answer: D

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17. Which curve shows Charle's law?

A.

B.

C.

D.

Answer: A

18. The law that relates the pressure and volume

of gases is

    A. Boyle's

    B. Charles law

    C. Dalton

    D. none of the above

Answer: A

19. The partial pressure of dry gas is

A. greater than the of wet gas

B. lesser than that of wet gas

C. equal to that of wet gas

D. none of these

Answer: B

20. Absolute zero is,

A. $-273^\circ C$

B. 0K

C. temperatue at which no substance exists in

gaseous state

D. All of these

Answer: D

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21. Passenger aeroplane cabins is artificially pressurised since

A. pressure decrases with the increase in altiude

B. pressure increases with the increases in altitude

C. temperature increases with the increase in altitude

D. none of the above

Answer: A

22. The rate of diffusion of gas is _____ to square root of their molecular mass.

    A. inversely proportional

    B. directly proportional

    C. equal

    D. twice

Answer: A

23. The temperatures at which real gases obey the ideal gas laws over a wide range of pressure is called

A. Inversion temperature

B. Boyle's temperature

C. Critical temperature

D. None of these

Answer: B

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24. When the gas behvaes ideally, the compression factor Z is

    A. > 1

    B. < 1

    C. $= 0$

    D. $= 1$

Answer: D

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25. Partial pressure is given as _____

A. $\dfrac{\text{mole fraction}}{\text{total pressure}}$

B. mole fraction $\times$ total pressure

C. $\dfrac{\text{mole fraction} \times \text{total pressure}}{2}$

D. $\dfrac{2 \times \text{mole fraction}}{\text{total pressure}}$

Answer: B

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26. Identify the correct mathematical expression of Graham's law of diffusion.

A. $\dfrac{r_2}{r_1} = \sqrt{\dfrac{M_2}{M_1}}$

B. $r_2 r_1 = \sqrt{\dfrac{M_2}{M_1}}$

C. $\dfrac{r_1}{r_2} = \sqrt{\dfrac{M_2}{M_1}}$

D. $\dfrac{r_1}{r_2} = \left[\dfrac{M_2}{M_1}\right]^2$

Answer: C

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27. Pick the equation that gives you the relationship between molecular mass and density.

A. $M = \dfrac{dRT}{P}$

B. $PV = nRT$

C. both (a) & (b)

D. neither (a) nor (b)

Answer: A

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28. Compression factor Z is given by _____.

A. PV/nRT

B. P/nRT

C. PV/R

D. PV/T

Answer: A

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29. A gas such as carbon monoxide would be most likely to obey the ideal gas law at

    A. High temperature and high pressure

    B. High temperature nd low pressure

    C. Low temperature and high pressure

    D. Low temperature and low pressure

Answer: B

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

    A. no. of molecules of gas increases.

    B. kinetic energy of molecules decreases.

    C. pressure of the gas increases.

    D. kinetic energy of molecules remains the same.

Answer: D

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31. The rice is cooked earlier in pressure cooker because

A. boiling point increases with increasing pressure

B. boiling point decreases with increasing pressure

C. Internal energy is not lost while cooking in pressure cooker

D. Extra pressure of pressure cooker soflens the rice

Answer: A

32. What is the dominant intermolecular force or bond that must be overcome in converting liquid methanol to a gas?

A. London dispersion force

B. Hydrogen bonding

C. Dipole-dipole interaction

D. Covalent bonds

Answer: B

33. Consider the following statements

I. Atmospheric pressure is less at top of a mountain than at sea level

II. Gases are much more compressible than solids or liquids

III. Gaseous state is deseribed by four measurable properties P,V,T and n

Select the correct statement

A. I and II

B. II and III

C. I and III

D. I, II and III

Answer: D

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34. Compresslbllity factor for CO_2 at 400 K and

71.0 bar is 0.8697 the molar volume of CO_2 under

these conditions

A. $22.04dm^3$

B. $2.24dm^3$

C. $0.41dm^3$

D. $19.5dm^3$

Answer: C

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35. Gases deviate from ideal behavior at high pressure which of the following is correct for non-ideallty?

A. At high pressure the collision between the gas molecule become enormous

B. at high pressure the gas molecules move only in one direction

C. At high pressure, the volume of gas become in significant

D. At high pressure the intermolecular interactions become significant

Answer: D

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36. Van der Waal's constant 'a' has the dimensions of

A. mol lit^{-1}

B. atm $\text{titre}^2 mol^{-2}$

C. lit mol^{-1}

D. atm litre mol^{-2}

Answer: B

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37. Which mixture of gases at room temperature does not obey Dalton's law of partial pressure?

A. NO_2 and O_2

B. SO_2 and SO_2

C. CO and CO_2

D. NH_3 and HCl

Answer: D

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38. Pick out the correct relation for 1 mole of real gas.

A. $\left(P + \dfrac{V}{a^2}\right)(V - b) = RT$

B. $P = \dfrac{RT}{(V - b)} + \dfrac{a}{V^2}$

C. $\left(P + \dfrac{a}{V^2}\right)(V - b) = RT$

D. $\left(P - \dfrac{a}{V^2}\right)(V + b) = \dfrac{1}{RT}$

Answer: C

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39. The compressibility factor is given by
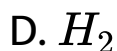
A. Z=PV

B. Z=nRT

C. $Z = \dfrac{nRT}{PV}$

D. $Z = \dfrac{PV}{nRT}$

Answer: D

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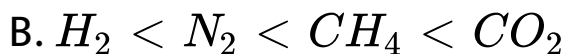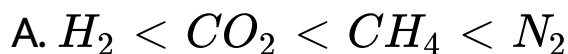**40.** Which of the following gas(es) always show positive devlation from ideal behavlour?

A. CH_4

B. CO_2

C. NH_3

D. H_2

Answer: D

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41. What is the correct increasing order of liquefiaility of the gas?

A. $H_2 < CO_2 < CH_4 < N_2$

B. $H_2 < N_2 < CH_4 < CO_2$

C. $CO_2 < CH_4 < H_4 < N_2$

D. $CO_2 < CH_4 < N_2 < H_2$

Answer: B

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42. Van der Waal's constant a and b are related with _____ respectively.

    A. attrative force and volume of molecules.

    B. repulsive force and volume of molecules.

    C. attractive force and bond energy of molecules.

    D. shape and repulsive force of molecules.

Answer: A

43. An ideal gas, obeying kinetic theory of cannot be liquefied, because

    A. its critical temperature is above $0°C$.

    B. force acting between its molecules are negligible.

    C. its molecules are relatively small in size.

    D. it solidifies before becoming a liquid.

Answer: B

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44. The measure of attractive forces of molecules is called_____.

A. internal pressure

B. cohesion pressure

C. both (a) and (b)

D. neither (a) nor (b)

Answer: C

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45. Statement I: H_2 when allowed to expand at room temperature it causes heating effect.

Statement II : H_2 has inversion temperature much below room temperature.

    A. Both statement I and statement II are true and statement II explains statement I.

    B. Both statement I and statement II are true but statement II does not explain statement I.

    C. Statement I is true but statement II is false.

D. Both the statements are false.

Answer: A

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46. _____ is the gas constant.

A. a

B. Ve

C. R

D. Te

Answer: C

47. Statement I: At very high pressures, compressibility factor is greater than 1.

Statement II : At very high pressure, 'b' can be neglected in van der Waal's gas equation.

  A. Both statement I and statement II are true

  and statement II explains statement I.

B. Both statement I and statement II are true but statement II does not explain statement I.

C. Statement I is true but statement II is false.

D. Both the statements are false.

Answer: C

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48. The inversion temperature for a gas is given by _____.

A. $\dfrac{2a}{Rb}$

B. $\dfrac{a}{Rb}$

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

D. $\dfrac{Rb}{a}$

Answer: A

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49. Statement I : Greater is the critical temperature, more difficult is to liquefy the gas.

Statement II: Stronger the intermolecular forces,

lower would be the critical temperature of that gas.

A. Both statement I and statement II are true and statement II explains statement I.

B. Both statement I and statement II are true but statement II does not explain statement I.

C. Statement I is true but statement II is false.

D. Both the statements are false.

Answer: D

50. The liquefaction behaviour of temporary gases like CO_2 approaches that of N_2, O_2 (permanent gases) as we go,

    A. below critical temperature

    B. above critical temperature

    C. below absolute zero

    D. above absolute zero

Answer: B

51. The corrected term for pressure in the vanderwaal's equation of state is _____.

A. (V-b)

B. $P + \dfrac{a}{V^2}$

C. (b-V)

D. $\dfrac{a}{V^2} \times P$

Answer: B

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52. When Boyle's law is applicable to all gases reagardless of their chemical identity?

    A. High pressure

    B. High temperature

    C. Low pressure

    D. Low temperature

Answer: C

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53. If a given amount of gas is compressed to half of its volume, the density is _____.

A. doubled

B. Foure times

C. Half

D. remains the same

Answer: A

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54. Which four variables are describe completely the gasous state?

    A. H, S, G, T

    B. P, S, V, H

    C. T, P, S, n

    D. T, P, V, n

Answer: D

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55. The temperature below which a gas obeys Joule- Thomoson effect is called _____.

    A. Boyle temperature

    B. Inversion temperature

    C. Transition temperature

    D. Zeeman effect

Answer: B

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56. Assertion (A) : When two non-reactive gases are allowed to mix, the gas molecules migrate from region of higher concetration to a region of lower concentration.

Reason (R) : The property of gas which involves the movement of the gas molecules through another gases is called Effusion.

    A. Bothe (A) and (R) are true and (R) is the correct explanation of (A).

    B. Both (A) and (R) are true and (R) is not the correct explanation of (A).

C. (A) true but (R) false.

D. Both (A) and (R) are false.

Answer: C

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57. Which of the following is incorrect?

A. The fact the gases can be liquefied shows that the attractive force exists among molecules.

B. There is all gases which behaves ideally

under all conditions.

C. The non-ideal gases are called real gases.

D. The real gases tend to approach the ideal

behaviour under certain conditions.

Answer: C

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58. The temperatures at which real gases obey

the ideal gas laws over a wide range of pressure

is called

A. Boyle temperature

B. Boyle point

C. Inversion temperture

D. a&b

Answer: D

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59. Above the Boyle point, for real gases shows
_____.

A. positive deviation

B. negative deviation

C. no deviation

D. unpredictable deviation

Answer: A

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60. Which effect is observed only below a certain temperature?

A. Joule-Thomson effect

B. Andrew's Isothermal

C. Van der Waal equation

D. Graham's Law of diffusion

Answer: A

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Additional Short Answers

1. State Boyle's law and Charles law.

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2. At identical temperature and pressure, the rate of diffusion of hydrogen gas is $3\sqrt{3}$ times that of a hydrocarbon having molecular formula C_nH_{2n-2}. What is the value of n ?

3. Distinguish real and ideal gases.

4. 0.6% solution of urea and 1.8% solution containing a solute (A) are isotonic with each other. Calculate the molecular weight of the solute (A).

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5. Give the expressions of crticial constants.

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6. Write a short not on the consquence of Boyle's law. (or) give the relationship between pressure and density

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7. When a real gas is converted from its initial to final state by adiabatic expansion, it is not pssible to calculate its volume using Boyle's law. Why ?

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8. Define absolute zero. Is it possible to attain a further lower temperatuer ? Comment on your answer.

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9. Define the terms isotherm, isobar and isochore.

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10. Passenger aeroplane cabins is artificially pressurised since

11. Why the size of a balloon in hot wate is incressesx compared to a balloon in cold water.

12. Define pressure. Give its units.

13. Why should divers never hold their breath while diving ?

14. Use of hot air balloon in meteorological observation is based on which gas law ? Explain.

15. state Dalton's law of partial pressure.

16. a gas is enclosed in a room. The pressure, density, temperature and number of moles are p atm, gcm^{-3}, $t°C$ and n moles repectively. What will be the pressure, temperature, density and number of moles, in each compartment. If room is partitioned into four equal compartments ?

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17. How does a person feels the effect of drop in pressure ? Explain

18. (a) State the following laws :

19. According to kinetic theory. What are the two assumptions made with regard to idean gas ?

20. When a compressed real gas is made to expand adiabatically through a porous plug, how does the temperature change ?

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21. Comment on the statement- A sample of an ideal gas escapes into an evacuated container without any changes in its kinetic energy.

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22. On what basis do you classify gases into permanent and temporary gases ? Expalin these types with example.

23. Derive the units of the vanderwaal's constants.

24. Imagine the molecular collisions to the gases were inelastic. What would have happened?

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25. What are the three charactersistics of gases ?

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26. Define atmospheric pressure what is its value ?

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27. Deep sea divers ascend slowly and breath contentiously by the time they reach the surface. Give reason.

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28. Most aeroplanes cabins are artificially pressurized. Why ?

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29. State Charle's law.

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30. Define Dalton's law of partial pressure.

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31. Helium diffuses more than air. Give reason.

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32. CO_2 gas is cannot be liquefied at room temperature. Give reason.

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33. Explain the different method used for liquefaction of gases.

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Additional Long Answers

1. Explain the experimental verification of Boyle's law along with the graphical representations of PV relationship.

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2. Derive the ideal gas equation by combining the empirical gas laws.

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3. Using the ideal gas equation how will you calculate the values of R ?

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4. What is compressbility factor ?

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5. State Joule thamson effect.

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6. defined the following terms. (i) Isotherm (ii) Critical Temperature (iii) Critical Pressure (iv) Critical Volume

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7. Explain the pressure - volume isotherms of Carbon dioxide Andrew's isotherm.

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8. Explain about Andrew's Experimental isotherms of CO_2 gas.

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9. Give a detailed accounte on compressbility factor.

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10. Using Dalton's law how will you determine the pressure of a dry gas.

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11. Define Grahm's Law of diffusion ?

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12. How will you calculate the partial pressure in terms of mole fraction ?

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Numerical Problems

1. Find the pressure of 5 mole Cl_2 gas filled in a 2 littre vassel at $27°C$ temperature.

2. Find the moles of O_2 gas having presure 250 bar in 500 ml vessle at 350 K temperature.

3. Find the pressure of neon gas having density $0.9 gmlit^{-1}$ at $350K$ temperature.

4. At $27^\circ C$ temperature and 4 bar pressure CO is filled in 2 litrre vessel. Find the pressure if it is filled in 4 litre vessel at $77^\circ C$ temperature.

5. A neon-dioxygen mixture contains 60.8 dioxygen and $167.5g$ neon. If pressure of the mxiture of gases in the cylinder is 20 bar, what is

the partial pressure of dioxygen and neon in the

mixture ?

6. If a gas diffuses at the rate of one-half as fast

as O_2, find the molecular mass of the gas.

7. 75 ml of gas A effuses through a pin hole in 73

seconds the same volume of SO_2 under indential

conditions effuses in seconds. Calculate the molecular mass of A.

8. Vanderwaal's constant for a gas (g) are $a = 6.34atmlit^{-2}$, and $b = 52.6mlmol^{-1}$. Find the critical temperature and critical pressure of the gas.

9. Vanderwaal's constant for a gas $a = 3.67 atm \mathrm{lit mol}^{-1} b = 0.0408 '\mathrm{lit\ mol}^{-1}$.

Find the critical temperautre and critical pressure of the gas.

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10. The vanderwaal's constant $a = 2.095 \mathrm{lit}^{-2} atm \mathrm{mol}^{-1}$ and $b = 0.0189 \mathrm{lit\ mol}^{-1}$ respectively. Calculate the inversion temperature.

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11. If a scuba diver takes a breath at the surfae filling his lungs with $5.82 dm^3$ of air what volume will the air in his lungs occupy when he drives to a dept where the pressure is $1.92 atm$. (aausme temperature is constant and the pressure at the surface ix excatly)

12. Inside a certain automobile engingen, the valume of air in a cylinder is $0.475 dm^3$, when the pressure is $1.05 atm$. When the gas is

compressed, the pressure increased ato 5.65 atm. At the same temperature. What is the volume of compressed air ?

13. 🖼️

Effect of temperature on volume of the gas to verify Charles law

All the container a,b and c have same pressure of atm. If T_1, T_2 and T_3 are, respectively, at 200, 300 and , K, and $V_1 - 0.3dm^{-3}$, calculate V_2 and V_3.

14. Find the ratio of effusion rates of hydrogen and krypton gas.

15. If the wather balloon at a pressure $0.0965 atm$. At ground level has a valume of $10.0 m^3$. What will be the pressure at an altitude of 5300 m where its volume is $20.0 m^3$?

16. At sea level a balloon has volume of $785 \times 10^{-3} dm^3$. What will be its volume, if it taken to a place where the pressure is 0.052 atm. Less than the atmospheric pressure of 1 atm.

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17. When the temperature of a gas increases from $0°C$ the valume of the gas increases by a factor of 1.25 what is the final temperature ?

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18. In an experiment of verification of Charle's law, the following are the set of readings taken by a student

What is the average value of the constant of proportionality ?

19. A helium filled balloon had a volume of 400 ml, when it is cooled to $-120°C$. What will be its

volume if the balloon is warmed in an overn to $100°C$ assuming changes in pressure.

20. Suppose a 375 ml sample of neon gas at $78°C$ is cooled to $22°C$ at constant pressure. What will be the new volume of neon sample ?

21. Which of following flasks has higher pressure , 5.00 L containing $4.15g$ of Helium at 298 K

22. Which of following flasks has higher pressure ,

10.0 L containing 56.2 g Argon at 303 K

23. At what temperature would $4.285 g$ o foxygen

gas O_2 exert a pressure of 1.21 atm. In a $2.15 dm^3$

flask.

24. For a gaseous mixtue of $2.41g$ of helium and $2.79g$ of neon in an evacuated $1.04dm^3$ container at 298 K Calculate the partial pressure of each gas and hence find the total pressure of the mixture.

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