



CHEMISTRY

BOOKS - MTG WBJEE CHEMISTRY (HINGLISH)

STATES OF MATTER (SOLIDS, LIQUIDS AND GASES)

**Wbjee Workout Category 1 Single Option Correct
Type**

1. When an ideal undergoes unrestrained expansion, no cooling occurs because the molecules

A. are above the inversion temperature

B. exert no attraction force on each

C. do work equal to loss in kinetic energy

D. collide without loss of energy.

Answer:



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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 ?

A. 1

B. 4

C. 3

D. 8

Answer:



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3. According to kinetic theory of gases, for a diatomic molecule

A. the pressure exerted by the gas is proportional to the mean velocity of the molecules

B. the pressure exerted by the gas is proportional to the root mean square velocity of the molecules

C. the root mean square velocity is inversely proportional to the temperature

D. the mean translational kinetic energy of the molecules is proportional to the absolute temperature.

Answer:



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4. In orthorhombic, the values of a, b and c are respectively 4.2\AA and 8.3\AA . Given the molecular of the solute of 155g mol^{-1} and density is 3.3 g /cc the number of formula units per unit cell is

A. 2

B. 3

C. 4

D. 6

Answer:



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5. Which out of the following statements is false?

A. Avogadro number = 6.02×10^{21}

B. The relationship between average velocity (\bar{v}) and root mean square velocity (u) is $(\bar{v}) = 0.912u$.

C. The mean kinetic energy of an ideal gas is independent of the pressure of the

gas.

D. The root mean square velocity of the gas

can be calculated by the formula

$$(3RT / M)^{1/2}.$$

Answer:



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6. The vapour pressure of a liquid varies with

temperature as $\log P = -\frac{A}{T} + I$. The plot

of

A. $\log P$ against T will be a straight line

B. $\log P$ against $1/T$ will be straight line

C. $\log P$ against I will be a parabola

D. None of these

Answer:



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7. In the laboratory, sodium chloride is made by burning sodium in the atmosphere of

chlorine. The salt obtained is yellow in colour.

The cause of yellow colour is

A. presence of Na^+ ions in the crystal lattice

B. presence of Cl^- ions in the crystal lattice

C. presence of electrons in the crystal lattice

D. presence of face centred cubic crystal lattice.

Answer:



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8. The van der Waal's parameters for gases W,X,Y and Z are

Gas	a ($\text{atm L}^2 \text{mol}^{-2}$)	b (L mol^{-1})
<i>W</i>	4.0	0.027
<i>X</i>	8.0	0.030
<i>Y</i>	6.0	0.032
<i>Z</i>	12.0	0.027

Which one of these gases has highest critical temperature?

A. W

B. X

C. Y

D. Z

Answer:



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9. If in diamond there is a unit cell of carbon atoms as fcc and if carbon atom is sp^3 hybridised, what fractions of voids are occupied by carbon atom?

A. 0.25

B. tetrahedral

C. 50% tetrahedral

D. 25% octahedral

Answer: A::C::D



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10. An electronic vacuum tube was sealed off during an experiment at a pressure of 8.2×10^{-10} atm at $27^\circ C$. The volume of the

tube was 30dm^3 . The number of gas molecules remaining in the tube are

A. 6.02×10^{14}

B. 49.4×10^{23}

C. 24.6×10^6

D. $8.2 \times 30 \times 6.02 \times 10^{23}$

Answer:



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11. 0.5 mole of each H_2 , SO_2 and CH_4 are kept in a container. A hole was made in the container. After 3 hours, the order of partial pressures in the container will be

A. $P_{SO_2} > p_{CH_4} > P_{H_2}$

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

C. $P_{CH_4} > P_{SO_2} > p_{H_4}$

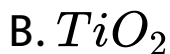
D. $P_{CH_2} > P_{CH_4} > P_{SO_2}$

Answer:



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12. Which of the following metal oxides is antiferromagnetic in nature?



Answer:



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13. The liquid is in equilibrium with its vapours at its boiling point. On the average, the molecules in the two phases have equal

- A. potential energy
- B. total energy
- C. kinetic energy
- D. intermolecular forces

Answer:



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14. A metal crystallises in a simple cubic unit cell. If the edge length of the unit cell is 565.6 pm then, radius of metal atom is

A. 282.8 pm

B. 400 pm

C. 200 pm

D. 245 pm

Answer:



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15. N_2 is found in a litre flask under 100 kPa pressure and O_2 is found in another 3 litre flask under 320 kPa pressure. If the two flasks are connected, the resultant pressure is

A. 310 kPa

B. 210 kPa

C. 420 kPa

D. 265 kPa

Answer:



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16. Select the wrong statement.

A. The C.N. of cation occupying a tetrahedral hole is 4.

B. The C.N. of cation occupying an octahedral hole is 6.

C. In Schottky defects, density of the lattice decreases.

D. In Frenkel defects, density of the lattice increases.

Answer:



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17. The numerical value of N/n (where N is the number of molecules in a given sample of the

gas and n is the number of moles of the gas)

is

A. 8.314

B. 6.02×10^{23}

C. 0.0821

D. 1.66×10^{-19}

Answer:



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18. Which one of the following is expected to have maximum viscosity at a given temperature?

- A. Acetic acid
- B. Water
- C. Entylene glycol
- D. Acetone

Answer:



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19. For an ionic crystal of the general formula AX and co- ordination no. 6, the radius ratio value will be

A. > 0.73

B. between 0.732 and 0.414

C. between 0.41 and 0.22

D. < 0.22

Answer:



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20. Slope of the plot between V and P at constant temperature

A. zero

B. 1

C. $1/2$

D. $1\sqrt{2}$

Answer:



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

A. $1.24 \times 10^2 J$

B. $2.24 \times 10^2 J$

C. $1.24 \times 10^3 J$

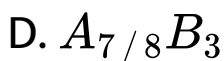
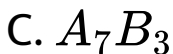
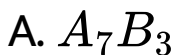
D. $2.24 \times 10^3 J$

Answer:



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22. In a face centred cubic arrangement of A and B atoms, A atoms are at the corners of the unit cell and B atoms at the face centres. One of the A atom is missing from one corner in the unit cell. The simplest formula of the compound is



Answer:



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23. What is the pressure of 2 mole of NH_3 at $27^\circ C$ when its volume is 5 litre in van der Waals' equation?

($a=4.17$, $b=0.03711$)

A. 10.33 atm

B. 9.33 atm

C. 9.74 atm

D. 9.2 atm

Answer:



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24. Which of the following statements is correct if the intermolecular forces in liquids A, B and C are in the order $A < B < C$?

A. B evaporates more readily than A.

B. B evaporates less readily than C.

C. A and B evaporate at the same rate.

D. A evaporates more readily than C.

Answer:



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25. Hydrogen diffuses six time faster than gas

A. tham molar mass of gas A is

A. 72

B. 6

C. 24

D. 36

Answer:



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26. When the temperature is increased, surface tension of water

A. increases

B. decreases

C. remains constant

D. show irregular behaviour

Answer:



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27. Containers A and B have same gas. Pressure, volume and temperature of A are all twice that of B. Then the ratio of the number of molecules of A and B are

A. 1 : 2

B. 2 : 1

C. 1 : 4

D. 4 : 1

Answer:



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28. Select the incorrect statement

A. For CsCl unit cell (edge length= a)

$$r_c + r_a = \frac{\sqrt{3}}{2}a$$

B. For NaCl unit cell (edge length= l),

$$r_c = r_a + \frac{l}{2}$$

C. The void space in a bcc unit cell is 0.68

D. The void space % in a face centered unit cell is 26

Answer:



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29. At constant volume and temperature conditions the rates of diffusion D_A and D_B of gases A and B having densities ρ_A and ρ_B are related by the expression

A. $D_A = \left[D_B \cdot \frac{\rho_A}{\rho_B} \right]^{1/2}$

B. $D_A \cdot \left[\frac{\rho_B}{\rho_A} \right]^{1/2}$

C. $D_A = D_B \left(\frac{\rho_A}{\rho_B} \right)^{1/2}$

D. $D_A = D_B \left(\frac{\rho_B}{\rho_A} \right)^{1/2}$

Answer:



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30. Non- stoichiometric metal deficiency is show in the salts of

A. all metals

B. alkali metals only

C. alkaline earth metals only

D. transition metals only

Answer:



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Wbjee Workout Category 2 Single Option Correct Type

1. Consider the following statements. If the van der Waals' parameters of two gases are given as $a / dm^6 \text{ bar mol}^{-2}$ $b / dm^3 - \text{mol}^{-1}$

<i>Gas A</i>	6.5	0.056
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<i>Gas B</i>	18.0	0.011
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then

1. critical volume $A >$ critical volume of B

2. critical pressure of $A >$ critical pressure of

B

3. critical temperature of A > critical temperature of B

Which of the above statements is/are correct?

A. 1 alone

B. 1 and 2

C. 1,2 and 3

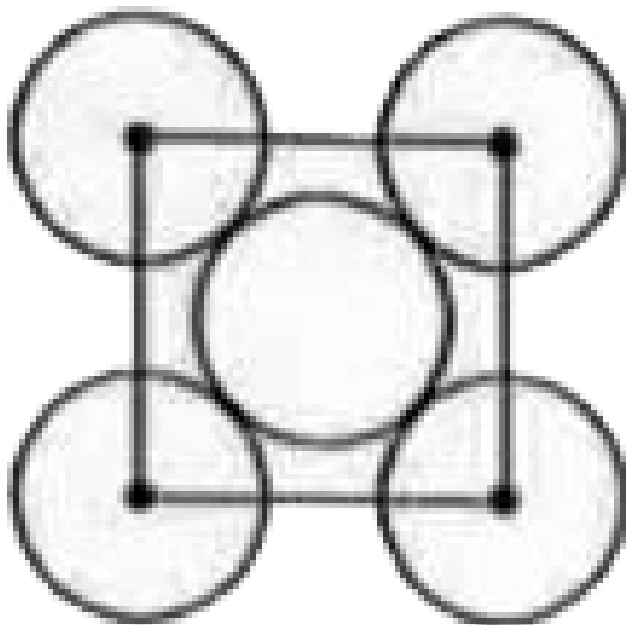
D. 2, and 3

Answer:



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2. The packing efficiency of the two dimensional square unit cell shown below is



A. 0.5025

B. 0.6802

C. 0.7405

D. 0.785

Answer:



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3. At normal temperature the barometric pressure is 76 cm, then the height of water column if water is used instead of mercury is (Give: density of mercury and water at the same temperature is 13.6 g/cc and 0.999 g/cc)

A. 1034.6 cm

B. 9230.2cm

C. 10346 .08 cm

D. 103.46 cm

Answer:



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4. Which of the following expressions is correct for an ideal gas?

$$\text{A. } P = \frac{2}{3} \frac{V}{N_A} \bar{E}$$

$$\text{B. } P = \frac{3}{2} \frac{v}{N_A} \bar{E}$$

$$\text{C. } P = \frac{2}{3} \frac{N_A}{V} \bar{E}$$

$$\text{D. } P = \frac{3}{2} \frac{N_A}{V} \bar{E}$$

Answer:



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5. Total number of voids in 0.5 mole of a compound forming hexagonal closed packed structure are

A. 60.22×10^{23}

B. 3.011×10^{23}

C. 9.034×10^{23}

D. 4.516×10^{23}

Answer:



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6. The volume of 0.0168 mol of O_2 obtained by decomposition of $KClO_4$ and collected by displacement of water is 428 mL at a pressure

of 754 mm Hg at $25^{\circ}C$. The pressure of water vapour at $25^{\circ}C$

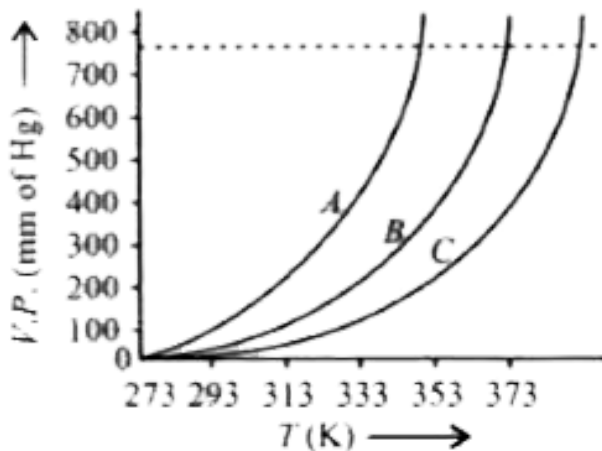
- A. 18 mm Hg
- B. 20 mm Hg
- C. 22 mm Hg
- D. 24 mm Hg

Answer:



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7. A graph between vapour pressure and temperature of few liquids is given below. Study the graph and answer following question.



Which of the following statements is not true?

- A. Boiling point of a liquid is the temperature at which its vapour

pressure becomes equal to atmospheric pressure.

B. Boiling point of water can be increased by increased the pressure above the atmospheric pressure

C. If liquid B is heated in a closed vessel it will boil at 353 K

D. Liquid C has higher boilingk point than B due to higher intermolecular forces.

Answer:



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8. If the partition is removed the average molar mass of the sample will be (Assume ideal behaviour).

H_2	D_2
16.42 L	16.42 L
300 K	300 K
3 atm	6 atm

A. $\frac{1}{2}$ g/mol

B. $\frac{10}{3}$ g/mol

C. $\frac{3}{2}$ g/mol

D. $\frac{5}{3}$ g/mol

Answer:



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9. 22 g of dry ice is placed in an evacuated bottle of 1 litre capacity and tightly stoppered. What would be the pressure (in atm) inside the bottle, when it is heated to $37^{\circ}C$?

A. 12.71

B. 127.1

C. 1.27

D. 0.127

Answer:



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10. A bubble of air is underwater at temperature $15^{\circ}C$ and the pressure 1.5 bar. If the bubble rises to the surface where the

temperature is $25^{\circ}C$ and the pressure is 1.0 bar, what will happen to the volume of the bubble?

A. Volume will become greater by a factor of 1.6

B. Volume will become greater by a factor of 1.1

C. Volume will become smaller by a factor of 0.70

D. Volume will become greater by a factor of 2.5

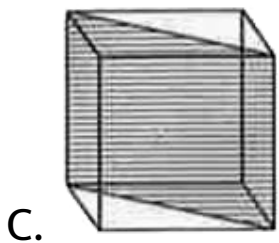
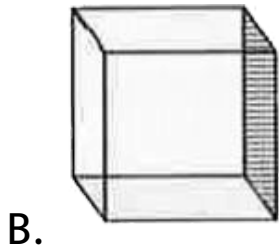
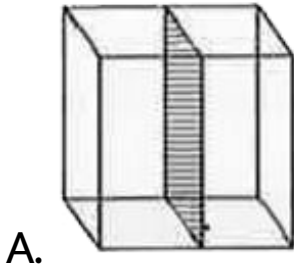
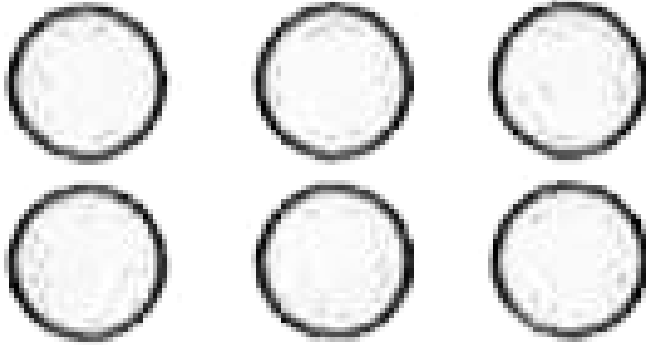
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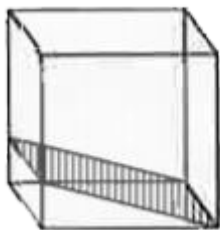


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11. Which of the following shaded plane in fcc lattice contains arrangement of atoms as

shown below:





D.

Answer:



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12. One litre of gas A at 2 atm pressure at $27^{\circ}C$ and two litres of gas B at 3 atm pressure at $127^{\circ}C$ are mixed in a 4 litre vessel. The temperature of the mixture is maintained at

327°C. What is the total pressure of the gaseous mixture?

A. 3.93 atm

B. 3.25 atm

C. 4.25 atm

D. 6.25 atm

Answer:



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13. Pick out the wrong statements(s)

(i) Vapour pressure of a liquid is the measure of the strength of intermolecular attractive forces.

(i) Surface tension of a liquid acts perpendicular to the surface of the liquid.

(iii) Vapour pressure of all liquids is same at their freezing points.

(iv) Liquids with stronger intermolecular attractive forces are more viscous than those with weaker intermolecular force.

A. ii,iii and iv

B. ii and iii

C. I,ii and iii

D. iii only

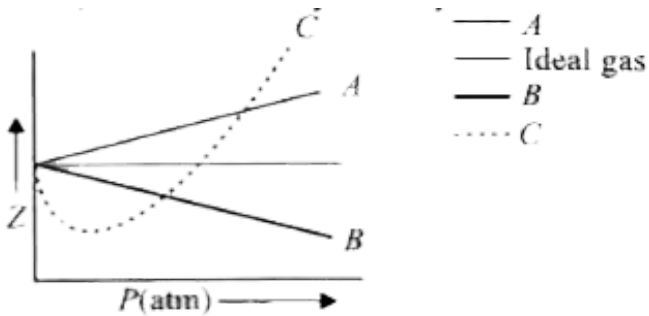
Answer:



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14. The given graph represents the variation of Z (compressibility factor $= \frac{PV}{nRT}$) versus P, for three real gases A,B and C. Identify the only

incorrect statement.



A. For the gas A, $a=0$ and its dependence on

P is linear at all pressures

B. For the gas B, $b=0$ and its dependence

on P is linear at all pressures.

C. For the gas C, which is typical real gas

for which neither $a=0$ nor $b=0$. By

knowing the minima and the point of intersection, with $Z=1$, a and b can be calculated.

D. At high pressure, the slope is positive for all real gases.

Answer:



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15. Volume occupied by single CsCl ion part in a crystal is $7.014 \times 10^{-23} \text{ cm}^3$. The smallest Cs-Cs internuclear distance is equal to length of the side of the cube corresponding to volume of one CsCl ion pair. The smallest Cs to Cs internuclear distance is nearly

A. 4.4 \AA

B. 4.3 \AA

C. 4.0 \AA

D. 4.5 \AA

Answer:



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Wbjee Workout Category 3 One Or More Than One Option Correct Type

1. For the orthorhombic crystal system

A. no two sides are equal i.e. $a \neq b \neq c$

B. all crystallographic angles are equal to

90° i.e. $\alpha = \beta = \gamma = 90^\circ$

C. three kinds of unit cells are found, these are primitive, body centred and face centred

D. all four unit cells are found.

Answer:



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2. Which of the following are not true about voids formed in three dimensional hexagonal close packed structure?

A. A tetrahedral void is formed when a sphere of the second layer is present above triangular void in the first layer.

B. All the triangular voids are not covered by the spheres of the second layer.

C. Tetrahedral voids are formed when the triangular voids in the second layer lie above the triangular voids in the first layer and the triangular shapes of these voids do not overlap.

D. Octahedral voids are formed when the triangular voids in the second layer exactly overlap with similar voids in the first layer.

Answer:



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3. If a gas is expanded at constant temperature

A. the pressure decreases

B. the kinetic energy of the molecules
remains the same

C. the kinetic energy of the molecules
decreases

D. the number of molecules of the gas
increases.

Answer:



View Text Solution

4. Which of the following are correct about Charles' law?

A. $(\partial V / \partial t)_P = \text{constant}$

B. $V \propto P$ at constant P and n

C. $V \propto P$ at constant T, n

D. $V \propto 1/T$ at constant P, n

Answer:



View Text Solution

5. Which of the following statement(s) is (are) correct?

A. The coordination number of each type of ion in CsCl crystal is 8.

B. A metal that crystallizes in bcc structure has a coordination number of 12.

C. A unit cell of an ionic crystal shares some of its ions with other unit cells.

D. The length of the unit cell in NaCl is 552 pm.

$$(r_{Na^+} = 95\text{pm}, r_{Cl^-} = 181\text{pm})$$

Answer:



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6. If a graph is plotted between $\log V$ and $\log T$ for 2 moles of a gas of constant pressure of 0.0821 atm, then which of the following statements are correct?

A. The curve is straight line with slope -1.

B. The curve is straight line with slope +1

C. The intercept on y-axis is equal to 2.

D. The intercept on y-axis is equal to 0.3010.

Answer:



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7. If a is the edge length of a unit cell, then correct option (s) is/are

A. for simple cubic lattice, radius of metal

$$\text{atom} = \frac{a}{2}$$

B. for bcc lattice, radius of metal atom

$$= \frac{\sqrt{3}a}{2}$$

C. for fcc lattice, radius of metal atom

$$= \frac{a}{2\sqrt{2}}$$

D. distance between nearest neighbours

$$\text{for fcc } d = \frac{\sqrt{3}a}{2}$$

Answer:



View Text Solution

8. The correct statements regarding defects in solids are

A. Frenkel defect is usually favoured by a very small difference in the sizes of cation and anion

B. Frenkel defect is a dislocation defect

C. trapping of an electron in the lattice leads to the formation of F-center

D. Schottky defects have no effect on the physical properties of solids.

Answer:



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9. Identify the correct statement(s)

A. CsCl changes to NaCl structure on heating.

B. NaCl changes to CsCl structure on applying pressure

C. Co-ordination number decreases on applying pressure.

D. Co-ordination number increases on heating.

Answer:



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Wb Jee Previous Years Questions Category 1

Single Option Correct Type

1. A vander Waals' gas may behave ideally when

A. the volume is very low

B. the temperature is very high

C. the pressure is very low

D. the temperature, pressure and volume
all are very high.

Answer:



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2. Four gases P,Q,R and S have almost same values of b but their a values (a, b are van der Waals constants) are in the order $Q < R < s < P$. At a particular temperature, among the four gases the most easily liquefiable is

A. P

B. Q

C. R

D. S

Answer:



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3. At a certain temperature the time required for the complete diffusion of 200 mL of H_2 gas is 30 minutes. The time required for the

complete diffusion of 50 mL of O_2 gas at the same temperature will be

A. 60 minutes

B. 30 minutes

C. 45 minutes

D. 15 minutes.

Answer:



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4. For one mole of an ideal gas the slope of V vs. T curve at constant pressure of 2 atm is $X \text{ lit mol}^{-1} \text{K}^{-1}$. The value of the ideal universal gas constant R in terms of X is

- A. $X \text{ lit atm mol}^{-1} \text{K}^{-1}$
- B. $X/2 \text{ lit atm mol}^{-1} \text{K}^{-1}$
- C. $2X \text{ lit atm mol}^{-1} \text{K}^{-1}$
- D. $2X \text{ atm lit}^{-1} \text{mol}^{-1} \text{K}^{-1}$

Answer:



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5. The rms velocity of CO gas molecules at 27°C is approximately 1000 m/s. For N_2 molecules at 600 K the rms velocity is approximately

- A. 2000 m/s
- B. 1414 m/s
- C. 1000 m/s
- D. 1500 m/s

Answer:



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6. A gas can be liquefied at temperature T and pressure P provided

A. $T = T_c$ and $P < P_C$

B. $T < T_c$ and $P > P_c$

C. $T > T_C$ and $P > P_C$

D. $T > T_C$ and $P < P_C$

Answer:



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7. Suppose the mass of a single Ag atom is m . Ag metal crystallizes in fcc lattice with unit cell of length a . The density of Ag metal in terms of a and m is

A. $\frac{4m}{a^3}$

B. $\frac{2m}{a^3}$

C. $\frac{m}{a^3}$

D. $\frac{m}{4a^3}$

Answer:

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8. The units of surface tension and viscosity of liquids are respectively

A. $kgm^{-1}s^{-1}, Nm^{-1}$

B. $kg s^{-20}, kgm^{-1}s^{-1}$

C. $Nm^{-1}, kgm^{-1}s^{-2}$

D. $kg s^{-1}$, $kg m^{-2} s^{-1}$

Answer:



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9. Ionic solids with Schottky defect may contain in their structure

A. cation vacancies only

B. cation vacancies and interstitial cations

C. equal number of cation and anion vacancies

D. anion vacancies and interstitial anions.

Answer:



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10. Which of the following has the dimension of ML^0T^{-2} ?

A. Coefficient of viscosity

B. Surface tension

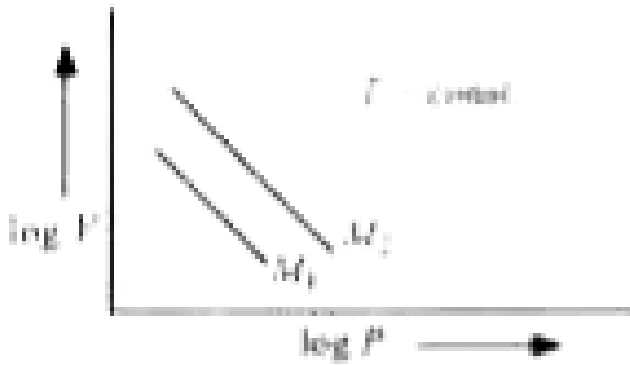
C. Vapour pressure

D. Kinetic energy

Answer:



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11.

For same mass of two different ideal gases of molecular weights M_1 and M_2 plots of $\log V$ vs $\log P$ at a given constant temperature are shown. Identify the correct option

A. $M_1 > M_2$

B. $M_1 = M_2$

C. $M_1 < M_2$

D. Can be predicted only if temperature is known.

Answer:



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12. A compound formed by elements X and y crystallises in the cubic structure , where X atoms at the corners of a cube and Y atoms are at the centres of the body . The formula of the compound is

A. XY

B. XY_2

C. X_2Y_3

D. XY_3

Answer:



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13. Equal weights of ethane and hydrogen and mixed in an empty container at $25^\circ C$. The

fraction of total pressure exerted by hydrogen
is

A. 1 : 2

B. 1 : 1

C. 1 : 16

D. 15 : 16

Answer:



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14. For an van der Waals' gas, the term $\left(\frac{ab}{V^2}\right)$

represents some

A. pressure

B. energy

C. critical density

D. molar mass

Answer:



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Wb Jee Previous Years Questions Category 2

Single Option Correct Type

1. The compressibility factor (Z) of one mole of a van der Waals gas of negligible a value is

A. 1

B. $\frac{bP}{RT}$

C. $1 + \frac{bP}{RT}$

D. $1 - \frac{bP}{RT}$

Answer:





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2. Among the following which should have the highest rms speed at the same temperature?

A. SO_2

B. CO_2

C. O_2

D. H_2

Answer:



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3. In a close packed centred cubic lattice of potassium the correct relation between the atomic radius (r) of potassium and the edge length (a) of the cube is

A. $r = \frac{a}{\sqrt{2}}$

B. $r = \frac{a}{\sqrt{3}}$

C. $r = \frac{\sqrt{3}}{2}a$

D. $r = \frac{\sqrt{3}}{4}a$

Answer:



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Wb Jee Previous Years Questions Category 3 One Or More Than One Option Correct Type

1. Two gases X (Mol. Wt M_X) and (Mol. Wt. $M_y, M_y > M_X$) are at the same temperature T in two different containers. Their root mean square velocities are C_x and C_Y respectively. If the average kinetic energies per molecule of two gases X and Y are $E_{X()}$ and E_Y

respectively, then which of the following relations (s) is (are) true?

A. $E_X > E_Y$

B. $C_X > C_Y$

C. $E_X = E_Y = \frac{3}{2}RT$

D. $E_X = E_Y = \frac{3}{2}k_B T$

Answer:



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