

GPLUS EDUCATION

Date :
Time :
Marks :

CHEMISTRY

STATES OF MATTER

Single Correct Answer Type

- Select incorrect statement
 - The properties of liquid crystals are intermediate between liquids and solids
 - Surface tension of a liquid is maximum at critical temperature
 - Viscosity decreases with increases in temperature
 - CO₂ and H₂O show the unusual properties of supercritical fluids
- The relation between molecular weight (M) and vapour density (VD) is:
 - $M = 2.5 \times VD$
 - $M = 2 \times VD$
 - $M = 0.5 \times VD$
 - $M = VD$
- Analysis shows that an oxide ore of nickel has formula Ni_{0.98}O_{1.00}. The percentage of nickel as Ni³⁺ ions is nearly
 - 2
 - 96
 - 4
 - 98
- In the calcium fluoride structure, the coordination number of the cation and anion are respectively
 - 4, 4
 - 6, 6
 - 4, 8
 - 8, 4
- In deriving the kinetic equation we make use of the root mean square speed of the molecules which is:
 - The average speed of molecules
 - The most probable speed of molecules
 - The square root of the average of the square of the speed of the molecules
 - The most accurate form in which speed can be used in the calculations
- Bravais lattices are of
 - 8 types
 - 9 types
 - 12 types
 - 14 types
- One poise is equal to:
 - 1 dyne sec⁻² cm
 - 1 dyne sec cm⁻²
 - 1 dyne sec⁻¹ cm⁻²
 - 1 dyne sec⁻¹ cm⁻¹
- The rate of diffusion of hydrogen is about
 - One half that of helium
 - 1.4 times that of helium
 - Twice that of helium
 - Four times that of helium
- The pressure of 2 moles of ammonia at 27° when its volume is 5 L according to van der Waals' equation is (Given, $a = 4.17, b = 0.3711$)
 - 10.33 atm
 - 9.33 atm
 - 9.74 atm
 - 9.2 atm
- The gases in the liquid form are held together by a weak attraction among the molecules, called as:
 - Nuclear attraction
 - Bond attraction
 - Van der Waals' attraction
 - Gravitational attraction
- The value of the molar gas constant is
 - $8.3145 \times 10^3 \text{ J (g mol)}^{-1} \text{ K}^{-1}$
 - 1.987 cal mol K⁻¹
 - $0.083145 \times 10^3 \text{ dm}^3 \text{ bar mol}^{-1} \text{ K}^{-1}$
 - $0.083145 \text{ dm}^3 \text{ bar mol}^{-1} \text{ K}^{-1}$
- For hydrogen gas $C_p - C_v = a$, and for oxygen gas $C_p - C_v = b$, so the relation between a and b is:
 - $a = 16b$
 - $16a = b$
 - $a = 4b$
 - $a = b$
- The solid NaCl is a bad conductor of electricity since
 - In solid NaCl, there is no velocity of ions
 - In solid NaCl, there are no ions
 - In solid NaCl, there are no electrons
 - Solid NaCl is covalent
- A gas deviates from ideal behaviour at a high pressure because its molecules

- a) Attract one another
 c) Have kinetic energy
- b) Show the Tyndall effect
 d) Are bound by covalent bonds
15. A closed vessel contains equal numbers of O_2 and H_2 molecules at same T . Which of the following is not true?
 a) The average speed of the hydrogen molecules is greater
 b) The hydrogen molecules strike the walls of the vessel more often
 c) The average kinetic energy of the two gases is the same
 d) The weight of H_2 is the same as the weight of oxygen
16. Two identical cylinders contain helium at 2.5 atm and argon at 1 atm respectively. If both the gases are filled in one of the cylinders, the pressure would be:
 a) 3.5 atm b) 1.75 atm c) 1.5 atm d) 1 atm
17. NH_3 and HCl gas are introduced simultaneously from the two ends of a long tube. A white ring of NH_4Cl appears first
 a) Nearer to the HCl end b) At the centre of the tube
 c) Throughout the tube d) Nearer to the NH_3 end
18. The molecular weight of O_2 and SO_2 are 32 and 64 respectively. If one litre of O_2 at $15^\circ C$ and 759 mm pressure contains N molecules, the number of molecules in two litre of SO_2 under the same conditions of temperature and pressure will be:
 a) $N/2$ b) N c) $2N$ d) $4N$
19. The pressure of a real gas is less than the pressure of an ideal gas because of
 a) Increases in the number of collisions b) Finite size of the molecules
 c) Increase in the kinetic energy d) Intermolecular forces
20. 32 g of O_2 , 2 g of H_2 and 28 g of N_2 at STP occupy separately a volume of
 a) 1 L b) 2 L c) 22.4 L d) 2.24 L
21. At what temperature is the rms speed of hydrogen molecules the same as that of oxygen molecules at $1327^\circ C$?
 a) 173 K b) 100 K c) 400 K d) 523 K
22. Mark out the wrong expression
 a) Boyle's temperature $T_B = \frac{b}{aR}$ b) Critical pressure $p_c = \frac{a}{27b^2}$
 c) Critical temperature, $T_c = \frac{8a}{27Rb}$ d) Critical volume $V_c = 3b$
23. Which is true statement?
 a) All liquid have concave meniscus
 b) All liquid have convex meniscus
 c) Mercury has convex and other liquids have concave meniscus
 d) Mercury has concave and other liquids have convex meniscus
24. If Z is the number of atoms in the unit cell that represents the closest packing sequence..... $ABC\ ABC\ \dots$, the number of tetrahedral voids in the unit cell is equal to
 a) Z b) $2Z$ c) $\frac{Z}{2}$ d) $\frac{Z}{4}$
25. A Dewar flask is usually used to:
 a) Measure the amount of liquid
 b) Measure known volumes of a gas
 c) Store distilled water
 d) Store liquid air
26. What is the coordination number of sodium in Na_2O ?
 a) 2 b) 4 c) 6 d) 8
27. For a given crystal, the lattice parameter ' a ' is 318 pm. The d -spacing for a (III) plane is
 a) 318 pm b) 184 pm c) 390 pm d) 225 pm
28. Select correct statement(s)

- a) The standard boiling temperature is the temperature at which the vapour pressure of the substance is 1 bar
 b) The normal boiling temperature is the temperature at which the vapour pressure of the substance is 1 atm
 c) Substances for which $T > T_c$ and $p > p_c$ are called super critical fluids
 d) All the above are correct statements
29. The ratio of Boyle's temperature and critical temperature for a gas is:
 a) $8/27$ b) $27/8$ c) $1/2$ d) $2/1$
30. Positive deviation from ideal behaviour takes place because of
 a) Molecular interaction between atoms and $pV/nRT > 1$
 b) Molecular interaction between atoms and $pV/nRT < 1$
 c) Finite size of atoms and $pV/nRT > 1$
 d) Finite size of atoms and $pV/nRT < 1$
31. a and b are van der Waals' constants for gases. Chlorine is more easily liquefied than ethane because
 a) a and b for $\text{Cl}_2 > a$ and b for C_2H_6
 b) a and b for $\text{Cl}_2 < a$ and b for C_2H_6
 c) a for $\text{Cl}_2 > a$ for C_2H_6 but b for $\text{Cl}_2 > b$ for C_2H_6
 d) a for $\text{Cl}_2 > a$ for C_2H_6 but b for $\text{Cl}_2 < b$ for C_2H_6
32. Longest mean free path under similar conditions of P and T stands for:
 a) N_2 b) O_2 c) H_2 d) Cl_2
33. Ferrous oxide has a cubic structure and each edge of the unit cell is 5.0 \AA . Assuming density of the oxide as 4.0 g/cm^{-3} then the number of Fe^{2+} and O^{2-} ions present in each unit cell will be
 a) Two Fe^{2+} and four O^{2-} b) Three Fe^{2+} and three O^{2-}
 c) four Fe^{2+} and two O^{2-} d) four Fe^{2+} and four O^{2-}
34. Which one of the following is correct about surface tension (ST) and viscosity (η)?
 a) Both decrease with temperature b) Both increase with temperature
 c) ST increases and η decreases d) ST decreases and η increases
35. In which of the following crystals alternate tetrahedral voids are occupied?
 a) NaCl b) CaF_2 c) Na_2O d) ZnS
36. For an ideal gas, number of mol per litre in terms of its pressure p , temperature T and gas constant R is
 a) pT/R b) pRT c) p/RT d) RT/p
37. For a gas (R/C_v) = 0.67, the gas is made up of molecules which are:
 a) Monoatomic b) Diatomic c) Polyatomic d) Mixture of gases
38. As the speed of molecules increases, the number of collisions per second:
 a) Decreases b) Increases c) Does not change d) None of these
39. To an evacuated vessel with movable piston under external pressure of 1 atm, 0.1 mole of He and 1.0 mole of an unknown compound (vapour pressure 0.68 atm at 0°C) are introduced. Considering the ideal gas behaviour, the total volume (in litre) of the gases at 0°C is close to
 a) 3 b) 5 c) 7 d) 9
40. A closed vessel contains equal number of nitrogen and oxygen molecules at a pressure of P mm. If nitrogen is removed from the system, then the pressure will be:
 a) P b) $2P$ c) $P/2$ d) P^2
41. The molar volume of CO_2 is maximum at
 a) NTP b) 0°C and 2.0 atm c) 127°C and 1 atm d) 273°C and 2 atm
42. An example of a metallic crystalline solid is
 a) P b) Si c) W d) C
43. The density of neon will be highest at
 a) STP b) 0°C , 2 atm c) 273°C , 1 atm d) 273°C , 2 atm
44. A 4 : 1 mixture of helium and methane is contained in a vessel at 10 bar pressure. Due to a hole in the

vessel, the gas mixture leaks out. The composition of mixture effusing out initially is

- a) 8 : 1 b) 8 : 3 c) 4 : 1 d) 1 : 1

45. Which of the following set of variables give a straight line with a negative slope when plotted?

(p = apour pressure, T = temperature in K)

y –axis x –axis

- a) p T b) $\log_{10} p$ T c) $\log_{10} p$ $\frac{1}{T}$ d) $\log_{10} p$ $\log_{10} \frac{1}{T}$

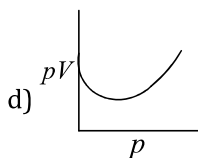
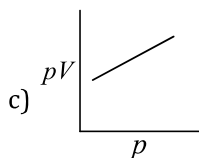
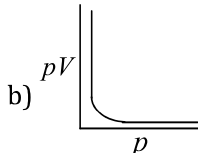
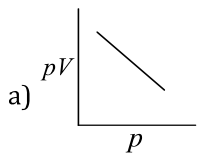
46. Volume occupied by 3.01×10^{23} molecules of acetylene at NTP is:

- a) 22.4 litre b) 11.2 litre c) 1.12 litre d) 2.24 litre

47. According to Charles' law:

- a) $(\partial V/\partial T)_p = K$ b) $(\partial V/\partial T)_p = -K$ c) $(\partial V/\partial T)_p = -K/T$ d) None of these

48. Which of the following is a Boyle's plot at very low pressure?



49. Gases X, Y, Z, P and Q have the van der Waals' constants a and b (in CGS units) as shown below

| | X | Y | Z | P | Q |
|-----|-------|------|-----|------|-----|
| a | 6 | 6 | 20 | 0.05 | 30 |
| b | 0.025 | 0.15 | 0.1 | 0.02 | 0.2 |

The gas with the highest critical temperature is

- a) P b) Q c) Y d) Z

50. At what temperature will be total kinetic energy (KE) of 0.30 mole of He be the same as the total KE of 0.40 mole of Ar at 400 K ?

- a) 400 K b) 373 K c) 533 K d) 300 K

51. At constant temperature, in the given mass of an ideal gas

- a) The ratio of pressure and volume always remains constants
 b) Volume always remains constant
 c) Pressure always remains constant
 d) The product of pressure and volume always remains constant

52. At what temperature will the volume of a gas at 0°C double itself, pressure remaining constant?

- a) -546°C b) 273 K c) 546°C d) 546 K

53. Which of the following is non-crystalline solid?

- a) NaCl b) CsCl c) CaF_2 d) Glass

54. The ratio of close packed atoms to tetrahedral holes in cubic close packing is

- a) 1:1 b) 1:2 c) 1:3 d) 2:1

55. Which of the following statement is not true?

- a) The pressure of a gas is due to collision of the gas molecules with the walls of the container.
 b) The molecular velocity of any gas is proportional to the square root of the absolute temperature.
 c) The rate of diffusion of a gas is directly proportional to the density of the gas at constant pressure.
 d) Kinetic energy of an ideal gas is directly proportional to the absolute temperature.

56. When air is blown to balloon (at constant temperature) its pressure and volume both increases. This violates:

- a) Boyle's law b) Charles' law c) Gas law d) None of these
57. The joule Thomson coefficient is zero at
 a) Absolute temperature b) Critical temperature
 c) Inversion temperature d) Below 0°C
58. The rms velocity of molecules of a gas of density 4 kg m^{-3} and pressure $1.2 \times 10^5 \text{ Nm}^{-2}$ is
 a) 300 ms^{-1} b) 900 ms^{-1} c) 120 ms^{-1} d) 600 ms^{-1}
59. The rms speed of hydrogen is $\sqrt{7}$ times the rms speed 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) $T_{H_2} = \sqrt{7T_{N_2}}$
60. The most unsymmetrical crystal system is
 a) hexagonal b) Triclinic c) Cubic d) orthorhombic
61. If the rms speed of a gaseous molecule is $x \text{ ms}^{-1}$ at a pressure $p \text{ atm}$, then what will be the rms speed at a pressure $2p \text{ atm}$ and constant temperature?
 a) x b) $2x$ c) $4x$ d) $x/4$
62. A 2.24 litre cylinder containing O_2 gas at 27°C and 2 atm is found to develop a leakage. When the leakage was repaired, the pressure dropped to 100 cm of Hg at 27°C . The number of mole of gas escaped out during leakage is:
 a) 0.06 b) 0.05 c) 0.07 d) 0.08
63. Avogadro's number is the number of molecules present at NTP in:
 a) 1 mL of gas b) 1 litre of gas c) 22.4 litre of gas d) 22.4 mL of gas
64. The ratio of rate of diffusion of helium and methane under identical conditions of pressure and temperature is:
 a) 4 b) 2 c) 1 d) 0.5
65. At what temperature will be rate of effusion of N_2 be 1.625 times the rate of effusion of SO_2 at 500°C ?
 a) 273 K b) 893 K c) 110 K d) 173 K
66. When a sample of gas is compressed at constant temperature from 15 atm to 60 atm , its volume changes from 76 cm^3 to 20.5 cm^3 . Which of the following statements are possible explanations of this behaviour?
 1. The gas behaves non-ideally
 2. The gas dimerises
 3. The gas is absorbed into the vessel walls
 a) 1, 2, and 3 b) 1 and 2 only c) 2 and 3 only d) 1 only
67. The root mean square velocity of a gas is double when the temperature is
 a) Increased four times b) Increased two times
 c) Reduced to half d) Reduced to one fourth
68. A flask is of a capacity one litre. What volume of air will escape out from it on heating from 27°C to 37°C ? Assume pressure constant:
 a) 1.033 litre b) 33.3 mL c) 33.3 litre d) None of these
69. The correct statement in the following is
 a) The ionic crystal of $AgBr$ has Schottky defect
 b) The coordination number of Na^+ ion in $NaCl$ is 4
 c) In ionic compounds having Frenkel defect, the ratio $\frac{r_+}{r_-}$ is high
 d) The unit cell having crystal parameters, $a = b \neq c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$ is hexagonal
70. An element occurring in the bcc structure has 12.08×10^{23} unit cells. The total number of atoms of the element in these cells will be
 a) 6.04×10^{23} b) 12.08×10^{23} c) 24.16×10^{23} d) 36.18×10^{23}
71. An ideal gas expands according to $PV = \text{constant}$. On expansion, the temperature of gas:
 a) Will rise
 b) Will drop

- c) Will remain constant
 d) Cannot be determined because the external pressure is not known
72. The temperature at which the second virial coefficient of a real gas is zero is called:
 a) Critical temperature b) Eutectic point c) Boiling point d) Boyle's temperature
73. Total energy of one mole of an ideal gas (monoatomic) at 27°C is:
 a) 600 cal b) 900 cal c) 800 cal d) 300 cal
74. *KE* of one mole of He at 0°C is:
 a) 819.0 cal b) 84.43 cal c) 8.143 cal d) None of these
75. At lower temperatures, all gases except H₂ and He show:
 a) Negative deviation
 b) Positive deviation
 c) Positive and negative deviation
 d) None of the above
76. For a real gas, deviations from ideal gas behaviour are maximum at:
 a) -10°C and 5.0 atm b) -10°C and 2.0 atm c) 0°C and 1.0 atm d) 100°C and 2.0 atm
77. Effect of temperature on viscosity is given by
 a) Hole theory b) Arrhenius theory c) Adsorption theory d) Collision theory
78. In a closed flask of 5 L, 1.0 g of H₂ is heated from 300 to 600 K. Which statement is not correct?
 a) Pressure of the gas increases b) The rate of collision increases
 c) The number of mole of gas increases d) The energy of gaseous molecules increases
79. If latent heat of vaporization is *L* at boiling point *T*(K) then entropy of vaporisation is
 a) *LT* b) *LT*⁻¹ c) *TL*⁻¹ d) None of these
80. Equal volumes of two gases are kept in separate containers at the same temperature and pressure. Then:
 a) Masses of the two gases are same
 b) Molecular structure of two gases would be similar
 c) The two gases contain the same number of molecules
 d) The two gases, if allowed to diffuse would do so at the same rate
81. 300 mL of a gas at 27°C is cooled to -3°C at constant pressure. The final volume is
 a) 350 L b) 270 mL c) 540 mL d) 135 mL
82. Which one of the following will give a linear plot at constant pressure?
 a) *T vs* $\frac{1}{V}$ b) *V vs* $\frac{1}{T}$ c) *V vs T* d) None of these
83. When gases are heated from 20°C to 40°C at constant pressure, the volume:
 a) Increase by the same magnitude
 b) Become double
 c) Increase in the ratio of their molecule masses
 d) Increase but to different extent
84. In which one of the following does the given amount of chlorine exert the least pressure in a vessel of capacity 1 dm³ at 273 K?
 a) 0.0355g b) 0.071
 c) 6.023 × 10²¹ molecules d) 0.02 moles
85. A crystalline solid
 a) Changes abruptly from solid to liquid when heated
 b) Has no definite melting point
 c) Has an irregular three-dimensional arrangements
 d) Undergoes deformation of its geometry easily
86. $\text{H}_2\text{O}(l) \xrightleftharpoons{1 \text{ atm}} \text{H}_2\text{O}(g), \Delta H_{\text{vap}} = 10 \text{ kcal mol}^{-1}$. If pressure is increased
 a) Steam is liquefied b) b.p. of H₂O is elevated

- c) Both (a) and (b) d) None of these
87. At NTP, 5.6 litre of a gas weighs 8 g. The vapour density of the gas is:
a) 32 b) 40 c) 16 d) 8
88. Which of the following will increase with the increase in temperature?
a) Surface tension b) Viscosity c) Molality d) Vapour pressure
89. The condition of SATP refers for:
a) 25°C and 2 atm b) 25°C and 1 atm c) 0°C and 2 atm d) 25°C and 1 bar
90. The equation, $\left[P_r + \frac{3}{V_r^2}\right][3V_r - 1] = 8T_r$:
a) Is equation for law of corresponding states.
b) States that under similar conditions of reduced pressure (P_r) and reduced temperature (T_r) gases possess same reduced volume (V_r)
c) Provides better results at boiling point of two liquids
d) All of the above
91. The compressibility of a gas is less than unity as STP. Therefore,
a) $v_m > 22.4$ L b) $v_m < 22.4$ L c) $v_m = 11.2$ L d) $v_m = 44.8$ L
92. If the pressure is halved and absolute temperature doubled the volume of the gas will be:
a) 4 b) 2 c) Same d) 8
93. Which form of matter is highly compressible?
a) Solid b) Liquid c) Gas d) Colloidal
94. Two sealed containers of the same capacity and at the same T are filled with 44 g of H_2 gas in one and 44 g of CO_2 in other. If the P of CO_2 is 1 atm in other, the P of H_2 in its container will be:
a) 1 atm b) Zero c) 22 atm d) 44 atm
95. Vapour pressure increases with increase in
a) Concentration of solution containing non-volatile solute
b) Temperature up to boiling point
c) Temperature up to triple point
d) Altitude of the concerned place of boiling
96. An alloy of Cu, Ag and Au is found to have Cu forming the simple cubic close packed lattice. If the Ag atoms occupy the face centres and Au is present at the body centre, the formula of the alloy will be
a) Cu_4Ag_4Au b) $CuAg_3Au$ c) $CuAgCu$ d) Cu_4Ag_2Au
97. The root mean square speed of the molecules of diatomic gas is u . When the temperature is doubled, the molecules dissociates into two atoms. The new rms speed of the atom is:
a) $\sqrt{2}u$ b) u c) $2u$ d) $4u$
98. The kinetic energy of molecules at constant temperature in gaseous state is:
a) More than those in the liquid state
b) Less than those in the liquid state
c) Equal to those in the liquid state
d) None of the above
99. At a constant pressure, what should be the percentage increase in the temperature in Kelvin for a 10% increase in volume?
a) 10% b) 20% c) 5% d) 50%
100. A mixture of helium and argon contains 3 mole of He for every 2 mole of Ar. The partial pressure of argon is:
a) $2/3$ the total pressure
b) $1/3$ the total pressure
c) $2/5$ the total pressure
d) $1/5$ the total pressure
101. Boyle's law is applicable in:
a) Isobaric process b) Isochoric process c) Isothermal process d) Adiabatic process

102. Which defect causes decreases in the density of crystal?
 a) Frenkel b) Schottky c) Interstitial d) F-centre
103. A perfect gas of a given mass is heated first in a small vessel and then in a large vessel, such that their volume remains unchanged. The P - T curves are:
 a) Parabolic with same curvature
 b) Parabolic with different curvatures
 c) Linear with same slope
 d) Linear with different slopes
104. The three states of matter are solid, liquid and gas. Which of the following statements is/ are true about them?
 a) Gases and liquids have viscosity as a common property
 b) The molecules in all the three states posses random translational motion
 c) Gases cannot be converted into solids without passing through the liquid phase
 d) Solids and liquids have vapour pressure as a common property
105. The kinetic theory of gases predicts that total kinetic energy of a gaseous assembly depends on
 a) Pressure of the gas b) Temperature of the gas
 c) Volume of the gas d) Pressure, volume and temperature of the gas
106. If two moles of a ideal gas at 546 K occupy volume 44.8 L, then pressure must be
 a) 2 atm b) 3 atm c) 4 atm d) 1 atm
107. What is kinetic energy of 1 g of O_2 at $47^\circ C$?
 a) 1.24×10^2 J b) 2.24×10^2 J c) 1.24×10^3 J d) 3.24×10^2 J
108. If volume containing gas is compressed to half, how many moles of gas remained in the vessel?
 a) Just double b) Just half c) Same d) More than double
109. At constant volume, the pressure of a monoatomic gas depends upon:
 a) Thickness of the walls of the container
 b) The absolute temperature
 c) The atomic number of the element
 d) The number of valency electrons
110. If two moles of an ideal gas at 246 K occupy a volume of 44.8 L, the pressure must be
 a) 4 atm b) 2 atm c) 8 atm d) 6 atm
111. Example of unit cell with crystallographic dimensions, $a \neq b \neq c, \alpha = \gamma = 90^\circ, \beta \neq 90^\circ$, is
 a) Calcite b) rhombic sulphur c) Graphite d) Monoclinic sulphur
112. The unit of van der Waals' constant ' a ' is:
 a) $\text{atm litre}^2 \text{ mol}^2$ b) $\text{dyne cm}^4 \text{ mol}^{-2}$ c) $\text{newton m}^4 \text{ mol}^{-2}$ d) All of these
113. Use of hot air balloons in sports and meteorological observations is an application of:
 a) Boyle's law b) Newtonic law c) Charles' law d) Brown's law
114. The circulation of blood in human body supplies O_2 and releases CO_2 . The concentration of O_2 and CO_2 is variable but on the average, 100 mL blood contains 0.02 g of O_2 and 0.08 g CO_2 . The volume of O_2 and CO_2 at 1 atm and body temperature $37^\circ C$, assuming 10 litre blood in human body is:
 a) 2 litre, 4 litre b) 1.5 litre, 4.5 litre c) 1.59 litre, 4.62 litre d) 3.82 litre, 4.62 litre
115. If the distance between Na^+ and Cl^- ions in NaCl crystal is ' a ' pm what is the length of the cell edge?
 a) $4a$ pm b) $\frac{a}{4}$ pm c) $2a$ pm d) $\frac{a}{2}$ pm
116. Normal temperature and pressure (NTP) of gases refers to:
 a) 273 K and 760 mm Hg
 b) $273^\circ C$ and 760 mm Hg
 c) 273 K and 76 mm Hg
 d) $273^\circ C$ and 76 mm Hg
117. $CuSO_4 \cdot aq.$ absorbs:
 a) NH_3 b) H_2S c) PH_3 d) All of these

118. Under which of the following conditions, van der Waals' gas approaches ideal behaviour?
 a) Extremely lower pressure
 b) Low temperature
 c) High pressure
 d) Low product of pV
119. The compressibility factor of an ideal gas is
 a) 1
 b) 2
 c) 4
 d) 0
120. A vessel has two equal compartments A and B containing H_2 and O_2 respectively, each at 1 atm pressure. If the wall separating the compartment is removed, the pressure:
 a) Will remain unchanged in A and B
 b) Will increase in A and decrease in B
 c) Will decrease in A and increase in B
 d) Will increase in both A and B
121. Quartz is a crystalline variety of
 a) Silica
 b) Silicon
 c) Silicon carbide
 d) Sodium silicate
122. A sample of gas at 35°C and 1 atmospheric pressure occupies a volume of 3.75 litre. At what temperature should the gas be kept, if it is required to reduce the volume to 3.0 litre at the same pressure?
 a) -26.6°C
 b) 0°C
 c) 3.98°C
 d) 28°C
123. Air at sea level is dense. This is a practical application of:
 a) Boyle's law
 b) Charles' law
 c) Avogadro's law
 d) Dalton's law
124. The strength of van der Waals' forces increases with:
 a) Increase in molecular size
 b) Increase in the number of electrons in the molecule
 c) Increases in molecular weight
 d) All of the above
125. The vacant space in the bcc unit cell is
 a) 23%
 b) 26%
 c) 32%
 d) None of these
126. Pressure remaining constant, the volume of a given sample of gas at 127°C will be doubled at:
 a) 254°C
 b) 524°C
 c) 400 K
 d) 800°C
127. The numerical value of ' a ' the van der Waals' constant is maximum for:
 a) NH_3
 b) H_2
 c) O_2
 d) He
128. To which of the following gaseous mixtures is Dalton's law not applicable?
 a) Ne + He + SO_2
 b) NH_3 + HCl + HBr
 c) O_2 + N_2 + CO_2
 d) N_2 + H_2 + O_2
129. At critical temperature of a liquid, surface tension is
 a) Zero
 b) Infinite
 c) Varies liquid to liquid
 d) Can't be measured
130. The rms speed of hydrogen is $\sqrt{7}$ times the rms speed 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) $T_{H_2} = \sqrt{7}T_{N_2}$
131. Equal masses of nitrogen and ethylene are mixed in an empty container at 27°C . The total pressure exerted by the gaseous mixture is 1 atm. The partial pressure exerted by ethylene gas is :
 a) 0.67 atm
 b) 0.33 atm
 c) 0.50 atm
 d) 0.20 atm
132. At a constant temperature what should be the percentage increase in pressure for a 5% decrease in the volume of gas?
 a) 5%
 b) 10%
 c) 5.26%
 d) 4.26%
133. At 27°C a gas was compressed to half its volume. To what temperature must it be heated so that it occupies the original volume? ($P = \text{constant}$)
 a) 54°C
 b) 600°C
 c) 327 K
 d) 327°C
134. A solid is made of two elements X and Z . The atoms Z are in ccp arrangement while the atom X occupy all the tetrahedral sites. What is the formula of the compound?
 a) XZ
 b) XZ_2
 c) X_2Z
 d) X_2Z_3
135. For cubic coordination, the value of radius ratio is

- a) 0.000 – 0.225 b) 0.225 – 0.414 c) 0.414 – 0.732 d) 0.732 – 1.000
136. An example of fluorite structure is
 a) NaF b) AlCl₃ c) SrF₂ d) SiF₄
137. Clausius-Clapeyron equation is
 a) $\frac{d \log p}{dT} = \frac{\Delta H_{\text{vap}}}{2.303 RT^2}$ b) $\log p = \log A - \frac{\Delta H_{\text{vap}}}{2.303 RT}$
 c) Both (a) and (b) d) None of the above
138. The concept of critical temperature for a gas was given by:
 a) Andrew b) Boyle c) Charles d) None of these
139. Correct gas equation is
 a) $\frac{p_1 T_1}{V_1} = \frac{p_2 T_2}{V_2}$ b) $\frac{V_1 T_2}{p_1} = \frac{V_2 T_1}{p_2}$ c) $\frac{p_1 V_1}{p_2 V_2} = \frac{T_1}{T_2}$ d) $\frac{V_1 V_2}{T_1 T_2} = p_1 p_2$
140. The edge of unit cell of fcc Xe crystal is 620 pm. The radius of Xe atom is
 a) 189.37 pm b) 209.87 pm c) 219.25 pm d) 235.16 pm
141. The following is not a function of an impurity present in a crystal
 a) Establishing thermal equilibrium b) Having tendency to diffuse
 c) Contributing to scattering d) Introducing new electronic energy levels
142. Which one of the following statements is not true about the effect of an increase in temperature on the distribution of molecular speeds in a gas?
 a) The area under the distribution curve remains the same as under the lower temperature
 b) The distribution becomes broader
 c) The fraction of the molecules with the most probable speed increases
 d) The most probable speed increases
143. Identify the pair of gases that have equal rates of diffusion
 a) CO, NO b) N₂O, CO c) N₂O, CO₂ d) CO₂, NO₂
144. Oxygen gas is collected by downward displacement of water in a jar. The level of water inside the jar is adjusted to the height of water outside the jar. When the adjustment is made, the pressure exerted by the oxygen is:
 a) Equal to the atmospheric pressure
 b) Equal to the vapour pressure of oxygen at that temperature
 c) Equal to atmospheric pressure plus aqueous tension at that temperature
 d) Equal to atmospheric pressure minus aqueous tension at that temperature
145. The maximum radius of sphere that can be fitted in the octahedral hole of cubical closed packing of sphere of radius r is
 a) $0.732 r$ b) $0.414 r$ c) $0.225 r$ d) $0.155 r$
146. The root mean square velocity of a gas is doubled when temperature is
 a) Increased four times b) Increased two times
 c) Reduced to half d) Reduced to one fourth
147. Assume that air is 21% oxygen and 79% nitrogen by volume. If the barometric pressure is 740 mm, the partial pressure of oxygen is closest to which one of the following?
 a) 155.4 mm b) 310 mm c) 580 mm d) 740 mm
148. A and B are two identical vessels. A contains 15 g of ethane at 298 K and 1 atm. The vessel B contains 75 g gas X_2 at the same temperature and pressure. The vapour density of X_2 is:
 a) 75 b) 150 c) 37.5 d) 300
149. Which gas contains larger number of molecules?
 a) 4 g of H₂O b) 2 g of marsh gas c) 4 g of PCl₅ d) 2 g of phosgene
150. A gas is found to have formula [CO] _{x} . Its VD is 70. The value of x must be:
 a) 3 b) 5 c) 6 d) 2.5
151. Which one of the following metal oxides is antiferromagnetic in nature?

- a) MnO_2 b) VO_2 c) TiO_2 d) CrO_2
152. If 1 litre of a gas *A* at 600 mm and 0.5 litre of gas *B* at 800 mm are taken in a 2 litre bulb. The resulting pressure is:
 a) 1500 mm b) 1000 mm c) 2000 mm d) 500 mm
153. Which of the following gases would have the highest rms speed at 0°C ?
 a) O_3 b) CO_2 c) SO_3 d) CO
154. Which statement violates the assumptions of the kinetic theory of gases?
 a) Gases consist of large number of small particles called molecules
 b) The molecules are at rest
 c) The molecules possess random and chaotic motion
 d) There is no attraction between the molecules
155. Space lattice of CaF_2 is
 a) fcc b) Bcc c) hcp d) simple cubic
156. In zinc blende structure, the coordination number of Zn^{2+} ion is
 a) 2 b) 4 c) 6 d) 8
157. At 27°C , 500 mL of helium diffuses in 30 min. What is the time (in hours) taken for 1000 mL of SO_2 to diffuse under same experimental conditions?
 a) 240 b) 3 c) 2 d) 4
158. Indicate which of the following statements is correct?
 a) At constant temperature, the KE of all gas molecules will be the same
 b) At constant temperature, the KE of different molecules will be different
 c) At constant temperature, the KE will be greater for heavier gas molecules
 d) At constant temperature, the KE will be less for heavier gas molecules
159. Which of the following represents total kinetic energy of one mole of gas?
 a) $1/2 RT$ b) $3/2 RT$ c) $(C_p - C_v) RT$ d) $2/3 RT$
160. Gay-Lussac's law of gaseous volumes is derived from:
 a) Law of reciprocal proportions
 b) Law of multiple proportions
 c) Experimental observations
 d) None of the above
161. The ratio of average speed of an oxygen molecule to the rms, speed of a nitrogen molecule at the same temperature is:
 a) $\left(\frac{3\pi}{7}\right)^{1/2}$ b) $\left(\frac{7}{3\pi}\right)^{1/2}$ c) $\left(\frac{3}{7\pi}\right)^{1/2}$ d) $\left(\frac{7\pi}{3}\right)^{1/2}$
162. The following is a method to determine the surface tension of liquids
 a) Single capillary method b) Refractometric method
 c) Polarimetric method d) Boiling point method
163. Which phrase would be incorrect to use?
 a) A molecule of an element
 b) An atom of an element
 c) A molecule of a compound
 d) None of the above
164. In which of the following substances the carbon atom is arranged in a regular tetrahedral structure?
 a) Diamond b) Benzene c) Graphite d) Carbon black
165. In two separate bulbs containing ideal gases *A* and *B* respectively, the density of gas *A* is twice that of gas *B* while molecular weight of gas *A* is half that of gas *B* at the same temperature, pressure ratio P_A/P_B will be:
 a) $1/4$ b) $1/2$ c) 4 d) 1
166. *A*, *B* and *C* are ideal gases. Their molecular weights are 2, 4 and 28 respectively. The rate of diffusion of

these gases follow the order

- a) $C > A > B$ b) $C > B > A$ c) $A = B$ d) $A > L$

167. 4.0 g of argon has pressure P and temperature T K in a vessel. On keeping the vessel at 50° higher temperature, 0.8 g of argon was given out to maintain the pressure P . The original temperature was:

- a) 73 K b) 100 K c) 200 K d) 510 K

168. The inversion temperature (T_i) for a gas is given by:

- a) $\frac{a}{Rb}$ b) $\frac{2a}{Rb}$ c) $\frac{Rb}{a}$ d) $\frac{2Rb}{a}$

169. The van der Waals' equation for real gas is:

- a) $\left(P + \frac{a}{V^2}\right)(V - b) = RT$
 b) $\left(P + \frac{n^2a}{V^2}\right)(V - b) = nRT$
 c) $P = \frac{nRT}{V - nb} - \frac{an^2}{V^2}$
 d) All of the above

170. Amorphous solids are

- a) Supercooled liquids b) solid substances
 c) Liquids d) Substances with definite m.p.

171. The temperature of 20 L of nitrogen was increased from 10 K to 30 K at a constant pressure. Change in volume will be

- a) 20 L b) 40 L c) 60 L d) 80 L

172. A flask of methane (CH_4) was weighed. Methane was then pushed out and the flask again weighed when filled with oxygen at the same temperature and pressure. The mass of oxygen would be:

- a) The same as the methane
 b) Half of the methane
 c) Double of that of methane
 d) Negligible in comparison to that of methane

173. When a solid vaporizes directly without melting, it is known as:

- a) Evaporation b) Sublimation c) Sedimentation d) Saponification

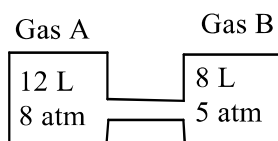
174. For an ionic crystal of the general formula AX and coordination number 6, the value of radius ratio will be

- a) in between 0.732 and 0.414 b) in between 0.414 and 0.225
 c) less than 0.225 d) greater than 0.732

175. A gas at 298 K is shifted from a vessel of 250 cm^3 capacity to that of 1 L capacity. The pressure of the gas will

- a) Becomes four times b) Becomes doubled
 c) Decrease by one-fourth d) Decrease by half

176. Two vessels containing gases A and B are interconnected as shown in the figure. The stopper is opened, the gases are allowed to mix homogeneously. The partial pressures of A and B in the mixture will be, respectively



- a) 8 and 5 atm b) 9.6 and 4 atm c) 4.8 and 2 atm d) 6.4 and 4 atm

177. Different gases at the same temperature have same

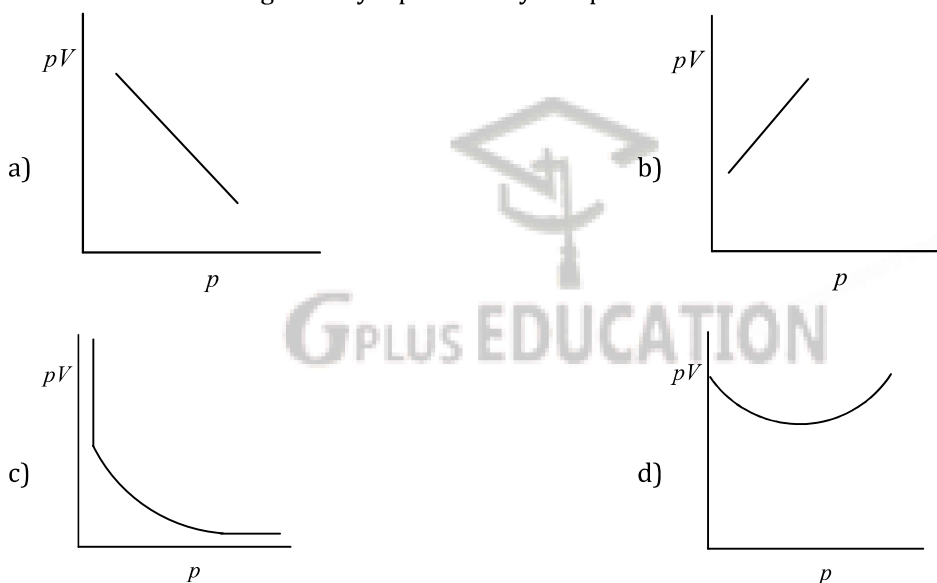
- a) Pressure b) Number of moles
 c) Volume d) Average kinetic energy

178. Certain crystals produces electric signals on application of pressure. This phenomena is called

- a) Ferroelectricity b) Ferrielectricity c) Pyroelectricity d) Piezoelectricity

179. If air contains N_2 and O_2 in volume ratio 4 : 1. The average vapour density of air is:
 a) 14.5 b) 16.5 c) 14.4 d) 29.0
180. In face centred cubic unit cell edge length is
 a) $2r$ b) $\frac{\sqrt{3}}{2}r$ c) $\frac{4}{\sqrt{3}}r$ d) $\frac{4}{\sqrt{2}}r$
181. When an ideal gas undergoes unrestricted expansion, no cooling takes place because the molecules:
 a) Exert no attractive forces on each other
 b) Do work equal to loss of KE
 c) Collide without loss of energy
 d) Are above the inversion temperature
182. If volume of a given mass of gas at constant T , becomes three times, the pressure will be:
 a) $3P$ b) $P/3$ c) $9P$ d) P
183. The relationship between P_c, V_c and T_c is:
 a) $P_c V_c = RT$ b) $P_c V_c = 3RT_c$ c) $P_c V_c = \frac{3}{5}RT_c$ d) $P_c V_c = \frac{3}{8}RT_c$
184. The rms speed of gas molecules at a temperature 27 K and pressure 1.5 bar is 1×10^4 cm/sec. If both temperature and pressure are raised three times, the rms speed of the gas will be:
 a) 9×10^4 cm/sec b) 3×10^4 cm/sec c) 1×10^4 cm/sec d) $\approx 1 \times 10^4$ cm/sec
185. The number of equidistance oppositely charged ions in a sodium chloride crystal is
 a) 2 b) 4 c) 6 d) 8
186. Equal volumes of two gases which don't react together are confined in separate vessels. Their pressure is 100 mm and 300 mm of Hg respectively. If the two vessels are joined together, then what will be the pressure of the resulting mixture? (Temperature remains constant)
 a) 400 mm b) $\sqrt{400}$ mm c) 300 mm d) 200 mm
187. The mean free path (λ) of a gas sample is given by:
 a) $\lambda = \sqrt{2} \pi \sigma^2 N$ b) $\lambda = \frac{1}{\sqrt{2} \pi \sigma^2 N}$ c) $\lambda = \sqrt{2} \pi \sigma^2 N$ d) None of these
188. Which of the following is ferroelectric compound?
 a) $BaTiO_3$ b) Pb_2O_3 c) $PbZrO_3$ d) $K_4[Fe(CN)_6]$
189. Gas CO CH₄ HCl SO₂
 Critical temp, T_c (K) 134 190 324 430
 In the context of given values of critical temperature, the greater ease of liquefaction is of
 a) SO₂ b) HCl c) CH₄ d) CO
190. The unit of van der Waal's constant ' b ' is:
 a) $cm^3 mol^{-1}$ b) $litre mol^{-1}$ c) $m^3 mol^{-1}$ d) All of these
191. The number of atoms in 100 g of an fcc crystal with density $d = 10g/cm^3$ and cell edge equal to 100 pm, is equal to
 a) 1×10^{25} b) 2×10^{25} c) 3×10^{25} d) 4×10^{25}
192. Which of the following pair of gases contain the same number of molecules?
 a) 16 g O₂, 14g N₂ b) 8g O₂, 22g N₂ c) 28g N₂, 22g CO₂ d) 32g O₂, 32g N₂
193. Two closed vessels of equal volume containing air at pressure p_1 and temperature T_1 are connected to each other through a narrow tube. If the temperature in one of the vessels is now maintained at T_1 and that in the other at T_2 , what will be the pressure in the vessels?
 a) $\frac{2p_1 T_1}{T_1 + T_2}$ b) $\frac{T_1}{2p_1 T_2}$ c) $\frac{2p_1 T_2}{T_1 + T_2}$ d) $\frac{2p_1}{T_1 + T_2}$
194. In case of hydrogen and helium the van der Waals' forces are:
 a) Strong b) Very strong c) Weak d) None of these
195. The volume of ammonia obtained by the complete combination of 10 mL of N_2 and 30 mL of H_2 is:
 a) 20 mL b) 40 mL c) 30 mL d) 10 mL

196. If the value of ionic radius ratio $\left(\frac{r_c}{r_a}\right)$ is 0.52 in an ionic compound, the geometrical arrangement of ions in crystal is
 a) Planar b) Pyramidal c) Tetrahedral d) Octahedral
197. The constituent particles of a solid have
 a) Rotatory motion only b) Vibratory motion only
 c) Translatory motion only d) All of these
198. At relatively high pressure, van der Waals' equation reduces to:
 a) $PV = RT$ b) $PV = RT + a/V$ c) $PV = RT + Pb$ d) $PV = RT - a/V^2$
199. Crystals can be classified into.... basic crystal lattices
 a) 3 b) 7 c) 6 d) 14
200. Which type of solid crystals will conduct heat and electricity?
 a) Ionic b) Covalent c) Molecular d) Metallic
201. One atmosphere is numerically equal to approximately:
 a) 10^6 dyne cm^{-2} b) 10^2 dyne cm^{-2} c) 10^4 dyne cm^{-2} d) 10^8 dyne cm^{-2}
202. Calculate the total pressure in a 10.0 L cylinder which contains 0.4 g helium, 1.6 g oxygen and 1.4 g nitrogen at 27°C.
 a) 0.492 atm b) 49.2 atm c) 4.92 atm d) 0.0492 atm
203. Which of the following is a Boyle plot at very low pressure?



204. A flask filled with CCl_4 was weighed at a temperature and pressure. The flask was then filled with oxygen at the same temperature and pressure. The mass of CCl_4 vapour would be about:
 a) The same as that of the oxygen
 b) One-fifth as heavy as oxygen
 c) Five times as heavy as oxygen
 d) Twice as heavy as oxygen
205. In a face centred cubic cell, an atom at the face contributes to the unit cell
 a) 1 part b) $\frac{1}{2}$ part c) $\frac{1}{4}$ part d) $\frac{1}{8}$ part
206. Four rubber tubes are respectively filled with H_2 , O_2 , N_2 and He. The tube which will be reinflated first is:
 a) H_2 filled tube b) O_2 filled tube c) N_2 filled tube d) He filled tube
207. Schottky defect generally appears in
 a) KCl b) NaCl c) CsCl d) All of these
208. Calculate the ionic radius of a Cs^+ ion, assuming that the cell edge length for CsCl is 0.4123 nm and that the ionic radius of a Cl^- ion is 0.181 nm

- a) 0.352 nm b) 0.116 nm c) 0.231 nm d) 0.176 nm
209. The deviation from the ideal gas behaviour of a gas can be expressed as
 a) $Z = \frac{p}{VRT}$ b) $Z = \frac{pV}{nRT}$ c) $Z = \frac{nRT}{pV}$ d) $Z = \frac{VR}{pT}$
210. Positive deviation from ideal behaviour takes place because of
 a) Molecular interaction between atom and $\frac{pV}{nRT} > 1$
 b) Molecular interaction between atom and $\frac{pV}{nRT} < 1$
 c) Finite size of atoms and $\frac{pV}{nRT} > 1$
 d) Finite size of atoms and $\frac{pV}{nRT} < 1$
211. In an experiment during the analysis of a carbon compound, 145 mL of H₂ was collected at 760 mm Hg pressure and 27°C. The weight of H₂ is nearly :
 a) 10 mg b) 12 mg c) 6 g d) 8 g
212. The pressure and temperature of 4dm³ of carbon dioxide gas are doubled, then the volume of carbon dioxide gas would be
 a) 2 dm³ b) 3 dm³ c) 4 dm³ d) 8 dm³
213. Adiabatic demagnetisation is a technique used for:
 a) Adiabatic expansion of a gas
 b) Production of low temperature
 c) Production of high temperature
 d) None of the above
214. A real gas at high pressure occupies under identical conditions:
 a) More volume than that of an ideal gas
 b) Less volume than that of an ideal gas
 c) Same volume as that of an ideal gas
 d) More or less volume than that of an ideal gas depending upon the nature of the gas
215. Structure similar to zinc blende is found in
 a) NaCl b) AgCl c) CuCl d) TiCl
216. One mole of a gas is defined as:
 a) The number of molecules in one litre of gas
 b) The number of molecules in 2.24 litre of a gas
 c) The number of atoms contained in 12g of C¹⁴ isotope
 d) The number of molecules in 22.4 litre of a gas at STP
217. The formula for determination of density of unit cell is
 a) $\frac{a^3 \times N_A}{Z \times M} \text{ g cm}^{-3}$ b) $\frac{M \times N_A}{A^3 \times Z} \text{ g cm}^{-3}$ c) $\frac{Z \times M}{a^3 \times N_A} \text{ g cm}^{-3}$ d) $\frac{a^3 \times M}{Z \times N_A} \text{ g cm}^{-3}$
218. The crystal system of a compound with unit cell dimensions, $a = 0.387$, $b = 0.387$ and $c = 0.504$ nm, and $\alpha = \beta = 90^\circ$ and $\gamma = 120^\circ$ is
 a) Cubic b) Hexagonal c) Orthorhombic d) Rhombohedral
219. Air at sea level is dense, this is a practical implementation of
 a) Boyle's law b) Charles' law c) Avogadro's law d) Dalton's law
220. During the evaporation of liquid
 a) The temperature of the liquid will rise b) The temperature of the liquid will fall
 c) May rise or fall depending on the nature d) The temperature remains unaffected
221. A spherical balloon of 21 cm diameter is to be filled with hydrogen at STP from a cylinder containing the gas at 20 atm and 27°C. If the cylinder can hold 2.82 L of water, the number of balloons that can be filled up is
 a) 5 b) 2 c) 10 d) 12

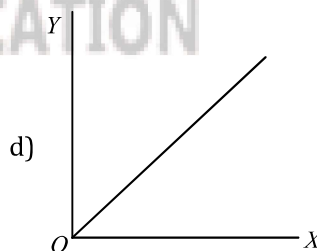
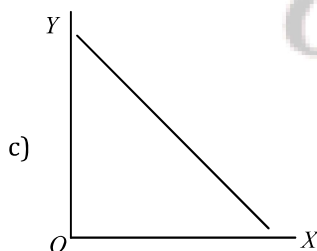
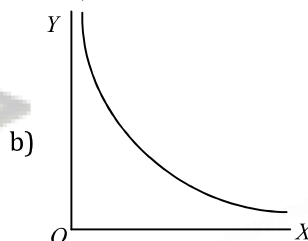
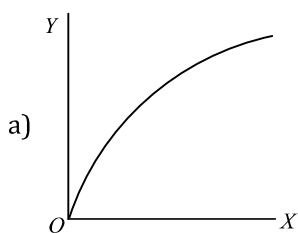
222. O_2 is collected over water at $20^\circ C$. The pressure inside shown by the gas is 740 mm of Hg. What is the pressure due to O_2 alone if vapour pressure of H_2O is 18 mm at $20^\circ C$?
 a) 722 mm b) 740 mm c) 758 mm d) None of these
223. A pure crystalline substance, on being heated gradually, first forms a turbid looking liquid and then the turbidity completely disappears. This behavior is the characteristic of substances forming
 a) isomeric crystals b) liquid crystals c) isomorphous crystals d) allotropic crystals
224. If pressure of a gas contained in a closed vessel is increased by 0.4% when heated by $1^\circ C$ its initial temperature must be:
 a) 250 K b) $250^\circ C$ c) 2500 K d) $25^\circ C$
225. A solid has a structure in which 'W' atoms are located at the corners of a cubic lattice 'O' atoms at the centre of edges and Na atoms at the centre of the cube. The formula for the compound is
 a) Na_2WO_3 b) Na_2WO_2 c) $NaWO_2$ d) $NaWO_3$
226. 10 g each of CH_4 and O_2 are kept in cylinders of same volume under same temperatures, give the pressure ratio of two gases
 a) 2 : 1 b) 1 : 4 c) 2 : 3 d) 3 : 4
227. A sample of gas is at $0^\circ C$. The temperature at which its rms speed of the molecules will be doubled is:
 a) $103^\circ C$ b) $273^\circ C$ c) $723^\circ C$ d) $819^\circ C$
228. If the concentration of water vapour in the air is 1% and the total atmospheric pressure equals 1 atm then the partial pressure of water vapour is:
 a) 0.1 atm b) 1 mm Hg c) 7.6 mm Hg d) 100 atm
229. 0.5 mole of each of H_2 , SO_2 and CH_4 are kept in a container. A hole was made in the container. After 3 h, the order of partial pressures in the container will be
 a) $p_{SO_2} > p_{H_2} > p_{CH_4}$ b) $p_{SO_2} > p_{CH_4} > p_{H_2}$ c) $p_{H_2} > p_{SO_2} > p_{CH_4}$ d) $p_{H_2} > p_{CH_4} > p_{SO_2}$
230. 22 g solid CO_2 or dry ice is enclosed in a bottle of one litre properly closed. If temperature of bottle is raised to $25^\circ C$ to evaporate all the CO_2 , the pressure in bottle is:
 a) 13.23 atm b) 12.23 atm c) 11.23 atm d) 14.23 atm
231. Gases deviate from ideal gas behaviour at high pressure. Which of the following is correct for non ideality?
 a) At high pressure, the collision between the gas molecules becomes enormous
 b) At high pressure, the gas molecules move only in one direction
 c) At high pressure, the volume of gas becomes insignificant
 d) At high pressure, the intermolecular interaction become significant
232. CsBr crystal has bcc structure. It has an edge length of 4.3 Å. The shortest interionic distance between Cs^+ and Br^- ions is
 a) 1.86 Å b) 2.86 Å c) 3.72 Å d) 4.72 Å
233. Two gases A and B having the same volume diffuse through a porous partition in 20 and 10 seconds respectively. The molecular mass of A is 49 u. Molecular mass of B will be:
 a) 25.00 u b) 50.00 u c) 12.25 u d) 6.50 u
234. In the van der Waals' equation, the constant 'a' and 'b' with temperature shows which trend:
 a) Both remains same
 b) 'a' remains same, b varies
 c) 'a' varies, b remains same
 d) Both varies
235. Frenkel defect is found in crystals in which the radius ration is
 a) 1.5 b) 1.7
 c) Very low d) Slightly less than unity
236. Graham's law deals with the relation between
 a) Pressure and volume b) Density and rate of diffusion
 c) Rate of diffusion and volume d) Rate of diffusion and viscosity
237. The density of a gas A is twice that of a gas B at the same temperature. The molecular weight of gas B is

- thrice that of A . The ratio of the pressures acting on A and B will be
- a) $\frac{1}{6}$ b) $\frac{7}{8}$ c) $\frac{2}{5}$ d) $\frac{1}{4}$
238. The CO_2 gas does not follow gaseous laws at all ranges of pressure and temperature because
- a) It is triatomic gas b) Its internal energy is quite high
c) There is attraction between its molecules d) It solidify at low temperature
239. Based on kinetic theory of gases following laws can be proved
- a) Boyle's law b) Charles' law c) Avogadro's law d) All of these
240. The quantity $pV/(k_B T)$ represents the
- a) Number of molecules in the gas b) Mass of the gas
c) Number of moles of the gas d) Translation energy of the gas
241. Hydrogen diffuses six times faster than gas A . The molar mass of gas A is
- a) 72 b) 6 c) 24 d) 36
242. A certain mass of gas occupies a volume of 300 cc at 27°C and 620 mm pressure. The volume of this gas at 47°C and 640 mm pressure will be
- a) 400 cc b) 510 cc c) 310 cc d) 350 cc
243. A closed vessel contains equal number of oxygen and hydrogen molecules at a total pressure of 740 mm. If oxygen is removed from the system, the pressure:
- a) Becomes half of 740 mm
b) Remains unchanged
c) Becomes 1/9th of 740 mm
d) Becomes double of 740 mm
244. 2 g of hydrogen diffuses from a container in 10 minute. How many gram of oxygen would diffused through the same container in the same time under similar conditions?
- a) 5 g b) 4 g c) 6 g d) 8 g
245. The critical temperature of a gas is that temperature:
- a) Above which it can no longer remain in the gaseous state
b) Above which it cannot be liquefied by pressure
c) At which it solidifies
d) At which volume of gas becomes zero
246. A preweighted vessel was filled with CO_2 at STP and weighed. It was then evaluated, filled with SO_2 at the same temperature and pressure and again weighted. The weight of the CO_2 will be
- a) The same as that of the SO_2 b) Twice of that of the SO_2
c) Half that of the SO_2 d) Two third of that of SO_2
247. The term that corrects for the attractive forces present in a real gas in the van der Waals' equation is
- a) nb b) $n^2 a/V^2$ c) $-(n^2 a/V^2)$ d) $-nb$
248. 1.0 L of N_2 and $7/8$ L of O_2 at the same temperature and pressure were mixed together. What is the relation between the masses of the two gases in the mixture?
- a) $M_{\text{N}_2} = 3M_{\text{O}_2}$ b) $M_{\text{N}_2} = 8M_{\text{O}_2}$ c) $M_{\text{N}_2} = M_{\text{O}_2}$ d) $M_{\text{N}_2} = 16M_{\text{O}_2}$
249. A gas will approach ideal behaviour at
- a) Low temperature and high pressure b) Low temperature and low pressure
c) High temperature and low pressure d) High temperature and high pressure
250. Which gas may be collected over water?
- a) NH_3 b) N_2 c) HCl d) SO_2
251. The relationship between coefficient of viscosity of a liquid and temperature can be expressed as
- a) $\eta = Ae^{ERT}$ b) $\eta = Ae^{E/RT}$ c) $\eta = ET/R$ d) $\eta = Ae^{RT/E}$
252. All the three states H_2O , *i. e.*, the triple point for H_2O the equilibrium,
Ice \rightleftharpoons Water \rightleftharpoons Vapour exist at:
- a) 3.85 mm and 0.0981°C

- b) 4.58 mm and 0.0098°C
 c) 760 mm and 0°C
 d) None of the above
253. Which is a postulate of kinetic theory of gases?
 a) Gases combine in simple ratio
 b) There is an attraction between gaseous molecules
 c) There is no influence of gravity on gas molecules
 d) Atom is indivisible
254. If a vessel containing hydrogen chloride at a pressure p is connected with another vessel of the same volume containing ammonia at a pressure p and the connecting tube opened so that they can mix and form a white solid then the gas pressure
 a) Is equal to the pressure p
 b) Will be $p/p = 1$
 c) Will be doubled, *ie*, $2p$
 d) Drops to zero
255. The Joule-Thomson coefficient for a gas is zero at:
 a) Inversion temperature
 b) Critical temperature
 c) Absolute temperature
 d) Below 0°C
256. Consider an ideal gas contained in a vessel. If the intermolecular interactions suddenly begins to acts, which of the following will happen?
 a) The pressure decrease
 b) The pressure increase
 c) The pressure remains unchanged
 d) The gas collapses
257. 5 g each of the following gases at 87°C and 750 mm pressure are taken. Which of them will have the least volume?
 a) HF
 b) HCl
 c) HBr
 d) HI
258. A thin balloon filled with air at 47°C has a volume of 3.0 litre. If on placing it in a cooled room, its volume becomes 2.7 litre, the temperature of room is:
 a) 42°C
 b) 30°C
 c) 15°C
 d) 0°C
259. The temperature at which nitrogen under 1.00 atm pressure has the same root mean square as that of carbon dioxide at STP, is
 a) 0°C
 b) 27°C
 c) -99°C
 d) -200°C
260. At what temperature will hydrogen molecules have the same kinetic energy as nitrogen molecules have at 35°C?
 a) $\frac{28 \times 35}{2}$ °C
 b) $\frac{2 \times 35}{28}$ °C
 c) $\frac{2 \times 28}{35}$ °C
 d) 35°C
261. Gay-Lussac's law of combining volume is applicable for those gases which on mixing:
 a) Do not react
 b) React with each other
 c) Diffuse
 d) All of these
262. Consider an ideal gas contained in a vessel. If the intermolecular interactions suddenly begins to act, which of the following will happen?
 a) The gas collapses
 b) The pressure decreases
 c) The pressure increases
 d) The pressure remain unchanged
263. The number of moles of H₂ in 0.224 L of hydrogen gas at STP (273 K, 1 atm) is
 a) 0.1
 b) 1
 c) 0.001
 d) 0.01
264. If the distance between Na⁺ and Cl⁻ ions in sodium chloride crystal is x pm, the length of the edge of the unit cell is
 a) $\frac{x}{2}$ pm
 b) $\frac{x}{4}$ pm
 c) $2x$ pm
 d) $4x$ pm
265. When a gas undergoes adiabatic expansion, it gets cooled due to
 a) Loss of kinetic energy
 b) Fall in temperature
 c) Decrease in velocity
 d) Energy change in doing work

266. For one mole of an ideal gas, increasing the temperature from 10°C to 20°C
- Increases the average kinetic energy by two times
 - Increases the rms velocity by $\sqrt{2}$ times
 - Increases the rms velocity by two times
 - Increases both the average kinetic energy and rms velocity, but not significantly
267. The energy of an ideal gas depends only on its
- Pressure
 - Volume
 - Number of moles
 - Temperature
268. X-ray analysis shows that the unit cell length in NaCl is 562.8 pm. Calculate the density you would expect on this basis, $N_A = 6.023 \times 10^{23} \text{ mol}^{-1}$
- 0.3216 g cm^{-3}
 - 2.179 g cm^{-3}
 - 1.859 g cm^{-3}
 - 2.346 g cm^{-3}
269. At what temperature will most probable speed of the molecules of the second member of alkyne series be the same as that of SO_2 at 527°C?
- 347°C
 - 227°C
 - 800°C
 - 254°C
270. Two gases A and B having the same temperature T , same pressure P and same volume V are mixed. If the mixture is at the same temperature T and occupies a volume V , the pressure of the mixture is:
- $2P$
 - P
 - $P/2$
 - $4P$
271. On a hot day of rainy season we feel discomfort as:
- Temperature is high
 - The blood pressure increases
 - The rate of evaporation decreases due to large relative humidity
 - The question is irrelevant
272. Which of the given sets of temperature and pressure will cause a gas to exhibit the greatest deviation from ideal gas behavior?
- 100°C and 4 atm
 - 100°C and 2 atm
 - 100°C and 4 atm
 - 0°C and 2 atm
273. In van der Waals' equation of state of the gas, the constant ' b ' is a measure of:
- Intermolecular collisions per unit volume
 - Intermolecular attraction
 - Volume occupied by molecules
 - Intermolecular repulsions
274. Which statement about evaporation is incorrect?
- Evaporation takes place at all temperature
 - Evaporation occurs only at the surface
 - Evaporation produces cooling
 - Average KE of residual liquid molecules increase as evaporation occurs
275. One mole of oxygen at 273 K and one mole of sulphur di-oxide at 546 K are taken in two separate containers, then
- Kinetic energy of $\text{O}_2 > \text{kinetic energy of } \text{SO}_2$
 - Kinetic energy of $\text{O}_2 < \text{kinetic energy of } \text{SO}_2$
 - Kinetic energy of both are equal
 - None of the above
276. Piezoelectric crystals are used in
- TV
 - Radio
 - Freeze
 - Record player
277. The root mean square speed of an ideal gas in a closed container of fixed volume is increased from $5 \times 10^4 \text{ cms}^{-1}$ to $10 \times 10^4 \text{ cms}^{-1}$. Which statement might correctly explain how the change accomplished?
- By heating the gas, the temperature is doubled
 - By heating the gas, the pressure is made four times
 - By heating the gas, the volume is tripled
 - By heating the gas, the pressure is made three times
278. At low pressure, the van der Waals' equation is reduced to
- $Z = \frac{pV_m}{RT} = 1 - \frac{ap}{RT}$
 - $Z = \frac{pV_m}{RT} = 1 + \frac{b}{RT}p$
 - $pV_m = RT$
 - $Z = \frac{pV_m}{RT} = 1 - \frac{a}{RT}$

279. If saturated vapours are compressed slowly (temperature remaining constant) to half the initial volume, the vapour pressure will
 a) Become four times b) Become doubled c) Remain unchanged d) Become half
280. In two vessels of 1 L each at the same temperature 1 g of H_2 and 1 g of CH_4 are taken, for these
 a) V_{rms} values will be same b) Kinetic energy per mol will be same
 c) Total kinetic energy will be same d) Pressure will be same
281. Which of the following statements about amorphous solids is incorrect?
 a) They melt over a range of temperature b) There is no orderly arrangement of particles
 c) They are rigid and incompressible d) They are anisotropic
282. Kinetic theory of gases assumes that tiny particles called molecules:
 a) Contain average KE proportional to absolute temperature
 b) Exert no force during collisions
 c) Exert attractive force on each other
 d) Contain constant KE at all temperatures
283. The absolute temperature of a gas is increased 3 times. The root mean square speed of the molecules will be:
 a) 3 times b) 9 times c) $1/3$ times d) $\sqrt{3}$ times
284. Which one of the following represents the graph between $\log p$ (on Y – axis) and $\frac{1}{T}$ (on X – axis)?
 (p = vapour pressure of a liquid, T = absolute temperature)

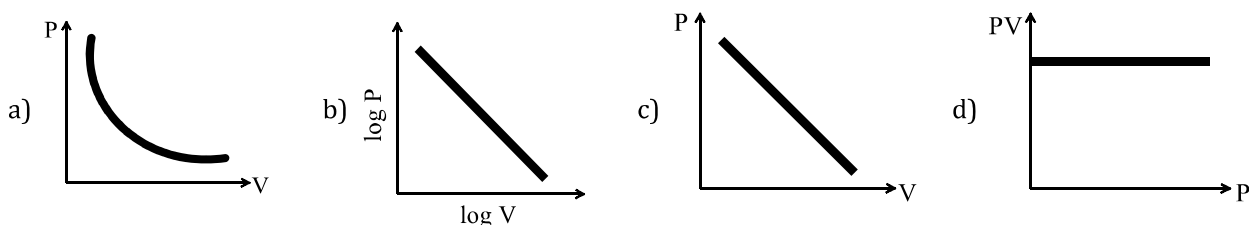


285. Joule-Thomson coefficient $(\partial T/\partial P)_H$ for an ideal gas is:
 a) Zero b) +ve c) –ve d) None of these
286. In $AgBr$ crystal, the ion size lies in the order $Ag^+ \ll Br^-$. The $AgBr$ crystal should have the following characteristics
 a) Defect less (perfect) crystal b) Schottky defect
 c) Frenkel defect d) Both Schottky and Frenkel defect
287. A bottle of dry NH_3 and bottle of dry HCl connected through a long tube are opened simultaneously at both ends, the white (NH_4Cl) ring first formed will be:
 a) At the centre of the tube
 b) Near the HCl bottle
 c) Near the ammonia bottle
 d) Throughout the length of the tube
288. At $20^\circ C$ and 1.00 atm partial pressure of hydrogen, 18 mL of hydrogen, measured at STP, dissolves in 1 L of water. If water at $20^\circ C$ is exposed to a gaseous mixture having total pressure of 1400 torr (excluding the vapour pressure of water) and containing 68.5% H_2 by volume, find the volume of H_2 , measured at STP,

- which will dissolve in 1 L of water
- a) 18 mL b) 12 mL c) 23 mL d) 121 mL
289. A compound is formed by elements A and B . This crystallizes in the cubic structure when atoms A are at the corners of the cube and atoms B are at the centre of the body. The simplest formula of the compound is
- a) AB b) AB_2 c) A_2B d) AB_4
290. If the pressure at the triple point of a substance is greater than 1 atm, we expect:
- a) The boiling point of the liquid to be lower than triple point temperature
 b) That the substance cannot exist as a liquid
 c) The solid sublimes without melting
 d) The melting point of the solid to be at a lower temperature than the triple point temperature
291. An aqueous solution of methanol has vapour pressure
- a) More than that of water b) Less than that of water
 c) Equal to that of water d) Equal to that of methanol
292. Dalton's law of partial pressure is not applicable to
- a) H_2 and N_2 mixture b) H_2 and Cl_2 mixture c) H_2 and CO_2 mixture d) None of these
293. The numerical value of $c_p - c_v$ is equal to:
- a) R b) R/M c) M/R d) None of these
294. The rms speed of N_2 molecules in a gas is u . If the temperature is doubled and the nitrogen molecules dissociate into nitrogen atoms, the rms speed becomes
- a) $u/2$ b) $2u$ c) $4u$ d) $14u$
295. When two atoms of hydrogen combine to form a molecule of hydrogen gas, the energy of the molecule is:
- a) Equal to that of sum of energy of separate atoms
 b) Higher than that of sum of energy of separate atoms
 c) Lower than that of sum of energy of separate atoms
 d) None of the above
296. A bubble of volume V_1 is in the bottom of a pond at $15^\circ C$ and 1.5 atm pressure when it comes at the surface it observes a pressure of 1 atm at $25^\circ C$ and have volume V_2 , give $\frac{V_2}{V_1}$
- a) 15.5 b) 0.155 c) 155.0 d) 1.55
297. One mole of an ideal monoatomic gas is mixed with 1 mole of an ideal diatomic gas. The molar specific heat of the mixture at constant volume is:
- a) 3 cal b) 4 cal c) 8 cal d) 9 cal
298. The arrangement $ABC, ABC, ABC \dots$ is referred as
- a) Cubic close packing b) Tetrahedral close packing
 c) Octahedral close packing d) Hexagonal close packing
299. Which is lighter than dry air?
- a) Moist air b) SO_2 c) Cl_2 d) O_2
300. Slope between pV and p at constant temperature is
- a) Zero b) 1 c) $\frac{1}{2}$ d) $\frac{1}{\sqrt{2}}$
301. When a capillary tube of diameter 0.8 mm is dipped in a liquid having density 800 kg m^{-3} , then the height of liquid in the capillary tube rises to 4 cm. The surface tension of liquid is ($g = 9.8 \text{ m/s}^2$)
- a) $4.3 \times 10^{-2} \text{ Nm}^{-1}$ b) $5.6 \times 10^{-2} \text{ Nm}^{-1}$ c) $6.3 \times 10^{-2} \text{ Nm}^{-1}$ d) $7.3 \times 10^{-2} \text{ Nm}^{-1}$
302. Which contains the same number of molecules as 16 g of oxygen?
- a) 16 g O_3 b) 16 g SO_2 c) 32 g SO_2 d) All of these
303. The number of octahedral sites per sphere in a fcc structure is
- a) 1 b) 2 c) 4 d) 8
304. One gram mole of a gas at NTP occupies 22.4 L as volume. This fact was derived from
- a) Dalton's theory b) Avogadro's hypothesis
 c) Berzelius hypothesis d) Law of gaseous volumes

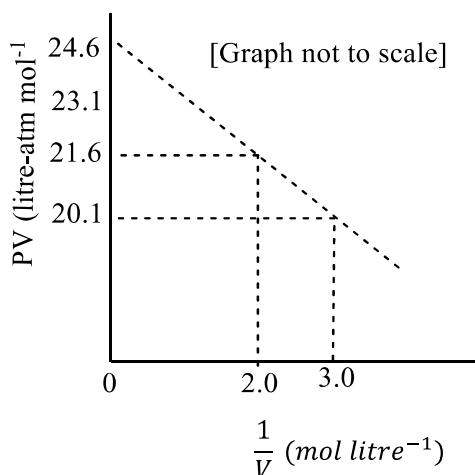
305. Ionic solids, with Schottky defects, contain in their structure
 a) equal number of cation and anion vacancies b) anion vacancies and interstitial anions
 c) cation vacancies only d) cation vacancies and cations
306. In the equation of state of an ideal gas $pV = nRT$, the value of the universal gas constant would depend only on
 a) The nature of the gas b) The pressure of the gas
 c) The units of the measurement d) None of the above
307. The number of molecules present in 1 mL of gas or vapour at STP is:
 a) Called Loschmidt's number
 b) Equal to 2.617×10^{19} per mL
 c) Both (a) and (b)
 d) None of the above

308. Which curve does not represent Boyle's law?



309. The rate of effusion doesn't depend on
 a) The area of cross section of hole b) Number of molecules per unit volume
 c) The average molecular speed d) Size of the molecule
310. A bottle of dry ammonia and one of dry hydrogen chloride are connected through a long tube. The stoppers at both ends of the tube are opened simultaneously. The white ammonium chloride ring first formed will be
 a) At the centre of the tube b) Near the hydrogen chloride bottle
 c) Near the ammonia bottle d) Throughout the length of the tube
311. Point defects are present in
 a) ionic solids b) amorphous solids c) molecular solids d) Liquids
312. Frenkel defect is caused due to
 a) The shift of a positive ion from its normal lattice site to an interstitial site
 b) An ion missing from the normal lattice site creating a vacancy
 c) An extra positive ion occupying an interstitial position in the lattice
 d) An extra negative ion occupying an interstitial position in the lattice
313. Which of the following is not correct for ionic crystals?
 a) All are electrolyte
 b) Exhibit the property of isomorphism
 c) They possess high melting point and boiling point
 d) Exhibit directional properties of the bond
314. If temperature of 1 mole of gas is increased by 50°C , calculate the change in kinetic energy of the system.
 a) 623.25 J b) 6.235 J c) 623.5 J d) 6235.0 J
315. Oxygen gas generated by the decomposition of potassium chlorate is collected. The volume of oxygen collected at 24°C and atmospheric pressure of 760 mm Hg is 128 mL. Calculate the mass of oxygen gas obtained. The pressure of the water vapour at 24°C is 22.4 mm Hg
 a) 0.123 g b) 0.163 g c) 0.352 g d) 1.526 g
316. Which set of conditions represents easiest way to liquefy a gas?
 a) Low temperature and high pressure
 b) High temperature and low pressure

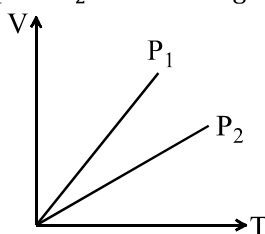
- c) Low temperature and low pressure
d) High temperature and high pressure
317. At STP, the order of root mean square velocities of molecules of H_2 , N_2 , O_2 and HBr is
a) $H_2 > N_2 > O_2 > HBr$ b) $HBr > O_2 > N_2 > H_2$ c) $HBr > H_2 > O_2 > N_2$ d) $N_2 > O_2 > H_2 > HBr$
318. The molecular weight of a gas which diffuses through a porous plug of $1/6$ th of the speed of hydrogen under identical conditions is:
a) 27 b) 72 c) 36 d) 48
319. The average molecular speed is greatest in case of a gas sample of:
a) 2.0 mole of He at 140 K
b) 0.05 mole of Ne at 500 K
c) 0.40 mole of O_2 at 400 K
d) 1.0 mole of N_2 at 560 K
320. A curve drawn at constant temperature is called an isotherm. This shows the relationship between
a) p and $\frac{1}{V}$ b) pV and V c) V and $\frac{1}{p}$ d) p and V
321. Which gas is adsorbed by charcoal?
a) CO b) N_2 c) H_2 d) All of these
322. If the temperature of 500 mL of air increases from $27^\circ C$ to $42^\circ C$ under constant pressure, then the increase in volume shall be
a) 15 mL b) 20 mL c) 25 mL d) 30 mL
323. In the closest packed structure of a metallic lattice, the number of nearest neighbours of a metallic atom is
a) 4 b) 6 c) 8 d) 12
324. Which gas when passed through dilute blood will impart a cherry red colour to the solution?
a) CO_2 b) $COCl_2$ c) NH_3 d) CO
325. Which one of the following has Frenkel defect?
a) NaCl b) AgBr c) Graphite d) Diamond
326. The number of close neighbour in a body centred cubic lattice of identical sphere is
a) 2 b) 4 c) 6 d) 8
327. For an ideal gas, the value of $\left(\frac{\partial E}{\partial V}\right)_T$ is :
a) Positive b) Zero c) Negative d) Interchangeable
328. In a mixture of a light gas and a heavy gas in a closed container, the light gas will:
a) Have a lower average speed per molecule than the heavy gas
b) Have a higher average speed per molecule than the heavy gas
c) Rise to the top of the container
d) All are wrong
329. Which gas can be most readily liquefied?
a) NH_3 b) Cl_2 c) SO_2 d) CO_2
330. It is easier to liquefy oxygen than hydrogen because:
a) Oxygen has a higher critical temperature and lower inversion temperature than hydrogen
b) Oxygen has a lower critical temperature and higher inversion temperature than hydrogen
c) Oxygen has a higher critical temperature and a higher inversion temperature than hydrogen
d) The critical temperature and inversion temperature of oxygen is very low
331. For one mole of a van der Waals' gas when $b = 0$ and $T = 300$ K, the PV vs. $1/V$ plot is shown below. The value of the van der Waals' constant a ($\text{atm. litre}^2 \text{mol}^{-2}$) is:



- a) 1.0 b) 4.5 c) 1.5 d) 3.0
332. The characteristic features of solids are
 a) Definite shape b) Definite size
 c) Definite shape and size d) Definite shape, size and rigidity
333. The liquefaction behaviour of temporary gases like CO₂ approaches that of permanent gases like N₂, O₂ etc, as we go to
 a) Below critical temperature b) Above critical temperature
 c) Above absolute zero d) Below absolute zero
334. The density of O₂ is 16 at NTP. At what temperature its density will be 14? Consider that the pressure remains constant, at
 a) 50°C b) 39°C c) 57°C d) 43°C
335. The density of CCl₄ vapour at 0°C and 76 cm Hg in g/litre is:
 a) 11.2 b) 77 c) 6.88 d) None of these
336. Which gas has the, same rate of diffusion as that of CO₂ at same P and T ?
 a) N₂O b) NO₂ c) N₂ d) CO
337. Which gas has the highest partial pressure in atmosphere?
 a) CO₂ b) H₂O c) O₂ d) N₂
338. Which of the following statements is not true about NaCl structure?
 a) Cl⁻ ions are in fcc arrangement b) Na⁺ ions has coordination number 4
 c) Cl⁻ ions has coordination number 6 d) Each cell contains 4 NaCl molecules
339. For real gases van der Waals' equation is written as

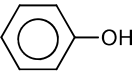
$$\left(p + \frac{an^2}{V^2}\right)(V - nb) = nRT$$
 Where ' a ' and ' b ' are van der Waals' constants
 Two set of gases are:
 (I) O₂, CO₂, H₂ and He
 (II) CH₄, O₂ and H₂
 The gases given in set-I in increasing order of ' b ' and gases given in set-II in decreasing order of ' a ', are arranged below. Select the correct order from the following:
 a) (I) He < H₂ < CO₂ < O₂ (II) CH₄ > H₂ > O₂
 b) (I) O₂ < He < H₂ < CO₂ (II) H₂ > O₂ > CH₄
 c) (I) H₂ < He < O₂ < CO₂ (II) CH₄ > O₂ > H₂
 d) (I) H₂ < O₂ < He < CO₂ (II) O₂ > CH₄ > H₂
340. An ideal gas is allowed to expand both reversibly and irreversibly in an isolated system. If T_i is the initial temperature and T_f is the final temperature, which of the following statements is correct?

- a) $(T_f)_{\text{irrev}} > (T_f)_{\text{rev}}$
 b) $T_f > T_i$ for reversible process but $T_f = T_i$ for irreversible process
 c) $(T_f)_{\text{rev}} = (T_f)_{\text{irrev}}$
 d) $T_f = T_i$ for both reversible and irreversible processes
341. A gas cannot be liquefied if:
 a) Forces of attraction are low under ordinary conditions
 b) Forces of attraction are high under ordinary conditions
 c) Forces of attraction are zero under ordinary conditions
 d) Forces of attraction either high or low under ordinary conditions
342. The average speed of gas molecules is equal to:
 a) $\left[\frac{2RT}{M}\right]^{1/2}$ b) $\left[\frac{3RT}{M}\right]^{1/2}$ c) $\left[\frac{8RT}{\pi M}\right]^{1/2}$ d) $\left[\frac{4RT}{\pi M}\right]^{1/2}$
343. If the pressure on a NaCl structure is increased, then its coordination number will
 a) Increase b) Decrease c) Either (a) or (b) d) Remain the same
344. To raise the volume of a gas by four times, the following method may be adopted. Which of the method is wrong?
 a) T is doubled and P is also doubled
 b) Keeping P constant, T is raised by four times
 c) Temperature is doubled and pressure is halved
 d) Keeping temperature constant, pressure is reduced to $1/4$ of its initial value
345. 50 mL of hydrogen diffuses through small hole from a vessel in 20 min. Time taken for 40 mL of oxygen to diffuse out under similar conditions will be
 a) 12 min b) 32 min c) 8 min d) 64 min
346. Tetragonal crystal system has the following unit cell dimensions
 a) $a = b = c$ and $\alpha = \beta = \gamma = 90^\circ$ b) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$
 c) $a = b \neq c$ and $\alpha = \beta = \gamma = 90^\circ$ d) $a = b \neq c$ and $\alpha = \beta = 90^\circ$ and $\gamma = 120^\circ$
347. A balloon filled with methane CH_4 is pricked with a sharp point and quickly plunged into a tank of hydrogen at the same pressure. After sometime, the balloon will have
 a) Enlarged b) Collapsed
 c) Remained unchanged in size d) Ethylene (C_2H_4) inside it
348. If a gas is expanded at constant temperature:
 a) Number of molecules of the gas decreases
 b) The kinetic energy of the molecules decreases
 c) The kinetic energy of the molecules remains the same
 d) The kinetic energy of the molecules increases
349. The compressibility factor for H_2 and He is usually:
 a) > 1 b) $= 1$ c) < 1 d) Either of these
350. The number of spheres contained (i) in one body centred cubic unit cell and (ii) in one face centred cubic unit cell, is
 a) In (i) 2 and in (ii) 4 b) In (i) 4 and in (ii) 2
 c) In (i) 2 and in (ii) 3 d) In (i) 3 and in (ii) 2
351. V versus T curves at constant pressure P_1 and P_2 for an ideal gas are shown in figure. Which is correct?



- a) $P_1 > P_2$ b) $P_1 < P_2$ c) $P_1 = P_2$ d) All of these
352. The root mean square speed of hydrogen molecules at room temperature is 2400 ms^{-1} . At room temperature the root mean square speed of oxygen molecules would be:
a) 400 ms^{-1} b) 300 ms^{-1} c) 600 ms^{-1} d) 1600 ms^{-1}
353. 4.4 g of CO_2 and 2.24 litre of H_2 at STP are mixed in a container. The total number of molecules present in the container will be:
a) 6.022×10^{23} b) 1.2044×10^{23} c) 2 d) 6.023×10^{24}
354. If 10^{-4} dm^3 of water is introduced into a 1 dm^3 flask at 300 K , how many moles of water are in the vapour phase when equilibrium is established (Given vapour pressure of H_2O at 300K is 3170 Pa ; $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$)
a) $5.56 \times 10^{-6} \text{ mol}$ b) $1.53 \times 10^{-2} \text{ mol}$ c) $4.46 \times 10^{-2} \text{ mol}$ d) $1.27 \times 10^{-3} \text{ mol}$
355. The most probable velocity (in cm/s) of hydrogen molecule at 27°C , will be
a) 19.3×10^4 b) 17.8×10^4 c) 24.93×10^9 d) 17.8×10^8
356. Four particles have speed 2,3,4 and 5 cm/s respectively. Their rms speed is:
a) 3.5 cm/s b) $(272) \text{ cm/s}$ c) $\sqrt{54} \text{ cm/s}$ d) $(\sqrt{54}/2) \text{ cm/s}$
357. An open vessel containing air is heated from 300 K to 400 K . The fraction of air originally present which goes out of it is:
a) $\frac{3}{4}$ b) $\frac{1}{4}$ c) $\frac{2}{3}$ d) $\frac{1}{8}$
358. Which is valid at absolute zero?
a) KE of the gas becomes zero, but molecular motion does not become zero
b) KE of the molecules becomes zero and the molecular motion also becomes zero
c) KE of the gas decreases but does not become zero
d) None of the above
359. Types of forces that can be present in ethanol giving it a liquid state
a) Dipole-dipole interaction b) London forces
c) Hydrogen bonding d) All of these
360. At what temperature would the volume of a given mass of a gas at constant pressure be twice to its volume at 0°C ?
a) 100°C b) 273°C c) 373°C d) 446°C
361. Specific heat is defined as:
a) Heat capacity/g
b) Heat capacity/mol
c) Heat capacity at constant pressure
d) Heat capacity at constant volume
362. The kinetic energy of two moles of N_2 at 27°C is ($R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$):
a) 5491.6 J b) 6491.6 J c) 7482.6 J d) 8882.4 J
363. An example of a substance possessing giant covalent structure is
a) Solid CO_2 b) Silica c) Iodine crystal d) White phosphorus
364. The ratio of cationic radius to anionic radius in an ionic crystal is greater than 0.732. Its coordination number is
a) 1 b) 4 c) 6 d) 8
365. The most probable speed of 8 g of H_2 200 ms^{-1} . Average kinetic energy of H_2 gas is
a) 240 J b) 180 J c) 320 J d) 360 J
366. The intermetallic compound LiAg crystallizes in cubic lattice in which both lithium and silver have coordination number of eight. The crystal class is
a) Simple cubic b) Body centred cube c) Face-centred cube d) None of these
367. Graham's law of diffusion gives better results at:
a) High pressure b) High temperature c) Low pressure d) At all conditions

368. Ratio of average to most probable velocity is
 a) 1.128 b) 1.224 c) 1.0 d) 1.112
369. A sample of pure gas has a density of $1.60 \text{ g litre}^{-1}$ at 26.5°C and 680.2 mm Hg . Which of the following is present in the sample?
 a) CH_4 b) C_2H_6 c) CO_2 d) Xe
370. Dalton's law of partial pressure is not applicable to
 a) $\text{O}_2 + \text{O}_3$ b) $\text{CO} + \text{CO}_2$ c) $\text{NH}_3 + \text{HCl}$ d) $\text{I} + \text{O}_2$
371. The rate of diffusion of hydrogen gas is
 a) 1.4 times to He gas b) Same as He gas c) 5 times to He gas d) 2 times to He gas
372. Which is not true in case of an ideal gas?
 a) It cannot be converted into a liquid
 b) There is no interaction between the molecules
 c) All molecules of the gas move with same speed
 d) At a given temperature pV is proportional to the amount of the gas
373. Weight of 112 mL of oxygen at NTP on liquefaction would be:
 a) 0.32 g b) 0.64 g c) 0.96 g d) 0.16 g
374. Gas equation $pV = nRT$ is obeyed by ideal gas in
 a) Adiabatic process b) Isothermal process c) Both (a) and (b) d) None of the above
375. A gas can be easily liquefied
 a) When its inversion temperature equals the Boyle temperature
 b) Under adiabatic compression
 c) Under pressure when it is cooled to below the critical temperature
 d) All of the above
376. At 400 K, the root mean square (rms) speed of a gas X (molecular weight = 40) is equal to the most probable speed of gas Y at 60 K. The molecular weight of the gas Y is
 a) 2 b) 4 c) 6 d) 8
377. What is the pressure of 2 moles of NH_3 at 27°C , when its volume is 5 L 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
378. Vapours of a liquid exist only:
 a) Below b.p.
 b) Below critical temperature
 c) Below inversion temperature
 d) Above critical temperature
379. If a mixture of gases has a total pressure of 100 cm Hg and the partial pressure of nitrogen in the mixture is 25 mm Hg, then the per cent of nitrogen in the mixture is:
 a) 4% b) 40% c) 400% d) 2.5%
380. A metallic element has a cubic lattice. Each edge of the unit cell is 2Å . The density of the metal is 2 g cm^{-3} . The unit cells in 200 g of the metal are
 a) 1×10^{25} b) 1×10^{24} c) 1×10^{22} d) 1×10^{20}
381. By what ratio the average velocity of the molecule in gas change when the temperature is raised from 50 to 200°C ?
 a) $\frac{1.21}{1}$ b) $\frac{1.46}{1}$ c) $\frac{1.14}{1}$ d) $\frac{4}{1}$
382. A gaseous mixture contains 1 g of H_2 , 4 g of He, 7 g of N_2 and 8 g of O_2 . The gas having the highest partial pressure is:
 a) H_2 b) O_2 c) He d) N_2
383. In a solid 'AB' having the NaCl structure, 'A' atoms occupy the corners of the cubic unit cell. If all the face-centred atoms along one of the axes are removed then the resultant stoichiometry of the solid is

- a) AB_2 b) A_2B c) A_3B_4 d) A_4B_3
384. Which has maximum vapour pressure at a given temperature?
- a) $CH_3CH_2CH_2OH$ b)  c) $CH_3 - O - CH_3$ d) CH_3COOH
385. The molecular mass of each N_2 and CO is 28. If 0.5 L of N_2 at $27^\circ C$ and 700 mm pressure contains n molecules, the number of molecules in 1.0 L of CO under identical conditions will be
- a) $\frac{n}{2}$ b) n c) $2n$ d) None of these
386. If a gas is allowed to expand at constant temperature then
- a) Number of molecules of the gas decreases
 b) The kinetic energy of the gas molecules decreases
 c) The kinetic energy of the gas molecules increases
 d) The kinetic energy of the gas molecules remains the same
387. The ratio of average speed of an oxygen molecule to the rms speed of a nitrogen molecule at the same temperature is
- a) $\left(\frac{3\pi}{7}\right)^{1/2}$ b) $\left(\frac{7}{3\pi}\right)^{1/2}$ c) $\left(\frac{3}{7\pi}\right)^{1/2}$ d) $\left(\frac{7\pi}{3}\right)^{1/2}$
388. The relative rates of diffusion of $U^{235}F_6$ and $U^{238}F_6$ are:
- a) 1.0043 b) 1.2 c) 1.4 d) 1.6
389. In van der Waals' equation of state of the gas law, the constant ' b ' is a measure of
- a) Intermolecular repulsions b) Intermolecular attraction
 c) Volume occupied by the molecules d) Intermolecular collisions per unit volume
390. There is 10 litre of a gas at STP. Which of the following changes keep the volume constant?
- a) 273 K and 2 atm b) $273^\circ C$ and 2 atm c) $546^\circ C$ and 0.5 atm d) $0^\circ C$ and 0 atm
391. In the gas equation $PV = nRT$ the value of universal gas constant depends upon:
- a) The nature of the gas
 b) The pressure of the gas
 c) The temperature of the gas
 d) The units of measurement
392. Sodium metal crystallizes as a body centred cubic lattice with the cell edge 4.29 Å. What is the radius sodium atom?
- a) $1.857 \times 10^{-8} cm$ b) $2.371 \times 10^{-7} cm$ c) $3.817 \times 10^{-8} cm$ d) $9.312 \times 10^{-7} cm$
393. The density of a gas is $1.964 g dm^{-3}$ at 273 K and 76 cm Hg. The gas is
- a) CH_4 b) C_2H_6 c) CO_2 d) Xe
394. How many space lattices are obtainable from the different crystal systems?
- a) 7 b) 14 c) 32 d) 230
395. By what factor does the average velocity of a gaseous molecule increase when the temperature (in Kelvin) is doubled?
- a) 1.4 b) 2.0 c) 2.8 d) 4.0
396. Consider $1 cm^3$ sample of air at absolute temperature T_0 at sea-level and another $1 cm^3$ sample of air at a height where the pressure is one third atmosphere. The absolute temperature T of the sample at the height is :
- a) Equal to $T_0/3$
 b) Equal to T_0
 c) Equal to $3T_0$
 d) Cannot be determined in terms of T_0 from the above data
397. Which among the following will show anisotropy?
- a) Glass b) Plastic c) Barium chloride d) Wood
398. If the radius ratio is in the range of 0.414 – 0.732, then the coordination number will be

- a) 15×10^{-3} b) 64×10^{-3} c) 5×10^{-3} d) 46×10^{-3}

413. When r , p and M represent rate of diffusion, pressure and molecular mass, respectively, then the ratio of the rates of diffusion (r_A/r_B) of two gases A and B , is given as

- a) $(p_A/p_B)^{1/2} (M_A/M_B)$ b) $(p_A/p_B) (M_B/M_A)^{1/2}$ c) $(p_A/p_B)^{1/2} (M_B/M_A)$ d) $(p_A/p_B) (M_A/M_B)^{1/2}$

414. A gas behaves like an ideal gas at

- a) High pressure and low temperature b) Low pressure and high temperature
c) High pressure and high temperature d) Low pressure and low temperature

415. Which gas is hydrolysed in the lungs to form HCl and ultimately lead to suffocation?

- a) NH_3 b) Cl_2 c) SO_2 d) COCl_2

416. In CsCl structure, the coordination number of Cs^+ is

- a) Equal to that of Cl^- , that is 6 b) Equal to that of Cl^- , that is 8
c) Not equal to that of Cl^- , that is 6 d) Not equal to that of Cl^- , that is 8

417. The intermolecular force of attraction between non-polar molecules is called

- a) H-bonding
b) Dispersion forces
c) Interionic attraction
d) Adhesive forces

418. Non-reacting gases have a tendency to mix with each other. This property is known as:

- a) Diffusion b) Fusion c) Mixing d) None of these

419. In orthorhombic, the value of a , b and c are respectively 4.2\AA , 8.6\AA and 8.3\AA . Given the molecular mass of the solute is 155 g mol^{-1} and that of density is 3.3 g/cc , the number of formula units per unit cell is

- a) 2
b) 3
c) 4
d) 6

420. At room temperature the rms speed of the molecules of a certain diatomic gas is found to be 1930 m/s .

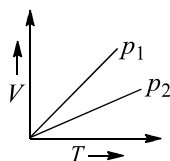
The gas is:

- a) H_2 b) F_2 c) O_2 d) Cl_2

421. The correct statement regarding F-centre is

- a) Electron are held in the voids of crystals
b) F-centre produces colour to the crystals
c) Conductivity of the crystal increases due to F-centre
d) All of the above

422. V versus T curves at constant pressure p_1 and p_2 for an ideal gas are shown in figure. Which is correct?

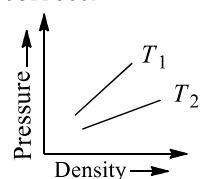


- a) $p_1 > p_2$ b) $p_1 < p_2$ c) $p_1 = p_2$ d) All of these

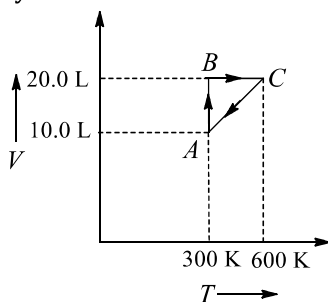
423. Which gas has the highest partial pressure in atmosphere?

- a) CO_2 b) H_2O c) O_2 d) N_2

424. Figure shows graphs of pressure versus density for an ideal gas at two temperatures T_1 and T_2 . Which is correct?



- a) $T_1 > T_2$ b) $T_1 = T_2$ c) $T_1 < T_2$ d) None of these
425. For an ideal gas, number of moles per litre in terms of its pressure P , gas constant R and temperature T is:
 a) PT/R b) PRT c) P/RT d) RT/P
426. The compressibility factor for a real gas at high pressure is:
 a) 1 b) $1 + (Pb/RT)$ c) $1 - (Pb/RT)$ d) $1 + (RT/Pb)$
427. If NaCl is doped with 10^{-3} mol % SrCl_2 , then the concentration of cation vacancies will be
 a) 1×10^{-3} mol % b) 2×10^{-3} mol % c) 3×10^{-3} mol % d) 4×10^{-3} mol %
428. This graph expresses the various steps of the system containing 1 mole of gas. Which type of process, system has when it moves from C to A?



- a) Isochoric b) Isobaric c) Isothermal d) Cyclic
429. The temperature, at which a gas shows maximum ideal behaviour, is known as
 a) Boyle's temperature b) Inversion temperature
 c) Critical temperature d) Absolute temperature
430. The rate of diffusion of methane at a given temperature is twice that of gas X. The molecular mass of gas X is
 a) 64.0 b) 32.0 c) 4.0 d) 8.0
431. The liquefaction behaviour of temporary gases like CO_2 approaches that of permanent gases like N_2 , O_2 , etc., as we go:
 a) Below critical temperature
 b) Above critical temperature
 c) Above absolute zero
 d) Below absolute zero
432. The rates of diffusion of SO_2 , CO_2 , PCl_3 and SO_3 are in the following order
 a) $\text{PCl}_3 > \text{SO}_3 > \text{SO}_2 > \text{CO}_2$ b) $\text{CO}_2 > \text{SO}_2 > \text{PCl}_3 > \text{SO}_3$
 c) $\text{SO}_2 > \text{SO}_3 > \text{PCl}_3 > \text{CO}_2$ d) $\text{CO}_2 > \text{SO}_2 > \text{SO}_3 > \text{PCl}_3$
433. Hexagonal close packed arrangement of ions is described as
 a) AB AB A ... b) ABC ABC ... c) ABBBBAB ... d) ABC ABA ...
434. If both oxygen and helium gases are at the same temperature, the rate of diffusion of O_2 is very close to
 a) 4 times that of He b) 2 times that of He c) 0.35 times that of He d) 8 times that of He
435. If C_1, C_2, C_3, \dots represent the speeds of n_1, n_2, n_3, \dots molecules, then the root mean square speed is:
 a) $\left[\frac{n_1 C_1^2 + n_2 C_2^2 + n_3 C_3^2 + \dots}{n_1 + n_2 + n_3 + \dots} \right]^{1/2}$
 b) $\left[\frac{n_1^2 C_1^2 + n_2^2 C_2^2 + n_3^2 C_3^2 + \dots}{n_1 + n_2 + n_3 + \dots} \right]^{1/2}$
 c) $\frac{(n_1 C_1^2)^{1/2}}{n_1} + \frac{(n_2 C_2^2)^{1/2}}{n_2} + \frac{(n_3 C_3^2)^{1/2}}{n_3} + \dots$
 d) $\left[\frac{(n_1 C_1 + n_2 C_2 + n_3 C_3 + \dots)^2}{(n_1 + n_2 + n_3 + \dots)} \right]^{1/2}$
436. The ratio of molar heats of vaporization and boiling point of a liquid is constant. This is known as
 a) Ostwald's rule b) Phase rule c) Vant Hoff rule d) Trouton's rule

437. At high temperature and low pressure, the van der Waals' equation is reduced to

a) $\left(p + \frac{a}{V_m^2}\right)(V_m) = RT$

b) $pV_m = RT$

c) $p(V_m - b) = RT$

d) $\left(p + \frac{a}{V_m^2}\right)(V_m - b) = RT$

438. To what temperature must a neon gas sample be heated to double its pressure, if the initial volume of gas at 75°C is decreased by 15.0%?

a) 319°C

b) 592°C

c) 128°C

d) 60°C

439. Consider following pairs of gases A and B

| S. no. | A | B |
|--------|--------------------------------|--------------------------------|
| (i) | CO ₂ | N ₂ O |
| (ii) | CO | N ₂ |
| (iii) | O ₂ | O ₃ |
| (iv) | H ₂ O | D ₂ O |
| (v) | ²³⁵ UF ₆ | ²³⁸ UF ₆ |

Relative rates of effusion of gases A and B is in the order

a) $a = b < c < d < e$

b) $a = b < d < c < e$

c) (i) = (ii) < (v) < (iv) < (iii)

d) $a < b < c < d < e$

440. What is the ratio of diffusion rate of oxygen and hydrogen?

a) 1 : 4

b) 4 : 1

c) 1 : 8

d) 8 : 1

441. A monoatomic ideal gas undergoes a process in which the ratio of P to V at any instant is constant and equal to unity. The molar heat capacity of the gas is:

a) $\frac{4R}{2}$

b) $\frac{3R}{2}$

c) $\frac{5R}{2}$

d) Zero

442. The units of van der Waals' constants a, b respectively, are

a) L atm² mol⁻¹ and mol L⁻¹

b) L atm mol² and mol L⁻¹

c) L² atm mol⁻² and mol⁻¹ L

d) L⁻² atm⁻¹ mol⁻¹ and L mol⁻²

443. In the Bragg's equation for diffraction of X-rays, n represents for

a) Avogadro's number

b) quantum number

c) Moles

d) an integer

444. The rms velocity of an ideal gas at constant pressure varies with density (d) as

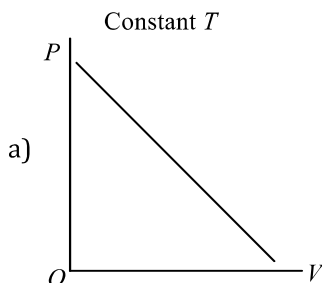
a) $\frac{1}{\sqrt{d}}$

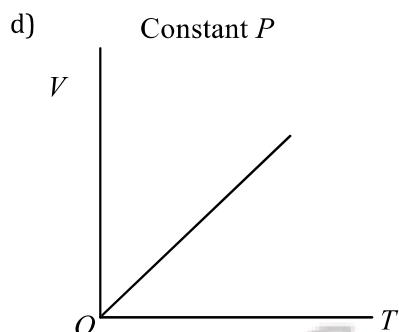
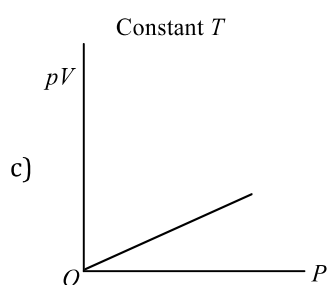
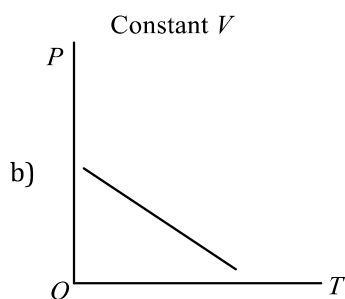
b) d

c) \sqrt{d}

d) d²

445. Which of the following diagrams correctly describes the behaviour of a fixed mass of an ideal gas? (T is measured in K).





446. An AB_2 type structure is found in
 a) N_2O b) $NaCl$ c) Al_2O_3 d) CaF_2
447. In a solid lattice, the cation has left a lattice site and is located at an interstitial position, the lattice defect is
 a) Frenkel defect b) Schottky defect c) Interstitial defect d) Valency defect
448. Volume occupied by molecules of one mole gas at NTP, each having radius of 10^{-8} cm is:
 a) 22.0 litre b) 22.4 litre c) 10.09 mL d) 10.09 litre
449. According to the kinetic theory of gases, in an ideal gas, between two successive collisions a gas molecule travels
 a) In a circular path b) In a wavy path
 c) In a straight line path d) With an accelerated velocity
450. At what temperature, both Celsius and Fahrenheit scale read the same value?
 a) 100° b) 130° c) 60° d) -40°
451. The gases showing heating and cooling effect during Joule-Thomson's experiment have Joule-Thomson coefficient:
 a) +ve and -ve respectively
 b) -ve and +ve respectively
 c) +ve
 d) -ve
452. If a gas is heated at constant pressure, its density
 a) Will decrease b) Will increase
 c) May increase or decrease d) Will remain unchanged
453. At NTP, the density of a gas, whose molecular weight is 45, is

- a) 44.8 g/L b) 11.4 g/L c) 2 g/L d) 3 g/L
454. The gases are at absolute temperature 300 K and 350 K respectively. The ratio of average kinetic energy of their molecules is:
 a) 7 : 6 b) 6 : 7 c) 36 : 49 d) 49 : 36
455. The ratio of the rate of diffusion of helium and methane under identical condition of pressure and temperature will be
 a) 4 b) 0.2 c) 2 d) 0.5
456. An example of a non-stoichiometric compound is
 a) PbO b) NiO₂ c) Al₂O₃ d) Fe₃O₄
457. For 1 mole of gas, the average kinetic energy is given as E . The u_{rms} of gas is:
 a) $\left[\frac{2E}{M}\right]^{1/2}$ b) $\left[\frac{3E}{M}\right]^{1/2}$ c) $\left[\frac{2E}{3M}\right]^{1/2}$ d) $\left[\frac{3E}{2M}\right]^{1/2}$
458. Which of the following is not the assumption of kinetic theory of gases?
 a) The actual volume of the gaseous molecules is negligible as compared to the total volume of the gas
 b) Molecules are perfectly elastic
 c) The critical temperature is the measure of the kinetic energy of the molecule
 d) The effect of gravity on motion of molecules is negligible
459. For a given mass of a gas, if pressure is reduced to half and temperature is increased two times, then the volume would become:
 a) $V/4$ b) $2V^2$ c) $6V$ d) $4V$
460. The pressure of gas having 2 mole in 44.8 litre vessel at 540 K is:
 a) 1 atm b) 2 atm c) 3 atm d) 4 atm
461. Charles' law is represented mathematically as
 a) $V_t = KV_0t$ b) $V_t = \frac{KV_0}{t}$ c) $V_t = V_0\left(1 + \frac{273}{t}\right)$ d) $V_t = V_0\left(1 + \frac{t}{273}\right)$
462. How many mole of He gas occupy 22.4 litre at 30°C and one atmospheric pressure?
 a) 0.90 b) 1.11 c) 0.11 d) 1.0
463. An open vessel at 27°C is heated until $3/8^{\text{th}}$ of the air in it has been expelled. Assuming that the volume remains constant, calculate the temperature at which the vessel was heated
 a) 307°C b) 107°C c) 480°C d) 207°C
464. The excluded volume of a molecule in motion is... times the actual volume of a molecule in rest
 a) 2 b) 4 c) 3 d) 0.5
465. In octahedral holes (voids)
 a) a bi-triangular void surrounded by six spheres
 b) a bi-triangular void surrounded by four spheres
 c) a bi-triangular void surrounded by eight spheres
 d) a simple triangular void surrounded by four spheres
466. Monoclinic crystal has dimension
 a) $a \neq b \neq c, \alpha = \gamma = 90^\circ, \beta \neq 90^\circ$ b) $a = b = c, \alpha = \beta = \gamma = 90^\circ$
 c) $a = b = c, \alpha = \beta = 90^\circ, \gamma = 120^\circ$ d) $a \neq b = c, \alpha = \beta = \gamma = 120^\circ$
467. When the temperature is raised, the viscosity of the liquid decreases. This is because of:
 a) Decreased volume of the solution
 b) Increase in temperature increases the average kinetic energy of molecules which overcome the attractive force between them
 c) Decreased covalent and hydrogen bond forces
 d) Increased attraction between the molecules
468. 10 mL of oxygen and 10 mL of hydrogen is kept at the same temperature and pressure, which is correct about number of molecules?
 a) $N_{O_2} > N_{H_2}$ b) $N_{O_2} < N_{H_2}$ c) $N_{O_2} = 16N_{H_2}$ d) $N_{O_2} = N_{H_2}$

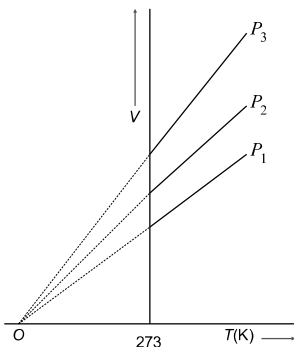
469. The speed possessed by majority of gaseous molecules is:
 a) Average speed b) Most probable speed c) RMS speed d) None of these
470. If the number of atoms per unit in a crystal is 2, the structure of crystal is
 a) Simple cubic b) Body centred cubic (bcc)
 c) Octahedral d) Face centred cubic (fcc)
471. Average speed is equal to
 a) 0.9813 RMS speed b) 0.9 RMS speed
 c) 0.9213 RMS speed d) 0.9602 RMS speed
472. The number of unit cells in 58.5 g of NaCl is nearly
 a) 0.5×10^{24} b) 1.5×10^{23} c) 3×10^{22} d) 6×10^{20}
473. During the evaporation of liquid
 a) The temperature of the liquid will rise b) The temperature of the liquid will fall
 c) May rise or fall depending on the nature d) The temperature remains unaffected
474. A mixture of two gases, having partial pressures p_1 and p_2 , has total pressure p , then according to Dalton's law
 a) $p = p_1 + p_2$ b) $p = \sqrt{(p_1 + p_2)}$ c) $p = p_1 \times p_2$ d) $p = (p_1 + p_2)/2$
475. The cooling caused by the adiabatic expansion of a compressed gas below its inversion temperature (T_i) without doing external work is called:
 a) Joule-Thomson effect
 b) Adiabatic demagnetism
 c) Tyndall effect
 d) Compton effect
476. The rates of diffusion of O_2 and H_2 at same P and T are in the ratio:
 a) 1 : 4 b) 1 : 8 c) 1 : 16 d) 4 : 1
477. 300 mL of a gas at 27°C is cooled to 3°C at constant pressure, the final volume is
 a) 270 mL b) 340 mL c) 150 mL d) 240 mL
478. Surface tension of water is 73 dyne cm^{-1} at 20°C . If surface area is increased by 0.10 m^2 , work done is
 a) 7.3 erg b) $7.3 \times 10^4 \text{ erg}$ c) 73 J d) 0.73 J
479. The temperature 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
480. A gas behaves most like an ideal gas under conditions of:
 a) High pressure and low temperature
 b) High temperature and high pressure
 c) Low pressure and high temperature
 d) Low pressure and low temperature
481. The partial pressure of a dry gas is:
 a) Less than that of wet gas
 b) Greater than that of wet gas
 c) Equal to that of wet gas
 d) None of the above
482. The number of collisions depends on:
 a) Mean free path b) Pressure c) Temperature d) All of these
483. The molecular velocity of any gas is
 a) Inversely proportional to the square root of temperature
 b) Inversely proportional to absolute temperature
 c) Directly proportional to square of temperature
 d) Directly proportional to square root of temperature
484. In order to increase the volume of a gas by 10%, the pressure of the gas should be

- a) Increased by 10% b) Increased by 1% c) Decreased by 10% d) Decreased by 1%
485. Compounds with identical crystal structure and analogous chemical formula are called
 a) Isomers b) Isotones c) Allotropes d) Isomorphous
486. 26 mL of CO₂ are passed over hot coke. The maximum volume of CO formed is :
 a) 15 mL b) 10 mL c) 32 mL d) 52 mL
487. Under what conditions will a pure sample of an ideal gas not only exhibit a pressure of 1 atm but also a concentration of 1 mol litre⁻¹?
 ($R = 0.082 \text{ litre atm mol}^{-1} \text{ deg}^{-1}$)
 a) At STP
 b) When $V = 22.4$ litre
 c) When $T = 12K$
 d) Impossible under any condition
488. 380 mL of a gas at 27°C, 800 mm of Hg weighs 0.455 g. The molecular weight of gas is
 a) 46 b) 38 c) 28 d) 24
489. If a gas contains only three molecules that move with velocities of 100, 200, 500 ms⁻¹. What is the rms velocity of that gas in ms⁻¹?
 a) $100 \frac{\sqrt{8}}{3}$ b) $100 \sqrt{30}$ c) $100 \sqrt{10}$ d) $\frac{800}{3}$
490. A vessel has nitrogen gas and water vapours at a total pressure of 1 atm. The partial pressure of water vapours is 0.3 atm. The contents of this vessel are transferred to another vessel having one third of the capacity of original volume, completely at the same temperature, the total pressure of the system in the new vessel is:
 a) 3.0 atm b) 1 atm c) 3.33 atm d) 2.4 atm
491. Average speed of the molecules of a gas in a container moving in one direction is:
 a) $\sqrt{\frac{8RT}{\pi M}}$ b) $\sqrt{\frac{3RT}{M}}$ c) $\sqrt{\frac{2RT}{M}}$ d) Zero
492. Cooking is fast in a pressure cooker, because
 a) Food particles are effectively smashed
 b) Water boils at higher temperature inside the pressure cooker
 c) Food is cooked at constant volume
 d) Loss of heat due to radiation is minimum
493. If one mole of a monoatomic gas ($\gamma = 5/3$) is mixed with one mole of a diatomic gas ($\gamma = 7/5$), the value of γ for the mixture is:
 a) 1.4 b) 1.5 c) 1.53 d) 3.07
494. The kinetic energy of N molecules of O₂ is x joule at -123°C . Another sample of O₂ at 27°C has a kinetic energy of $2x$ joule. The latter sample contains:
 a) N molecules of O₂ b) $2N$ molecules of O₂ c) $N/2$ molecules of O₂ d) None of these
495. A gas is heated in such a way so that its pressure and volume both becomes double. Again by lowering temperature, one fourth of initial number of moles of air has been taken in, to maintain the double volume and pressure. By what fraction, the temperature must have been raised finally?
 a) $\frac{1}{5}$ times b) $\frac{4}{5}$ times c) $\frac{16}{5}$ times d) $\frac{8}{5}$ times
496. If the absolute temperature of a gas is doubled and the pressure is reduced to one half, the volume of the gas will
 a) Remain unchanged b) Be doubled
 c) Increase four fold d) Be halved
497. Diffusion of helium gas is four times faster than
 a) CO₂ b) SO₂ c) NO₂ d) O₂

498. The ratio between root mean square speed of H_2 at 50 K and that of O_2 at 800 K is:
 a) 4 b) 2 c) 1 d) 1/4
499. The product of pressure and volume (PV) has a unit of:
 a) Impulse b) Energy or work c) Entropy d) Force
500. Boyle's law may be expressed as:
 a) $(\partial P/\partial V)_T = K/V$ b) $(\partial P/\partial V)_T = -K/V^2$ c) $(\partial P/\partial V)_T = -K/V$ d) None of these
501. The structure of Na_2O crystal is
 a) NaCl type b) CsCl type c) ZnS type d) Antifluorite type
502. If detergent is added
 a) Surface tension decreases b) Surface tension increases
 c) Surface tension can increase or decrease d) No effect
503. Under identical conditions of temperature the density of a gas A is three times that of gas B while molecular mass of gas B is twice that of A . The ratio of pressures of A and B will be:
 a) 6 b) 1/6 c) 2/3 d) 3/2
504. One mole of CO_2 contains:
 a) 6.02×10^{23} atoms of C
 b) 6.02×10^{23} atoms of O
 c) 3.01×10^{23} molecules of CO_2
 d) None of the above
505. The pressure exerted by 6.0 g of methane gas in a 0.03 m^3 vessel at 129°C is: (Atomic masses of C = 12.01, H = 1.01 and $R = 8.314 \text{ J K}^{-1}\text{mol}^{-1}$)
 a) 215216 Pa b) 13409 Pa c) 41648 Pa d) 31684 Pa
506. Two vessels having equal volume contain molecular hydrogen at one atmospheric and helium at two atmospheric pressure respectively. If both samples are at the same temperature the mean velocity of hydrogen molecular is:
 a) Equal to that of helium
 b) Twice that of helium
 c) Half that of helium
 d) $\sqrt{2}$ times that of helium
507. Solid carbon dioxide is an example of
 a) Metallic crystal b) Covalent crystal c) Molecular crystal d) Ionic crystal
508. A gas is heated from 0°C to 100°C at 1.0 atm pressure. If the initial volume of the gas is 10 litre, its final volume would be:
 a) 7.32 litre b) 10.0 litre c) 13.66 litre d) 20.0 litre
509. 32 g of oxygen and 3 g of hydrogen are mixed and kept in a vessel of 760 mm pressure and 0°C . The total volume occupied by the mixture will be nearly:
 a) 22.4 litre b) 33.6 litre c) 56 litre d) 44.8 litre
510. The rate of diffusion of a gas is proportional to
 a) $\frac{p}{\sqrt{d}}$ b) $\sqrt{\frac{p}{d}}$ c) $\frac{p}{d}$ d) $\frac{\sqrt{p}}{d}$
511. The structure of MgO is similar to $NaCl$. What would be the coordination number of magnesium?
 a) 2 b) 4 c) 6 d) 8
512. Which solid will have the weakest intermolecular forces?
 a) P b) Naphthalene c) NaF d) Ice
513. A 0.5 dm^3 flask contains gas A and another flask of 1 dm^3 contains gas B at the same temperature. If density of gas A is 3.0 g dm^{-3} and of gas B is 1.5 g dm^{-3} and mol. wt. of $A = \frac{1}{2}$ mol. wt. of 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) $\frac{P_A}{P_B} = 3$

514. A helium atoms is two times heavier than a hydrogen molecule. At 298 K, the average kinetic energy of a helium atom is
 a) Two times that of a hydrogen molecule b) Four times that of a hydrogen molecule
 c) Half that of a hydrogen molecule d) Same as that of a hydrogen molecule
515. Pressure exerted by 1 mole of methane in a 0.25 L container at 300 K using van der Waals' equation is (Given, $a = 2.253 \text{ atm L}^2 \text{ mol}^{-2}$, $b = 0.0428 \text{ L mol}^{-1}$)
 a) 82.82 atm b) 152.51 atm c) 190.52 atm d) 70.52 atm
516. The temperature of an ideal gas is increased from 140 K to 560 K. If at 140 K the root mean square velocity of the gas molecules is V , at 560 K it becomes:
 a) $5V$ b) $2V$ c) $V/2$ d) $V/4$
517. When a certain crystal was studied by the Bragg technique using X-rays of wavelength 229 pm, an X-ray reflection was observed at an angle of $23^\circ 20'$. What is the corresponding interplanar spacing?
 [$\sin(23^\circ 20') = 0.396$]
 a) 375.6 pm b) 256.5 pm c) 289.2 pm d) 315.4 pm
518. The compressibility factor of a gas is defined as $Z = PV/nRT$. The compressibility factor of an ideal gas is:
 a) Zero b) Infinite c) 1 d) -1
519. The numerical value of $\frac{RT}{PV}$ for a gas at critical condition is ... times of $\frac{RT}{PV}$ at normal condition.
 a) 4 b) $3/8$ c) $8/3$ d) $1/4$
520. Which gas is most soluble in water?
 a) H_2S b) NH_3 c) SO_2 d) CO_2
521. Introduction of absolute scale of thermometry is the result of:
 a) Gaseous law b) Graham's law c) Charles' law d) Dalton's law
522. As the temperature is raised from 20°C to 40°C , the average kinetic energy of neon atoms changes by a factor of which of the following?
 a) $1/2$ b) $\sqrt{313/293}$ c) $313/293$ d) 2
523. Calculate the total pressure in a 10.0 L cylinder which contains 0.4 g helium, 1.6 g oxygen and 1.4 g nitrogen at 27°C
 a) 0.492 atm b) 49.2 atm c) 4.92 atm d) 0.0492 atm
524. Which one, among the following, is the van der Waals' equation, describing the behaviour of one mole of a real gas over wide ranges of temperature and pressure?
 a) $\left(p + \frac{a}{V^2}\right)(V - b) = RT$ b) $\left(p - \frac{a}{V^2}\right)(V - b) = RT$
 c) $\left(p + \frac{a}{V^2}\right)(V - b) = \frac{R}{T}$ d) $\left(p + \frac{a}{V^2}\right)(V + b) = RT$
525. Four one litre flasks are separately filled with the gases, O_2 , F_2 , CH_4 and CO_2 under the same conditions. The ratio of number of molecules in these gases:
 a) $2 : 2 : 4 : 3$ b) $1 : 1 : 1 : 1$ c) $1 : 2 : 3 : 4$ d) $2 : 2 : 3 : 4$
526. At absolute zero:
 a) Gaseous phase does not exist
 b) Molecular motion ceases
 c) Temperature is -273°C
 d) All of the above
527. The equation of state corresponding to 8g of O_2 is
 a) $pV = 8RT$ b) $pV = RT/4$ c) $pV = RT$ d) $pV = RT/2$
528. The molecular velocities of two gases at the same temperature are u_1 and u_2 and their masses are m_1 and m_2 respectively. Which of the following expressions are correct?
 a) $\frac{m_1}{u_1^2} = \frac{m_2}{u_2^2}$ b) $m_1u_1 = m_2u_2$ c) $\frac{m_1}{u_1} = \frac{m_2}{u_2}$ d) $m_1u_1^2 = m_2u_2^2$
529. Evaporation and boiling differs

- a) Evaporation is spontaneous at all temperature while boiling is at constant temperature
 b) Boiling is spontaneous at all temperatures while evaporation takes place at constant temperature
 c) Both are spontaneous at all temperature
 d) Evaporation is exothermic while boiling is endothermic
530. Certain volume of a gas exerts on its walls some pressure at a particular temperature. It has been found that by reducing the volume of the gas to half of its original value the pressure becomes twice that of the initial value at constant temperature. This happens because:
 a) Weight of the gas increases with pressure
 b) Speed of the gas molecules decreases
 c) More number of gas molecules strike the surface per second
 d) Gas molecules attract each other
531. The three dimensional graph of lattice points which sets the pattern for the whole lattice is called
 a) Space lattice b) Simple lattice c) Crystal lattice d) Unit cell
532. According to kinetic theory of gases for a diatomic molecule
 a) The pressure exerted by the gas is proportional to the mean square speed of the molecules
 b) The pressure exerted by the gas is proportional to the root mean square speed of the molecules
 c) The root mean square speed is inversely proportional to the temperature
 d) The mean translational KE of the molecule is directly proportional to the absolute temperature
533. 10 g of hydrogen fluoride gas occupy 5.6 litre of volume at NTP. The empirical formula of the gas is HF. The molecular formula of the gas will be:
 (at. Wt. of fluorine = 19)
 a) H_4F_4 b) HF c) H_2F_2 d) H_3F_3
534. Dalton's law of partial pressure is applicable to which one of the following systems?
 a) $NH_3 + HCl$ b) $NO + O_2$ c) $H_2 + Cl_2$ d) $CO + H_2$
535. 50 mL of each gas A and of gas B takes 150 and 200 seconds respectively for effusing through a pin hole under the similar conditions. If molecular mass of gas B is 36, the molecular mass of gas A will be:
 a) 32 b) 64 c) 96 d) 128
536. The volume-temperature graphs of a given mass of an ideal gas at constant pressures are shown below. What is the correct order of pressures?



- a) $p_1 > p_3 > p_2$ b) $p_1 > p_2 > p_3$ c) $p_2 > p_3 > p_1$ d) $p_2 > p_1 > p_3$
537. A balloon filled with N_2O is pricked with a sharp point and quickly plunged into a tank of CO_2 under the same pressure and temperature. The balloon will:
 a) Be enlarged
 b) Shrink
 c) Remain unchanged in size
 d) Collapse completely
538. Kinetic energy of one mole of an ideal gas at 300 K in kJ is
 a) 3.74 b) 348 c) 34.8 d) 3.48
539. In the laboratory, sodium chloride is made by burning the sodium in the atmosphere of chlorine which is

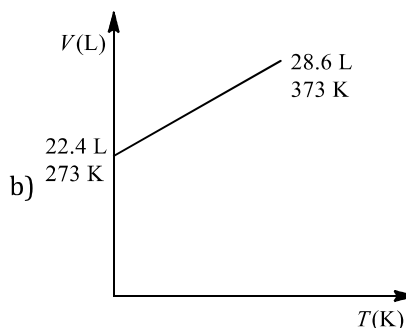
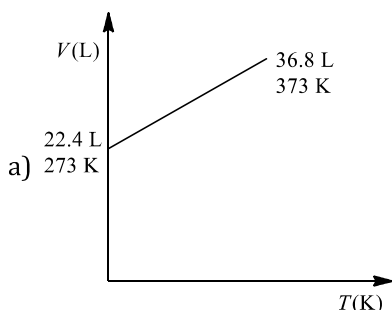
- yellow in colour. The cause of yellow colour is
- a) Presence of electrons in the crystal lattice b) Presence of Na^+ ions in the crystal lattice
 c) Presence of Cl^- ions in the crystal lattice d) Presence of face centred cubic crystal lattice
540. A mixture of 0.50 mole of H_2 and 0.50 mole of SO_2 is introduced into a 10.00 L container at 25°C . The container has a pinhole leak. After a period of time, the partial pressure of H_2 in the remaining mixture
- a) Exceeds that of SO_2 b) Is equal to that of SO_2
 c) Is less than that of SO_2 d) Is the same as in the original mixture
541. The density of oxygen gas at 25°C is 1.458 mg/litre at one atmosphere. At what pressure will oxygen have the density twice the value?
- a) 0.5 atm and 25°C b) 2 atm and 25°C c) 4 atm and 25°C d) None of these
542. A device used for measurement of gaseous pressure based on Boyle's law is known as:
- a) Macleod gauge b) Manometer c) Fortin's barometer d) Screw gauge
543. The average speed of an ideal gas molecule at 27°C is 0.3 m sec^{-1} . The average speed at 927°C will be ...m sec^{-1}
- a) 0.6 b) 0.3 c) 0.9 d) 3.0
544. Potassium crystallizes in a bcc lattice, hence the coordination number of potassium metal is
- a) 0 b) 4 c) 6 d) 8
545. Which of the following is correct for critical temperature?
- a) It is the lowest temperature at which liquid and vapour can coexist
 b) Beyond the critical temperature, there is no distinction between the two phases and a gas cannot be liquefied by compression
 c) At critical temperature, the surface tension of the system is not zero
 d) At critical temperature, the gas and the liquid phases have different critical densities
546. 20 g of hydrogen is present in 5 litre vessel. The molar concentration of hydrogen is:
- a) 2 b) 4 c) 3 d) 1
547. The ratio of most probable velocity to average velocity is
- a) $\frac{\pi}{2}$ b) $\frac{2}{\pi}$ c) $\frac{\sqrt{\pi}}{2}$ d) $\frac{2}{\sqrt{\pi}}$
548. The interionic distance for cesium chloride crystal will be
- a) a b) $\frac{a}{2}$ c) $\frac{2a}{\sqrt{3}}$ d) $\frac{\sqrt{3}}{2}a$
549. A certain mass of a gas occupies a volume of 2 L at STP. To what temperature the gas must be heated to double its volume, keeping the pressure constant?
- a) 100 K b) 273 K c) 273°C d) 546°C
550. In A^+B^- ionic compound, radii of A^+ and B^- ions are 180 pm and 187 pm respectively. The crystal structure of this compound will be
- a) NaCl type b) CsCl type c) ZnS type d) Similar to diamond
551. The density of a gas filled electric lamp is 0.75 kg/m^3 . After the lamp has been switched on, the pressure in it increases from $4 \times 10^4 \text{ Pa}$ to $9 \times 10^4 \text{ Pa}$. What is increases in U_{rms} ?
- a) 100 b) 300 c) 200 d) 400
552. The van der Waals' equation for a real gas is given by the formula $\left(p + \frac{n^2a}{V^2}\right)(V - nb) = nRT$, where p, V, T and n are the pressure, volume, temperature and the number of moles of the gas. Which one is the correct interpretation for the parameter a ?
- a) The parameter a accounts for the finite size of the molecule, not included temperature in the ideal gas law.
 b) The parameter a accounts for the shape of gas phase molecules.
 c) The parameter a accounts for intermolecular interaction's present in the molecule.
 d) The parameter a has no physical significance and van der Waals' introduced it as a numerical correction

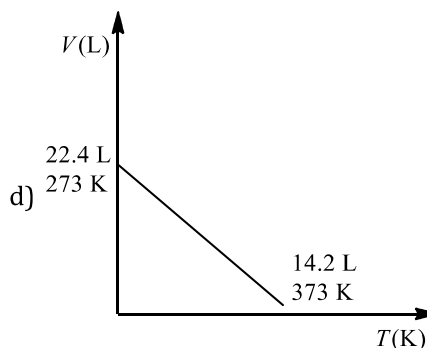
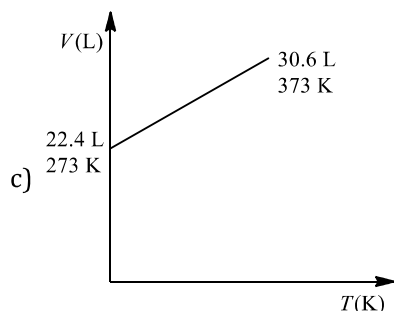
- factor only.
553. Compressibility factor of an ideal gas is
 a) Equal to 2 b) Equal to 1 c) Greater than 1 d) Always less than 1
554. Which of the given sets of temperature and pressure will cause a gas to exhibit the greatest deviation from ideal gas behaviour?
 a) 100°C and 4 atm b) 100°C and 2 atm c) -100°C and 4 atm d) 0°C and 2 atm
555. The van der Waals' equation for a real gas is given by the formula $\left(p + \frac{n^2 a}{V^2}\right)(V - nb) = nRT$ where p, V, T and n are the pressure, volume, temperature and the number of moles of the gas. Which one is the correct interpretation for the parameter a ?
 a) The parameter a accounts for the finite size of the molecule, not included temperature in the ideal gas law
 b) The parameter a account for the shape of gas phase molecules
 c) The parameter a accounts for intermolecular interactions present in the molecule
 d) The parameter is a correction factor to the volume of the container
556. Schottky defect in crystals is observed when
 a) Density of crystal is increased
 b) An ion leaves its normal site and occupies an interstitial site
 c) Equal number of cations and anions are missing from the lattice
 d) Unequal number of cations and anions are missing from the lattice
557. Following properties will decrease with increase in temperature except
 a) Surface tension b) Viscosity c) Density d) Vapour pressure
558. Which statement is incorrect?
 a) A curve plotted between p and V at constant temperature is called isotherm
 b) A curve plotted between p and T at constant volume is called isochore
 c) A curve plotted between V and T at constant pressure is called isobar
 d) At absolute zero, the gas equation holds good
559. The closest distance between the centres of two molecules of a gas taking part in collision is called
 a) Effective molecular diameter b) Collision diameter
 c) Both (a) and (b) d) None of the above
560. A flask containing air is heated from 300 K to 500 K. The percentage of air escaped to the atmosphere is nearly
 a) 40% b) 30% c) 80% d) 60%
561. Equal masses of ethane and hydrogen are mixed in an empty container at 25°C. The fraction of the total pressure exerted by hydrogen is
 a) 1 : 2 b) 1 : 1 c) 1 : 16 d) 15 : 16
562. If the pressure of N_2/H_2 mixture in a closed vessel is 100 atmosphere and 20% of the mixture then reacts, the pressure at the same temperature would be:
 a) The same b) 110 atmospheres c) 90 atmospheres d) 80 atmospheres
563. Which is not correct for gases?
 a) Gases do not have definite shape and volume
 b) Volume of gas is equal to volume of container confining the gas
 c) Confined gas exerts uniform pressure on the walls of its container in all directions
 d) None of the above
564. If the intermolecular forces vanish away, the volume occupied by the molecules contained in 4.5 kg water at STP will be:
 a) 5.6 m³ b) 4.5 m³ c) 11.2 litre d) 11.2 m³
565. At low pressure, van der Waals' 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) $1 + \frac{RTV}{a}$ d) $1 - \frac{a}{RTV}$
566. Air contains 79% N₂ and 21% O₂ by volume. If the barometric pressure is 750 mm Hg the partial pressure of oxygen is:
 a) 157.5 mm of Hg b) 175.5 mm of Hg c) 315.0 mm of Hg d) None of these
567. A gas can be liquefied by pressure alone when its temperature is
 a) Higher than its critical temperature b) Lower than its critical temperature
 c) Either (a) or (b) d) None of the above
568. Gas equation $PV = nRT$ is obeyed by:
 a) Only isothermal process
 b) Only adiabatic process
 c) Both (a) and (b)
 d) None of these
569. Charles' law is applicable under:
 a) Isobaric process b) Isochoric process c) Isothermal process d) Adiabatic process
570. A metal has bcc structure and the edge length of its unit cell is 3.04 Å. The volume of the unit cell in cm³ will be
 a) 1.6×10^{21} cm³ b) 2.81×10^{-23} cm³ c) 6.02×10^{-23} cm³ d) 6.6×10^{-24} cm³
571. Bragg's law is given by the equation
 a) $n\lambda = 2\theta \sin \theta$ b) $n\lambda = 2d \sin \theta$ c) $2n\lambda = d \sin \theta$ d) $n \frac{\theta}{2} = \frac{d}{2} \sin \theta$
572. Surface tension vanishes at
 a) Boiling point b) Critical point c) Condensation point d) Triple point
573. Based on kinetic theory of gases following laws can be proved
 a) Boyle's law b) Charles' law c) Avogadro's law d) All of these
574. Which gas cannot be kept in a glass bottle because it chemically reacts with glass?
 a) F₂ b) Cl₂ c) Br₂ d) SO₂
575. Most probable speed, average speed and RMS speed are related as:
 a) 1 : 1.128 : 1.224 b) 1 : 1.128 : 1.424 c) 1 : 2.128 : 1.224 d) 1 : 1.428 : 1.442
576. While He is allowed to expand through a small jet under adiabatic condition heating effect is observed. This is due to the fact that:
 a) Helium is an inert gas
 b) Helium is a noble gas
 c) Helium is an ideal gas
 d) The inversion temperature of helium is very low
577. At 27° the ratio of root mean square speeds of ozone to oxygen is
 a) $\sqrt{(3/5)}$ b) $\sqrt{(4/3)}$ c) $\sqrt{(2/3)}$ d) 0.25
578. 6.4 g of SO₂ at 0°C and 0.99 atm pressure occupies a volume of 2.241 L. Predict which of the following is correct?
 a) The gas is ideal
 b) The gas is real with intermolecular attraction
 c) The gas is real without intermolecular repulsion
 d) The gas is real with intermolecular repulsion greater than intermolecular attraction
579. A gas of unknown identity effuses at the rate of 83.3 mLs⁻¹ in an effusion apparatus in which carbon dioxide effuses at the rate of 102 mLs⁻¹. Calculate molar mass of the unknown gas.
 a) 6.597 g mol⁻¹ b) 65.97 g mol⁻¹ c) 3.650 g mol⁻¹ d) 36.50 g mol⁻¹
580. The flame colours of metal ions are due to
 a) Schottky defect b) Frenkel defect
 c) Metal excess defect d) Metal deficiency defect

581. With increase of pressure, the mean free path:
 a) Decreases b) Increases c) Becomes zero d) Remains same
582. The pyknometric density of sodium chloride crystal is $2.165 \times 10^3 \text{ kg m}^{-3}$, while its X-rays density is $2.178 \times 10^3 \text{ kg m}^{-3}$. The fraction of unoccupied sites in sodium chloride crystal is
 a) 5.96 b) 5.96×10^{-1} c) 5.96×10^{-2} d) 5.96×10^{-3}
583. The rate of diffusion of NH_3 is 3.32 times faster than that of an unknown gas when both gases are at 350 K. The molecular weight of the unknown gas is:
 a) 188 b) 56 c) 94 d) 31.0
584. Which is not a surface phenomenon?
 a) Surface tension b) Viscosity c) Evaporation d) All of these
585. A certain gas takes three times as long to effuse out as helium. Its molecular mass will be:
 a) 27 u b) 36 u c) 64 u d) 9 u
586. Which of the following statements is not true?
 a) The ratio of the mean speed to the RMS speed is independent of the temperature
 b) The square of the mean speed of the molecules is equal to the mean squared speed at a certain temperature
 c) Mean kinetic energy of the gas molecules at any given temperature is independent of the mean speed
 d) The difference between RMS speed and mean speed at any temperature for different gases diminishes as larger and yet larger molar masses are considered
587. A cylinder was filled with gaseous mixture containing CO and N_2 (equal masses). The ratio of their partial pressures in cylinder is:
 a) 1 : 1 b) 1 : 2 c) 2 : 1 d) 1 : 3
588. Potassium fluoride has NaCl type structure. What is the distance between K^+ and F^- ions if cell edge is a cm?
 a) $\frac{a}{2}$ cm b) $\frac{a}{4}$ cm c) $2a$ cm d) $4a$ cm
589. Amorphous substances show
 (i) Short and long range order
 (ii) Short range order
 (iii) Long range order
 (iv) Have no sharp melting point
 a) (i) and (iii) are correct b) (i) and (ii) are correct
 c) (ii) and (iii) are correct d) (ii) and (iv) are correct
590. Doping of silicon (Si) with boron (B) leads to
 a) n -type semiconductor b) p -type semiconductor
 c) Metal d) Insulator
591. The value of gas constant R in SI unit is:
 a) $83 \text{ erg K}^{-1} \text{ mol}^{-1}$ b) 0.082 litre atm c) $8.3 \text{ J mol}^{-1} \text{ K}^{-1}$ d) $0.987 \text{ cal mol}^{-1} \text{ K}^{-1}$
592. Which represents the largest amount of energy?
 a) Calorie b) Joule c) Erg d) Electron-volt
593. A gaseous mixture containing He, CH_4 and SO_4 was allowed to effuse through a fine hole then find what molar ratio of gases coming out initially? (Given mixture contains He, CH_4 and SO_2 in 1 : 2 : 3 mole ratio)
 a) $\sqrt{2} : \sqrt{2} : 3$ b) 2 : 2 : 3 c) 4 : 4 : 3 d) 1 : 1 : 3
594. Gas at a pressure P_0 is contained in a vessel. If the masses of all the molecules are halved and their speed doubled, the resulting pressure P will be equal to:
 a) $4P_0$ b) $2P_0$ c) P_0 d) $P_0/2$
595. The number of atoms/molecules contained in one face centred cubic unit cell of a monoatomic substance is
 a) 1 b) 2 c) 4 d) 6

596. Surface tension of water is 73 dyne cm^{-1} at 20°C . If surface area is increased by 0.10 m^2 , work done is
 a) 7.3 erg b) $7.3 \times 10^4 \text{ erg}$ c) 73 J d) 0.73 J
597. The volume of balloon filled with 4.0 g of He at 22°C and 720 mm of Hg is:
 a) 25.565 litre b) 20 litre c) 15 litre d) 30 litre
598. The ratio a/b (the terms used in van der Waals' equation) has the unit:
 a) $\text{atm litre mol}^{-1}$ b) $\text{atm dm}^3 \text{ mol}^{-1}$ c) dyne cm mol^{-1} d) All of these
599. Which has more weight at NTP?
 a) One litre of oxygen b) One litre of hydrogen c) One litre of nitrogen d) One litre of chlorine
600. 0.44 g of a colourless oxide of nitrogen occupies 224 mL at STP. The compound is:
 a) N_2O b) NO c) N_2O_2 d) NO_2
601. When an ideal diatomic gas is heated at constant pressure the fraction of the heat energy supplied which increases the internal energy of the gas is:
 a) $2/5$ b) $3/5$ c) $3/7$ d) $5/7$
602. Helium atom is two times heavier than a hydrogen molecule. At 15°C , the average KE of helium atom is:
 a) Twice that of hydrogen
 b) Same as that of hydrogen
 c) Four times that of hydrogen
 d) Half that of hydrogen
603. Of these quantities, the one that we expect to be largest
 a) Molar heat capacity of liquid b) Heat of fusion
 c) Heat of vaporisation d) Heat of sublimation
604. For a monoatomic gas kinetic energy = E . The relation with rms velocity is
 a) $u = \left(\frac{2E}{m}\right)^{1/2}$ b) $u = \left(\frac{3E}{2m}\right)^{1/2}$ c) $u = \left(\frac{E}{2m}\right)^{1/2}$ d) $u = \left(\frac{E}{3m}\right)^{1/2}$
605. Under the similar conditions of P and T the rate of diffusion of hydrogen is about:
 a) One half that of He b) 1.4 times that of He c) Twice that of He d) Four times that of He
606. Which one of the following is the most correct statement?
 a) Brass is an interstitial alloy, while steel is a substitutional alloy
 b) Brass is a substitutional alloy, while steel is an interstitial alloy
 c) Brass and steel are both substitutional alloy
 d) Brass and steel are both interstitial alloy
607. Which one of the following volume (V) –temperature (T) plots represents the behaviour of one mole of an ideal gas at one atmospheric pressure?





608. A fcc unit cell of aluminium contains the equivalent of how many atoms?
 a) 1 b) 2 c) 3 d) 4
609. Equal volumes of H_2 and Cl_2 are mixed. How will the volume of the mixture change after the reaction?
 a) Unchanged b) Reduced to half c) Increases two fold d) None of these
610. If both gases are at the same temperature, the rate of diffusion of O_2 is very close to:
 a) 8 times that of He b) 0.35 times that of He c) 2 times that of He d) 4 times that of He
611. The average kinetic energy of an ideal gas per molecule in SI units at $25^\circ C$ will be
 a) 6.17×10^{-21} kJ b) 6.17×10^{-21} J c) 6.17×10^{-20} J d) 7.16×10^{-20} J
612. What is the temperature at which the kinetic energy of 0.3 mole of helium is equal to the kinetic energy of 0.4 mole of argon at 400 K?
 a) 400 K b) 873 K c) 533 K d) 300 K
613. A gaseous mixture was prepared by taking equal mole of CO and N_2 . If the total pressure of the mixture was found 1 atmosphere, the partial pressure of the nitrogen (N_2) in the mixture is:
 a) 1 atm b) 0.5 atm c) 0.8 atm d) 0.9 atm
614. Which does not change during compression of a gas at constant temperature?
 a) Density of a gas
 b) The distance between molecules
 c) Average speed of molecules
 d) The number of collisions
615. Under which category iodine crystals are placed among the following?
 a) Ionic crystal b) Covalent crystal c) Molecular crystal d) Metallic crystal
616. At lower temperatures, all gases except H_2 and He show
 a) Negative deviation b) Positive deviation
 c) Positive and negative deviation d) None of the above
617. Two gas cylinders having same capacity have been filled with 44 g of H_2 and 44 g of CO_2 respectively. If the pressure in CO_2 cylinder is 1 atm at a particular temperature, the pressure in the hydrogen cylinder at the same temperature is
 a) 2 atm b) 1 atm c) 22 atm d) 44 atm