doubtnut
India's Number 1 Education App

CHEMISTRY

RESONANCE ENGLISH

GASEOUS STATE

Physical Chmistry Gaseous State

1. A certain quantity of a gas occupied $100ml$ when collected over water at $15^\circ C$ and $750mm$ pressure . It occupies $91.9ml$ in dry state at NTP. Find the $V.P.$ of water at $15^\circ C$

A. $20mm$

B. $13.2mm$

C. $18mm$

D. 63mm

Answer: 2

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2. The virial equation for 1mole of a real gas is written as

:

$$PV = RT$$

$$\left[1 + \frac{A}{V} + \frac{B}{V^2} + \frac{C}{V^3} + \text{.....To higher power of } n\right]$$

Where $A, B,$ and C are known as virial coefficients . If

Vander wall's equation is written in virial form, then what will be value of B:

A. $a - \frac{b}{RT}$

B. b^3

C. $b - \frac{a}{RT}$

D. b^2

Answer: 4

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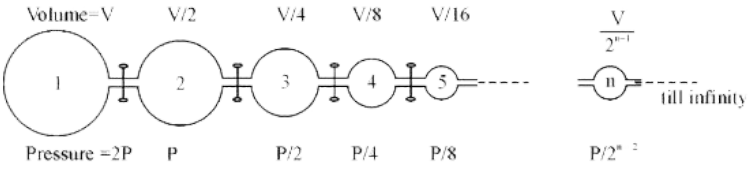
3.



Infinite number of flask are connected to one another as shown above. The volumes and pressure in each flask vary as shown. The stopcocks are initially closed. The common pressure, when all the stopcocks are opened, is : (Assume constant temperature)

A. P

B. $\frac{1}{2}P$

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

D. $\frac{4}{3}P$

Answer: 4

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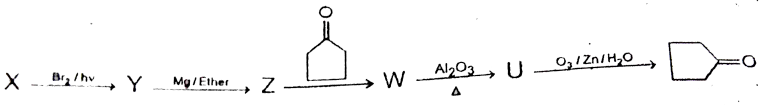
4. At point P and Q , the real gas deviation with respect to ideal gas is respectively :



A. Positive, negative

B. Positive, positive

C. Negative, positive

D. Negative, negative

Answer: A

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5. A real gas most closely approaches the behaviour of an ideal gas at:

A. low pressure & low temperature

B. high pressure & high temperature

C. low pressure & high temperature

D. high pressure & low temperature

Answer: 3

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6. If the number of molecules of SO_2 (atomic weight=64) effusing through an orifice of unit area of cross-section in unit time at $0^\circ C$ and 1 atm pressure in n. the number of He molecules (atomic weight=4) effusin under similar conditions at $273^\circ C$ and 0.25 atm is:

A. $\frac{n}{\sqrt{2}}$

B. $n\sqrt{2}$

C. $2n$

D. $\frac{n}{2}$

Answer: 1

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7. A gaseous mixture contains three gases A,B and C with a total number of moles of 10 and total pressure of 10 atm. The partial pressure of A and B are 3 atm and 1 atm respectively. If C has molecular weight of 2 g/mol. then, the weight of C present in the mixture will be :

A. $8g$

B. $12g$

C. $3g$

D. $6g$

Answer: 2

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8. 1 mol of a gaseous aliphatic compound $C_nH_{3n}O_m$ is completely burnt in an excess of oxygen. The contraction in volume in (assume water gets condensed out):

A. $\left(1+\frac{1}{2}n-\frac{3}{4}m\right)$

B. $\left(1+\frac{3}{4}n-\frac{1}{4}m\right)$

C. $\left(1+\frac{1}{2}n-\frac{3}{4}m\right)$

D. $\left(1+\frac{3}{4}n-\frac{1}{2}m\right)$

Answer: 4

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9. At what temperature will the molar kinetic energy of 0.3 mol of He be the same as that of 0.4 mol of argon at 400 K ?

A. $533K$

B. $400K$

C. $346K$

D. $300K$

Answer: 1

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10. The volume of a gas increases by a factor of 2 while the pressure decrease by a factor of 3 Given that the number of moles is unaffected, the factor by which the temperature changes is :

A. $\frac{3}{2}$

B. 3×2

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

D. $\frac{1}{2} \times 3$

Answer: 3

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11. Which has maximum internal energy at 290 K?

A. Neon gas

B. Nitrogen gas

C. Ozone gas

D. Equal

Answer: 3

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12. There are 6.02×10^{22} molecules each of N_2, O_2 and H_2 which are mixed together at $760mm$ and $273K$. The mass of the mixture in grams is :

A. 6.2

B. 4.12

C. 3.09

D. 7

Answer: 1

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13. At $27^\circ C$, a ges is compressed to half of its volume . To what temperature it must now be heated so that gas occupies just its original volume ?

A. $54^\circ C$

B. $600^\circ C$

C. $327^\circ C$

D. $327K$

Answer: 3

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14. A gas in an open container is heated from $27^\circ C$ to $127^\circ C$. The fraction of the original amount at gas remaining in the container will be

A. $\frac{3}{4}$

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

C. $\frac{1}{2}$

D. $\frac{1}{8}$

Answer: 1

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15. A Vdm^3 flask contains gas A and another flask of $2Vdm^3$ contains gas B at the same temperature If density of gas A is $3.0gdm^{-3}$ and of gas B is $1.5gdm^{-3}$ and mo1 wt of $A = 1/2$ wt pf B then the ratio of pressure exerted by gases is .

A. $\frac{P_A}{P_B} = 2$

B. $\frac{P_A}{P_B} = 1$

C. $\frac{P_A}{P_B} = 4$

D. $\frac{P_A}{P_B} = 3$

Answer: 3

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16. At low pressure, vander waal's equation is reduced to $\left[P + \frac{a}{V^2}\right]V = RT$. The compressibility factor can be given as :

A. $1 - \frac{a}{RTV}$

B. $1 - \frac{RTV}{a}$

C. $1 - \frac{a}{RTV}$

D. $1 + \frac{RTV}{a}$

Answer: 1

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17. $300ml$ of a gas at $27^\circ C$ is cooled to $-3^\circ C$ at constant pressure, the final volume is

A. $540ml$

B. $135ml$

C. $270ml$

D. $350ml$

Answer: C

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18. In the ideal gas equation, the gas constant R has the dimension of $-$

A. Mole$-atm/K$

B. Litre$/$ mole

C. Litre$-atm/K/$mole

D. erg/K

Answer: 3

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19. 3.7 g of a gas at 25°C occupies the same volume as 0.184 g of hydrogen at 17°C and at the same pressure. What is the molecular mass of the gas ?

A. 82.66

B. 41.33

C. 20.67

D. 10.33

Answer: 2

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20. 180 mL of a hydrocarbon diffuse through a porous membrane in 15 minutes, while 120 mL of SO_2 under identical conditions diffuse in 20 minutes. What is the molecular mass of the hydrocarbon ?

A. 8

B. 16

C. 24

D. 32

Answer: 2

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21. At what temperature will hydrogen molecules have the same root mean square speed as nitrogen molecules at $27^{\circ} C$?

A. $21.43^{\circ} C$

B. $42.86 K$

C. $21.43 K$

D. $42.86^{\circ} C$

Answer: 3

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22. What is the total pressure exerted by the mixture of $7.0g$ of N_2, $2g$ of hydrogen and $8.0g$ of sulphur dioxide gases in a vessel of $6L$ capacity that has been kept at $27^\circ C$.

A. 2.5 bar

B. 4.5 bar

C. 10 atm

D. 5.7 bar

Answer: 4

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23. An open flask containing air is heated from 300 K to 500 K. What percentage of air will be escaped to the atmosphere, if pressure is keeping constant?

A. 80

B. 40

C. 60

D. 20

Answer: 2

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24. At STP, a container has 1 mole of He, 2 mole Ne, 3 mole O_2 and 4 mole N_2. Without changing total pressure if 2 mole of O_2 is removed . The partial pressure of O_2 will be decreased by :

A. $26\ \%$

B. $40\ \%$

C. $58.33\ \%$

D. $66.66\ \%$

Answer: 3

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25. Density of methane , at $250^{\circ}C$ and 6 atm pressure, is $[R = 0.0821 atm]$:

A. $2.236 g/L$

B. $8 g/L$

C. $12 g/L$

D. $16 g/L$

Answer: 1

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26. The ratio among most probable speed, mean speed and root mean square speed is given by

A. $1:2:3$

B. $1:\sqrt{2}:\sqrt{3}$

C. $\sqrt{2}:\sqrt{3}:\sqrt{8/\pi}$

D. $\sqrt{2}:\sqrt{8/\pi}:\sqrt{3}$

Answer: 4

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27. The compressibility factor for nitrogen at 330 K and 800 atm is 1.90 and at 570 K and 200 atm is 1.10. A certain mass of N_2 occupies a volume of 1 dm^3 at 330 K and 800 atm. Calculate volume occupied by same quantity of N_2 gas at 570 K and 200 atm :

A. $1L$

B. $2L$

C. $3L$

D. $4L$

Answer: 4

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28. If the weight of 5.6 litres of a gas at $N.T.P.$ is 11 gram. The gas may be :

A. PH_3

B. $COCl_2$

C. NO

D. N_2O

Answer: D

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29. The density of vapour of a substance (X) at 1 atm pressure and 500 K is 0.8 kg/m^3. The vapour effuses through a small hole at a rate of 4/5 times slower than oxygen under the same condition. What is the compressibility factor (Z) of the vapour?

A. 0.974

B. 1.35

C. 1.52

D. 1.22

Answer: C

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30. The volume of $2.8g$ of CO at $27^{\circ}C$ and $0.821atm$ pressure is $(R = 0.0821$ lit. atm $mol^{-1}K^{-1})$

A. 1.5 litre

B. 3 litre

C. 30 litre

D. 0.3 litre

Answer: 2

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31. For a real gas $'G'$ $Z > 1$ as STP Then for $'G'$:

Which of the following is true :

A. 1 mole of the gas occupies $22.4L$ at NTP

B. 1 mole of the gas occupies $22.4L$ at pressure higher than that at STP (keeping temperature constant)

C. 1 mole of the gas occupies $22.4L$ at pressure lower than that at STP (keeping temperature constant)

D. None of above

Answer: 2

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32. Following graph represents a pressure (P) volume (V) relationship at a fixed temperature (T) for n moles of a real gas. The graph has two regions marked. (I) and (II). Which of the following options is true.

A. $Z > 1$ in the region (II).

B. $Z = 1$ in the region (II)

C. $Z = 1$ for the curve

D. Z approaches 1 as we move from region (II) to region (I)

Answer: 4

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33. A small bubble rises from the bottom of a lake, where the temperature and pressure are $8^{\circ}C$ and 6.0 atm, to the water's surface, where the temperature is $25^{\circ}C$ and pressure is 1.0 atm. Calulate the final volume of the bubble if its initial volume was 2 mL.

A. $14mL$

B. $12.72mL$

C. $11.31mL$

D. $15mL$

Answer: B

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34. Oxygen gas generated by the decomposition of potassium chorate is collected over water. The volume of wxygen collected at $24^\circ C$ and atmospheric pressure of 760 mmHg is 128 mL. Calculate the mass of oxygen gas obtained. The pressure of the water vapour at $24^\circ C$ is 22.4 mmHg.

A. 1.36

B. $1.52g$

C. $0.163g$

D. $1.63g$

Answer: C

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35. The root mean square speed of hydrogen is $\sqrt{5}$ times than that of nitrogen. If T is the temperature of the gas, then :

A. $T_{H_2} = T_{N_2}$

B. $T_{H_2} > T_{N_2}$

C. $T_{H_2} < T_{N_2}$

D. $T_{H_2} < \sqrt{7} T_{N_2}$

Answer: 3

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36. A gaseous mixture containing He, CH_4 and SO_2 in $1:2:3$ mole ratio, calculate the molar ratio of gases effusing out initially.

A. $2:2:3$

B. $6:6:1$

C. $\sqrt{2}:\sqrt{2}:3$

D. $4:4:3$

Answer: 4

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37. 6×10^{22} gas molecules each of mass 10^{-24} kg are taken in vessel of 10 litre . What is the pressure exerted by gas molecules? The root mean square speed of gas molecules is 100 m/s.

A. $20Pa$

B. $2 \times 10^4 Pa$

C. $2 \times 10^5 Pa$

D. $2 \times 10^7 Pa$

Answer: 2

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38. Two flask A and B of equal volumes maintained at temperature 300 K and 700 K contain equal mass of He(g) and $N_2(g)$ respectively. What is the ratio of translational kinetic energy of gas in flask A to that of flask B?

A. $1:3$

B. $3:1$

C. $3:49$

D. None of these

Answer: 2

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39. The density of gas A is twice that to B at the same temperature. The molecular weight of gas B is twice that of A. The ratio of pressure of gas A and B will be :

A. $1:6$

B. $1:1$

C. $4:1$

D. $1:4$

Answer: 3

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40. A balloon weighing 50 kg is filled with 685 kg of helium at 1 atm pressure and $25^\circ C$. What will be its pay load if it displaced 5108 kg of air?

A. $4373kg$

B. $4423kg$

C. $5793kg$

D. none of these

Answer: 1

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41. At 273 K temperature and 9 atm pressure, the compressibility for a gas is 0.9. The volulme of 1 milli-mole of gas at this temperature and pressure is :

A. 2.24 litre

B. $0.020mL$

C. $2.24mL$

D. $22.4mL$

Answer: 3

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42. Calculate the volume occupied by 16 gram O_2 at 300 K and 8.31 Mpa if $\frac{P_cV_c}{RT_c} = 3/8$ and $\frac{P_rV_r}{T_r} = 2.21$ (Given : R=8.314 j/k-mol)

A. $120.31mL$

B. $124.31mL$

C. $248.62mL$

D. none of these

Answer: 2

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43. Density of dry air (only N_2 and O_2) is $124 g \text{litre}^{-1}$ at 760 mm and 300 K. Find the partial pressure of N_2 gas in air (Take $R = \frac{1}{12}$ litre atm/mol K , mol. wt. of N_2 = 28)

A. 0.25

B. 0.35

C. 0.5

D. 0.75

Answer: 1

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44. The mass of molecule A is twice the mass of molecule B. The rms speed of A is twice the rms speed of B. If two samples of A and B contain same number of molecules. If the pressure of gas B is 2atm then what will be the pressure of gas A (atm) . If two samplest are taken in separate containers of equal volume ?

A. 16

B. 32

C. 48

D. 64

Answer: 1

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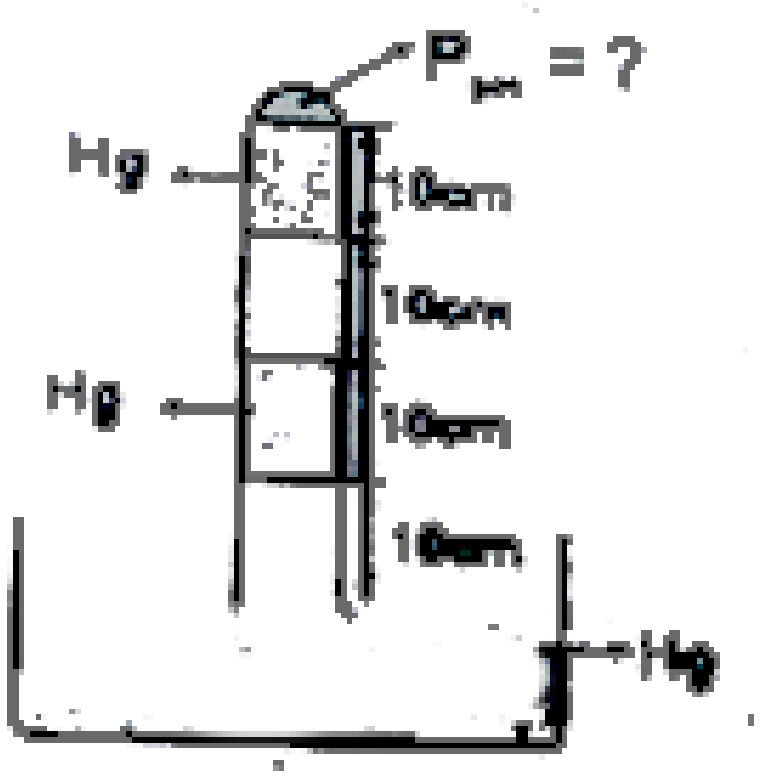
45. In the above figure mercury columns of $10cms$ each are trapped between gas columns of $10cm$ each . If $P_{atm} = 75cm$ of Hg then the gas pressure in the topmost column will be



A. $55cm$ of Hg

B. $35cm$ of Hg

C. $65cm$ of Hg

D. $45cm$ of Hg

Answer: 1

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46. $3.06L$ of H_2O vapour is taken at a pressure of $1atm$ and $373K$. It is now condensed to $H_2O(l)$ at $300K$. Calculate the approximate volume occupied by $H_2O(l)$: (Assume density of liquid water at $300K = 1000kg/m^3$)

A. $3.06L$

B. $1.8mL$

C. $1.8L$

D. $3.06mL$

Answer: 2

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47. A mixture of two gases A and B in the mole ratio $2:3$ is kept in a 2 litre vessel. A second 3 litre vessel has the same two gases in the mole ratio $3:5$. Both gas mixtures have the same temperature and same pressure. They are allowed to intermix and the final temperature and pressure are the same as the initial

values, the final volume beingh 5 litres. Given theat the molar masses are M_A and M_B . what is the mean molar mass of the final mixture :

A. $\frac{77M_A + 123M_B}{200}$

B. $\frac{123M_A + 77M_B}{200}$

C. $\frac{77M_A + 123M_B}{250}$

D. $\frac{123M_A + 77M_B}{250}$

Answer: A

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Inorganic Chemistry Coordination Compounds

1. There are 6.02×10^{22} molecules each of N_2, O_2 and H_2 which are mixed together at $760mm$ and $273K$. The mass of the mixture in grams is :

A. $\left[Co(en)(NH_3)_2Cl_2\right]Cl$

B. $\left[Co(PPh_3)_2(NH_3)_2Cl_2\right]Cl$

C. $\left[Co(en)_3\right]Cl_3$

D. $\left[Co(en)_2Cl_2\right]Br$

Answer: 4

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2. At $27^{\circ}C$, a ges is compressed to half of its volume . To what temperature it must now be heated so that gas occupies just its original volume ?

A. $\left[Sc(H_2O)_6\right]^{3+}$

B. $\left[Ti(en)_2(NH_3)_2\right]^{4+}$

C. $\left[Cr(CN)_6\right]^{3-}$

D. $\left[Co(NH_3)_6\right]^{3+}$

Answer: 3

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3. A gas in an open container is heated from $27^\circ C$ to $127^\circ C$. The fraction of the original amount at gas remaining in the container will be

A. $\left[Ni(PPh_3)_3Cl\right] = dsp^2$

B. $\left[Cu(CN)_4\right]^{3-} = sp^3$

C. $\left[Co(H_2O)_6\right]^{3+} = d^2sp^3$

D. $\left[Ni(NH_3)_6\right]^{2+} = sp^2d^2$

Answer: C

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4. A Vdm^3 flask contains gas A and another flask of $2Vdm^3$ contains gas B at the same temperature If density of gas A is $3.0gdm^{-3}$ and of gas B is $1.5gdm^{-3}$ and mo1 wt of $A = 1/2$ wt pf B then the ratio of pressure exerted by gases is .

A. $\left[Co(ox)_3\right]^{3-}$

B. $[PtCl_6]^{2-}$

C. $\left[Mn(CN)_6\right]^{3-}$

D. $\left[Fe(H_2O)_5NO\right]^{2+}$

Answer: D

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5. At low pressure, vander waal's equation is reduced to $\left[P+\frac{a}{V^2}\right]V=RT$. The compressibility factor can be given as :

A. $\begin{matrix} & A & B & C & D \\ (1) & c & a & b & d \end{matrix}$

B. $\begin{matrix} & A & B & C & D \\ (2) & a & c & d & b \end{matrix}$

C. $\begin{matrix} & A & B & C & D \\ (3) & a & d & c & b \end{matrix}$

D. $\begin{matrix} & A & B & C & D \\ (4) & c & b & a & d \end{matrix}$

Answer: D

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6. $300ml$ of a gas at $27^{\circ}C$ is cooled to $-3^{\circ}C$ at constant pressure, the final volume is

A. potassium amminedicyanide $-C-$ dioxidoperoxideochromate (VI)

B. potassium amminedicyanatotetraoxyochromium (III)

C. potassium amminedicyanochromate (IV)

D. potassium amminocyanodiperoxochromate (VI)

Answer: 1

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7. In the ideal gas equation, the gas constant R has the dimension of $-$

A. $\left[Cr(NH_3)_6\right]^{3+}, \left[Co[H_2O)_6\right]^{3}$

B. $\left[Cr(NH_3)_6\right]^{3+}, \left[Fe(H_2O)_6\right]^{2+}$

C. $\left[Co(NH_3)_6\right]^{2+}, \left[Cr(NH_3)_6\right]^{3+}$

D. $\left[Mn(H_2O)_6\right]^{2+}, \left[Fe(H_2O)_6\right]^{2+}$

Answer: C

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8. 3.7 g of a gas at 25°C occupies the same volume as 0.184 g of hydrogen at 17°C and at the same pressure.

What is the molecular mass of the gas ?

A. $3, 3, 3, 2$

B. $2, 4, 0, 6$

C. $2, 4, 2, 6$

D. $2, 4, 4, 4$

Answer: C

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9. 180 mL of a hydrocarbon diffuse through a porous membrane in 15 minutes, while 120 mL of SO_2 under identical conditions diffuse in 20 minutes. What is the molecular mass of the hydrocarbon ?

A. $\left[Co(en)(SCN)_4\right]^-$

B. $\left[Pt(en)_2ClBr\right]^{2+}$

C. $\left[Cr(\text{gly})_3\right]$

D. $\left[Pt(\text{gly})_2Cl_2\right]$

Answer: 1

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10. At what temperature will hydrogen molecules have the same root mean square speed as nitrogen molecules at $27^\circ C$?

A. CN^-

B. SCN^-

C. CO

D. NO_2^-

Answer: 3

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11. What is the total pressure exerted by the mixture of $7.0g$ of N_2, $2g$ of hydrogen and $8.0g$ of sulphur dioxide gases in a vessel of $6L$ capacity that has been kept at $27^\circ C$.

A. the number of only anionic ligands bonded to metal ion

B. the number of ligands around a metal ion bonded by pi bonds

C. the number of only neutral ligands around a metal ion bonded by sigma bonds

D. the number of sigma bonds between the ligands and the central atom/ ion i.e. the number of ligand donor atoms to which the metal is directly attached.

Answer: D

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12. An open flask containing air is heated from 300 K to 500 K. What percentage of air will be escaped to the atmosphere, if pressure is keeping constant?

A. $\left[Co(NH_3)_3(H_2O)_2Cl\right]Cl_2$

B. $\left[Co(NH_3)_3(H_2O)Cl_3\right]$

C. $\left[Co(NH_2)_3(H_2O)_2Cl\right]$

D. $\left[Co(NH_3)_3(H_2O)_3\right]Cl_3$

Answer: 1

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13. At STP, a container has 1 mole of He, 2 mole Ne, 3 mole O_2 and 4 mole N_2. Without changing total pressure if 2 mole of O_2 is removed . The partial pressure of O_2 will be decreased by :

A. $\left[Cr(H_2O)_5Cl\right]Cl_2.H_2O$

B. $\left[Co(NH_3)_6\right]Cl_3$

C. $\left[Cr(H_2O_3)_4Cl_2\right.$

D. $\left[Cr(H_2O)_6\right]Cl_3$

Answer: 4

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14. Density of methane , at $250^\circ C$ and 6 atm pressure, is $[R = 0.0821 atm]$:

A. $K_4[Fe(CN)_6]$

B. $[Co(H_2O)_4Cl_2]Cl_3$

C. $[Cu(NH_3)_4]Cl_2$

D. $[Nl(CO)_4]$

Answer: A

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15. The ratio among most probable speed, mean speed and root mean square speed is given by

A. 36

B. 34

C. 38

D. 40

Answer: 1

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16. The compressibility factor for nitrogen at 330 K and 800 atm is 1.90 and at 570 K and 200 atm is 1.10. A certain mass of N_2 occupies a volume of 1 dm^3 at 330 K and 800 atm. Calculate volume occupied by same quantity of N_2 gas at 570 K and 200 atm :

A. $\left[Ti(H_2O)_6\right]Cl_2$

B. $K_2[CrO_4]$

C. $\left[Cr(H_2O)_6\right]^{3+}$

D. $\left[Cu(H_2O)_4\right]^{3+}$

Answer: 2

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17. If the weight of 5.6 litres of a gas at $N.T.P.$ is 11 gram. The gas may be :

A. s, p_x, p_y, d_{yz}

B. $s, p_x, p_y, d_{x^2-y^2}$

C. s, p_x, p_y, d_{x^2}

D. s, p_x, p_y, d_{xy}

Answer: B

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18. The density of vapour of a substance (X) at 1 atm pressure and 500 K is 0.8 kg/m^3. The vapour effuses through a small hole at a rate of 4/5 times slower than oxygen under the same condition. What is the compressibility factor (Z) of the vapour?

A. $\left[Co(ox)_3\right]^{3-}$

B. $\left[Cr(NH_3)_6\right]^{3+}$

C. $\left[Mn(CN)_6\right]^{3-}$

D. $\left[Zn(NH_3)_6\right]^{2+}$

Answer: 4

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19. The volume of $2.8g$ of CO at $27^\circ C$ and $0.821atm$ pressure is $(R = 0.0821$ lit. atm $mol^{-1}K^{-1})$

A. d^2sp^3

B. sp^2d^2

C. d^3sp^2

D. dsp^3

Answer: B

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20. For a real gas $'G'$ $Z > 1$ as STP Then for $'G'$:

Which of the following is true :

A. $\left[NiCl_2(PPh_3)_2\right]^{2+}$

B. $\left[Co(SCN)_4\right]^{2-}$

C. $\left[PtCl_2(NH_3)_2\right]$

D. $[CrCl_4]^-$

Answer: 3

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21. Following graph represents a pressure (P) volume (V) relationship at a fixed temperature (T) for n moles of a real gas. The graph has two regions marked. (I) and (II). Which of the following options is true.

A. $[PdCl_4]^{2-}$

B. $[Ni(CN)_4]^{2-}$

C. $[Pd(CN)_4]^{2-}$

D. $[NiCl_4]^{2-}$

Answer: 4

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22. A small bubble rises from the bottom of a lake, where the temperature and pressure are $8^{\circ}C$ and 6.0 atm, to the water's surface, where the temperature is $25^{\circ}C$ and pressure is 1.0 atm. Calulate the final volume of the bubble if its initial volume was 2 mL.

A. $\left[Co(H_2O)_6\right]^{3+}$

B. $\left[Co(NH_3)_6\right]^{3+}$

C. $\left[Co(CN)_6\right]^{3-}$

D. $\left[Co(C_2O_4)_3\right]^{3-}$

Answer: 3

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23. Oxygen gas generated by the decomposition of potassium chorate is collected over water. The volume of wxygen collected at $24^\circ C$ and atmospheric pressure of 760 mmHg is 128 mL. Calculate the mass of oxygen gas obtained. The pressure of the water vapour at $24^\circ C$ is 22.4 mmHg.

A. $\left[Cr(NH_3)_6\right]^{3+}$

B. $\left[Co(NH_3)_6\right]^{3+}$

C. $\left[Zn(NH_3)_6\right]^{3+}$

D. $\left[Ni(NH_3)_6\right]^{2+}$

Answer: A

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24. The root mean square speed of hydrogen is $\sqrt{5}$ times than that of nitrogen. If T is the temperature of the gas, then :

A. $[CrCl_4]^-, [FeCl_4]^-$

B. $[Ni(NH_3)_6]^{2+}, [Zn(NH_3)_6]^{2+}$

C. $[MnCl_6]^{3-}, [FeF_5]^{3-}$

D. $[Co(CN)_6]^{3-}, [Co(C_2O_4)_2]^{3-}$

Answer: D

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25. A gaseous mixture containing He, CH_4 and SO_2 in $1:2:3$ mole ratio, calculate the molar ratio of gases effusing out initially.

A. $\left[Cr(CO)_6\right]$

B. $\left[Zn(NH_3)_2\right]^{2+}$

C. $[CoF_6]^{3-}$

D. $\left[Mn(CN)_6\right]^{3-}$

Answer: 4

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26. 6×10^{22} gas molecules each of mass 10^{-24} kg are taken in vessel of 10 litre . What is the pressure exerted by gas molecules? The root mean square speed of gas molecules is 100 m/s.

A. Linkage

B. Geometrical

C. Ionization

D. Optical isomerism

Answer: C

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27. Two flask A and B of equal volumes maintained at temperature 300 K and 700 K contain equal mass of He(g) and $N_2(g)$ respectively. What is the ratio of translational kinetic energy of gas in flask A to that of flask B?

A. $\left[M(AA)_2\right]$

B. $[MA_3B_3]$

C. $\left[M(AA)_3\right]$

D. $[MABCD]$

Answer: 2

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28. The density of gas A is twice that to B at the same temperature. The molecular weight of gas B is twice that of A. The ratio of pressure of gas A and B will be :

A.

$$Cis - \left[CrCl_2(OX)_2\right]^{2-}, \text{trans} - \left[CrCl_2(OX)_2\right]^{3-}$$

B. $\left[Fe(NH_3)_2(CN)_4\right]^{-}\left[Fe(en)_3\right]^{3+}$

C. $Cis - \left[Pt(en)_2Cl_2\right]^{2+}, \left[Co(en)_3\right]^{3+}$

D. $Cis - \left[Co(NH_3)_4(NO_2)_2\right]^{+}, cis\left(Cr(gly)_3\right]$

Answer: C

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29. A balloon weighing 50 kg is filled with 685 kg of helium at 1 atm pressure and $25^{\circ}C$. What will be its pay load if it displaced 5108 kg of air?

A. $IV > III > II > I$

B. $I > II > III > IV$

C. $III > IV > II > I$

D. $II > III > I > IV$

Answer: 1

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30. At 273 K temperature and 9 atm pressure, the compressibility for a gas is 0.9. The volulme of 1 milli-

mole of gas at this temperature and pressure is :

A. Ag^+ ions with an excess of a solution containing CN^- ions form a complex having coordination number two.

B. $PtCl_3\left(n^2 - C_2H_4\right)$, an organometallic compound is σ and π bonded.

C. Vitamin B_{12} is a coordination compound of cobalt.

D. $RhCl(PPh_3)_3$, a Wilkinson catalyst has sp^3 hybridisation and is used for the hydrogenation of alkenes.

Answer: D

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31. Calculate the volume occupied by 16 gram O_2 at 300 K and 8.31 Mpa if $\frac{P_cV_c}{RT_c} = 3/8$ and $\frac{P_rV_r}{T_r} = 2.21$ (Given : R=8.314 j/k-mol)

A. $6, 5, 4$

B. $3, 2, 1$

C. $0, 1, 2$

D. $3, 3, 3$

Answer: 4

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32. Density of dry air (only N_2 and O_2) is $124 g \text{litre}^{-1}$ at 760 mm and 300 K. Find the partial pressure of N_2 gas in air (Take $R = \frac{1}{12}$ litre atm/mol K , mol. wt. of N_2 = 28)

A. $\left[CoBr(NH_3)_5SO_4\right.$ and $\left.\left[Co(SO_4)(NH_3)_5\right]Br\right.$

B. $\left[CoCl_2(NH_3)_4\right.$ and $\left.\left[CoCl(NO_2)(NH_3)_4\right]Cl\right.$

C. $\left[PtCl_2(NH_3)_4Br\right.$ and $\left.\left[PtBr_2(NH_3)_4\right]Cl\right.$

D. $\left[Co(NO_2)(NO_3)_5Cl_2\right.$ and $\left.\left[Co(ONO)(NH_3)_5\right]Cl_2\right.$

Answer: 1

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33. The mass of molecule A is twice the mass of molecule B. The rms speed of A is twice the rms speed of B. If two samples of A and B contain same number of molecules. If the pressure of gas B is 2atm then what will be the pressure of gas A (atm) . If two samplest are taken in separate containers of equal volume ?

A. sp^3 and dsp^2

B. sp^3 and sp^3

C. dsp^2 and dsp^2

D. dsp^2 and sp^3

Answer: 1

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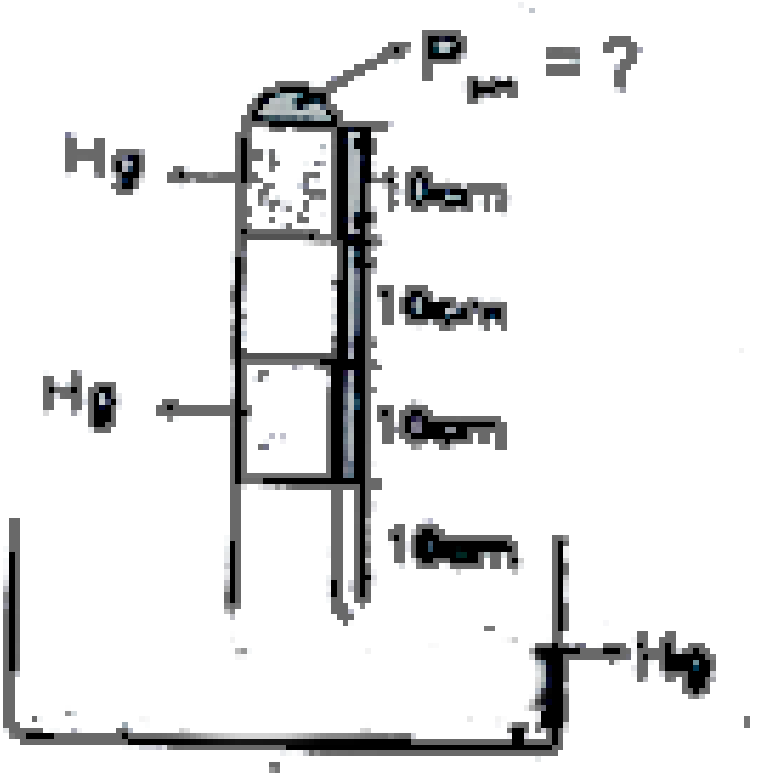
34. In the above figure mercury columns of $10cms$ each are trapped between gas columns of $10cm$ each . If $P_{atm} = 75cm$ of Hg then the gas pressure in the topmost column will be



A. $\left[Cr(en)_2Cl_2\right]^+$, $\left[Cr(en)_3\right]^{3+}$

B. $\left[Co(NH_3)_4Cl_2\right]^+, \left[Co(en)_2Cl_2\right]^+$

C.

$[Pt(NH_3)(H_2O)Cl_2], \left[Co(NH_3)_2(NO_2)\right](NO_3)_2$

D. $\left[Fe(NH_3)_2\right]^+, \left[Fe(NH_3)(CN)_5\right]^{2-}$

Answer: 2

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35. $3.06L$ of H_2O vapour is taken at a pressure of $1atm$ and $373K$. It is now condensed to $H_2O(l)$ at $300K$. Calculate the approximate volume occupied by $H_2O(l)$: (Assume density of liquid water at $300K = 1000kg/m^3$)

A. 2

B. 3

C. 4

D. 1

Answer: B

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36. A mixture of two gases A and B in the mole ratio $2:3$ is kept in a 2 litre vessel. A second 3 litre vessel has the same two gases in the mole ratio $3:5$. Both gas mixtures have the same temperature and same pressure. They are allowed to intermix and the final

temperature and pressure are the same as the initial values, the final volume beingh 5 litres. Given theat the molar masses are M_A and M_B . what is the mean molar mass of the final mixture :

A. Both $\left[Ti(H_2O)_6\right]Cl_3$ and $\left[Ni(H_2O)_6\right]Cl_2$ are coloured solutions.

B. Removal of water from $\left[Ti(H_2O)_6\right]Cl_3$ on heating renders it colourless

C. The metal carbon bond carbonlys possess both s and p character

D. The $M - C\pi$ bond in metal carbonly is formed by the donation of a pair of electrons from the

carbon monoxide into a vacant orbital of the metal.

Answer: 4

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Organic Chemistry Hydrocarbon

1. A certain quantity of a gas occupied $100ml$ when collected over water at $15^\circ C$ and $750mm$ pressure . It occupies $91.9ml$ in dry state at NTP. Find the $V.P.$ of water at $15^\circ C$

A. CH_3CH_2CHO

B. CH_3CH_2COOH

C. $CH_3 - C(OH) = CHOH$

D. 63mm

Answer: D

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2. The virial equation for 1mole of a real gas is written as

:

$$PV = RT$$

$$\left[1 + \frac{A}{V} + \frac{B}{V^2} + \frac{C}{V^3} + \text{.....To higher power of } n\right]$$

Where $A, B,$ and C are known as virial coefficients . If

Vander wall's equation is written in virial form, then what will be value of B:

A. 6

B. 2

C. 3

D. 4

Answer: D

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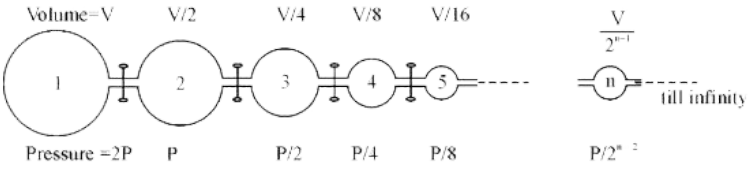
3.



Infinite number of flask are connected to one another as shown above. The volumes and pressure in each flask vary as shown. The stopcocks are initially closed. The common pressure, when all the stopcocks are opened, is : (Assume constant temperature)

A. $26.8\ \%$

B. $25\ \%$

C. $30\ \%$

D. $50\ \%$

Answer: 3

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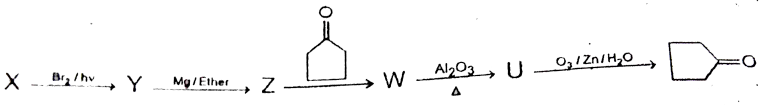
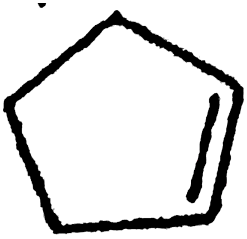
4. At point P and Q , the real gas deviation with respect to ideal gas is respectively :

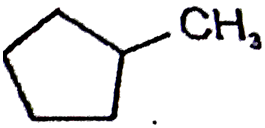


A. (1)

B.

C.



D. 

Answer: 1

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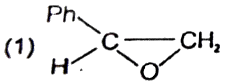
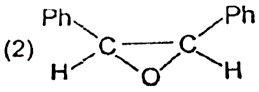
5. A real gas most closely approaches the behaviour of an ideal gas at:

A. 

B. 

C. $Ph - CH_2 - CHO$

D. $Ph - \overset{\overset{O}{||}}{C} - CH_3$

Answer: 1

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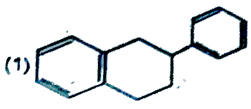
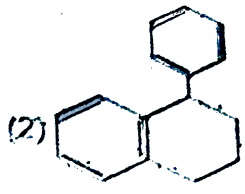
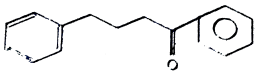
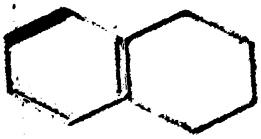
6. If the number of molecules of SO_2 (atomic weight=64) effusing through an orifice of unit area of cross-section in unit time at $0^\circ C$ and 1 atm pressure in n. the number of He molecules (atomic weight=4) effusin under similar conditions at $273^\circ C$ and 0.25 atm is:

A. 

B. 

C. 

D. 

Answer: A

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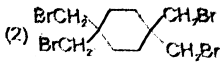
7. A gaseous mixture contains three gases A,B and C with a total number of moles of 10 and total pressure of 10 atm. The partial pressure of A and B are 3 atm and 1

atm respectively. If C has molecular weight of 2 g/mol. then, the weight of C present in the mixture will be :

A. $(BrCH_2)_3CCH_2CH_2C(CH_2Br)_2$

B. 

C. 

D. 

Answer: 4

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8. 1 mol of a gaseous aliphatic compound $C_nH_{3n}O_m$ is completely burnt in an excess of oxygen. The

contraction in volume in (assume water gets condensed out):

A. Melting point of neo $-$ pentane is greater than that of $n-$ pentane but the boiling of $n-$ pentane is more than that of neo $-$ pentane.

B. Melting point depends upon packing in crystal lattic whereas boiling point depends upon surface area of the molecule.

C. Propene is less reactive than ethene towards electrophilic addition reaction.

D. Electron density of double bond increases due to hyperconjugation of methyl group.

Answer: 3

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9. At what temperature will the molar kinetic energy of 0.3 mol of He be the same as that of 0.4 mol of argon at 400 K ?

A. Monobromination of $2-$ methyl butane prodces 3° bromide as major product where as monochlorination of $2-$ methyl butane produces 2° chloride as major product.

B. Halogenation of alkane in presence of sunlight , is followed through fee radical mechnism.

C. In the reaction of propence with H_2O & Br_2H_2O is act as nucleophile.

D. Alkanes undergo electrophilic substitution reaction generally.

Answer: 4

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10. The volume of a gas increases by a factor of 2 while the pressure decrease by a factor of 3 Given that the

number of moles is unaffected, the factor by which the temperature changes is :

A. Methyl radical

B. Ethyl radical

C. $n-$ propyl radical

D. tert $-$ butyl radical

Answer: 4

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11. Which has maximum internal energy at 290 K?

A. $CH_3-\underset{\underset{C_2H_5}{|}}{CH}-D$

B. $CH_3 - \underset{\underset{C_2H_5}{|}}{CH} - OC_2H_5$

C. $CH_3 - \overset{\overset{D}{|}}{\underset{\underset{C_2H_5}{|}}{C}} - H$

D. $CH_3 - CH_2 - \overset{\overset{D}{|}}{\underset{\underset{CH_3}{|}}{C}} - OC_2H_5$

Answer: 3

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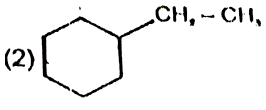
12. There are 6.02×10^{22} molecules each of N_2, O_2 and H_2 which are mixed together at $760mm$ and $273K$. The mass of the mixture in grams is :

A. $CH_3 - CH_2 - CH_2 - CH_3$

B. 

C. $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - CH_2$

D. $CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH_2 - CH_2 - CH_3$

Answer: C

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13. At $27^\circ C$, a ges is compressed to half of its volume . To what temperature it must now be heated so that gas occupies just its original volume ?

A. H_2

B. CO_2

C. CH_4

D. $CH_3 - CH_3$

Answer: A

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14. A gas in an open container is heated from $27^\circ C$ to $127^\circ C$. The fraction of the original amount at gas remaining in the container will be

A. increases

B. decreases

C. remains same

D. can not be predicted

Answer: A

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15. A Vdm^3 flask contains gas A and another flask of $2Vdm^3$ contains gas B at the same temperature If density of gas A is $3.0gdm^{-3}$ and of gas B is $1.5gdm^{-3}$ and mo1 wt of $A = 1/2$ wt pf B then the ratio of pressure exerted by gases is .

A. $CH_3 - CH_3$

B. $CH_2 = CH_2$

C. $CH_3 - CH_2 - CH_2 - CH_3$

D. A mixture of 1,2 and 3

Answer: 4

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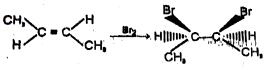
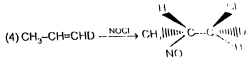
16. At low pressure, vander waal's equation is reduced to $\left[P + \frac{a}{V^2}\right]V = RT$. The compressibility factor can be given as :

A. 

B. 

C. $CH_3 - CH = CH_2 \xrightarrow[H_2O]{Br_2} CH_3 - \overset{Br}{\underset{|}{CH}} - \underset{OH}{\underset{|}{CH_2}}$

D. 

Answer: 1

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17. $300ml$ of a gas at $27^\circ C$ is cooled to $-3^\circ C$ at constant pressure, the final volume is

A. $(i)\&(ii)$

B. $(ii)\&(iii)$

C. $(i)\&(iii)$

D. $(ii)\&(iv)$

Answer: 3

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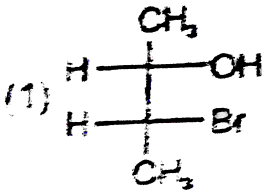
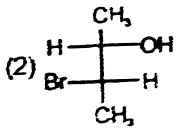
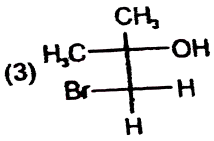
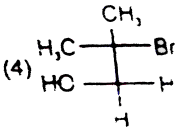
18. In the ideal gas equation, the gas constant R has the dimension of $-$

A. 

B. 

C. 

(4) 

D.

Answer: 2

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