**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 523**

**Time :** 17:21:00 **CHEMISTRY**

**Marks :** 1033

5.STATES OF MATTER

**Single Correct Answer Type**

| 1. | The root mean square velocity of an ideal gas to constant pressure varies with density as | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 2. | A gas of volume 100 cc is kept in a vessel at pressure 10.4 Pa maintained at temperature . Now, if the pressure is increased to 105 Pa, keeping the temperature constant, then the volume of the gas becomes | | | | | | | |
|  | a) | 10 cc | b) | 100 cc | c) | 1 cc | d) | 1000 cc |
| 3. | For the non-zero value of the force of attraction between gas molecules, gas equation will be | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 4. | The compressibility factor for definite amount of van der Waal’s gas at and 100 atm is found to be 0.5. Assuming the volume of gas molecules negligible, the van der Waals’ constant for a gas is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 5. | A 3:2 molar mixture of and is present in a vessel at 500 bar pressure. Due to hole in the vessel, the gas mixture leaks out. The composition of mixture effusing out initially is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 6. | Boltzmann constant is given by | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| 7. | The compressibility factor for an ideal gas is | | | | | | | |
|  | a) | 1.5 | b) | 1.0 | c) | 2.0 | d) |  |
| 8. | At 400 K, the root mean square (rms) speed of a gas (molecular weight = 40) is equal to the most probable speed of gas The molecular weight of the gas is | | | | | | | |
|  | a) | 2 | b) | 4 | c) | 6 | d) | 8 |
| 9. | The value of van der Waals constant for the gases and are 1.360, 1.390, 4.170, and , respectively. The gas which can most easily be liquefied is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 10. | A spherical air bubble is rising from the depth of a lake when pressure is atm and temperature is K. The percentage increase in the radius when it comes to the surface of a lake will be (Assume temperature and pressure at the surface to be, respectively, K and ) | | | | | | | |
|  | a) |  | b) | 50% | c) | 40% | d) | 200% |
| 11. | If and are mole fraction, pressure fraction and volume fraction respectively of a gaseous mixture, then: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 12. | For the non-zero volume of the molecules, real gas equation for mol of the gas will be | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) | Both (b) and (c) are true | | |
| 13. | The quantity represents | | | | | | | |
|  | a) | Number of molecules in the gas | | | b) | Mass of the gas | | |
|  | c) | Number of moles of the gas | | | d) | Translational energy of the gas | | |
| 14. | The SI unit of the coefficient of viscosity is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 15. | A quantity of gas is collected in a graduated tube over the mercury. The volume of the gas at is 50.0 mL and the level of the mercury in the tube is 100 mm above the outside mercury level. The barometer reads 750 mm. Volume at STP is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 16. | of gas effuses through a hole in a container in 5 s. The time taken for the effusion of the same volume of the gas specified below, under identical conditions, is | | | | | | | |
|  | a) | 10 s, He | b) | 20 s, | c) | 25 s, CO | d) | 55 s, |
| 17. | gas at STP contained in a flask was replaced by under same conditions. The weight of will be | | | | | | | |
|  | a) | Equal to that of | b) | Half that of | c) | Twice that of | d) | One-fourth of |
| 18. | Which expression gives average speed of gas molecules? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 19. | The rate of diffusion of methane at a given temperature is twice that of a gas . The molecular weight of is | | | | | | | |
|  | a) | 64.0 | b) | 32.0 | c) | 4.0 | d) | 8.0 |
| 20. | Under similar conditions, which of the following gas will have same value of as ? | | | | | | | |
|  | a) | NO | b) |  | c) |  | d) |  |
| 21. | The pressure of a gas is due to | | | | | | | |
|  | a) | Rapid intermolecular collisions | | | | | | | |
|  | b) | Molecular impacts against the walls of vessel | | | | | | | |
|  | c) | Voids between the gas molecules | | | | | | | |
|  | d) | Ideal behaviour of gases | | | | | | | |
| 22. | The rate of diffusion of a gas is | | | | | | | |
|  | a) | Directly proportional to its density | | | | | | | |
|  | b) | Directly proportional to its molecular weight | | | | | | | |
|  | c) | Directly proportional to the square root of its molecular weight | | | | | | | |
|  | d) | Inversely proportional to the square root of its molecular weight | | | | | | | |
| 23. | Which gas shows real behaviour? | | | | | | | |
|  | a) | 8g at STP occupies 5.6L | | | | | | | |
|  | b) | 1g in 0.5L flask exerts a pressure of 24.63 atm at 300K | | | | | | | |
|  | c) | 1mol at 300K and 1atm occupies volume 22.4L | | | | | | | |
|  | d) | 5.6L of at STP is equal to 11g | | | | | | | |
| 24. | Number of molecules present in L vessel at NTP when compressibility factor is 1.2 is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 25. | A gas in an open container is heated from to . The fraction of the original amount of the gas escaped in the container will be | | | | | | | |
|  | a) | 3⁄4 | b) | 1⁄2 | c) | 1⁄4 | d) | 1⁄8 |
| 26. | Which of the following statements is not correct about the three states of matter, i.e., solid, liquids and gas? | | | | | | | |
|  | a) | Molecules of a solid possess least energy whereas those of a gas possess highest energy | | | | | | | |
|  | b) | The density of a solid is highest whereas that of gases is lowest | | | | | | | |
|  | c) | Gases like liquids possess definite volumes | | | | | | | |
|  | d) | Molecules of a solid possess vibratory motion | | | | | | | |
| 27. | Relative humidity of air is and the saturation vapour pressure of water vapour in air is 3.6 kPa. The amount of water vapours present in 2 L air at 300 K is | | | | | | | |
|  | a) | 52 g | b) | 31.2 g | c) | 26 g | d) | 5.2 g |
| 28. | At constant volume, for a fixed number of moles of a gas, the pressure of the gas increases with the rise in temperature due to | | | | | | | |
|  | a) | Increase in average molecular speed | | | | | | | |
|  | b) | Increase in the rate of collisions among the molecules | | | | | | | |
|  | c) | Increase in the molecular attraction | | | | | | | |
|  | d) | Decrease in the mean free path | | | | | | | |
| 29. | Which of the following expression at constant pressure represents Charles’ law? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 30. | At and 730 mm pressure, 730 mL of dry oxygen was collected. If the temperature is kept constant what volume will oxygen gas occupy at 760 mm pressure? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 31. | Distribution of molecules with velocity is represented by the curve    Velocity corresponding to point is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 32. | 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, temperature, and volume of the gas | | | | | | | |
| 33. | For 1 mol of an ideal gas, in Fig. (I), in Fig. (II), in Fig. (III), and in Fig. (IV), then which curves are correct | | | | | | | |
|  | a) | I, II | b) | I, II, III | c) | II, IV | d) | I, III, IV |
| 34. | The density of neon gas will be highest at | | | | | | | |
|  | a) | STP | b) |  | c) |  | d) |  |
| 35. | A bottle of dry ammonia and a bottle of dry hydrogen chloride connected through a long tube are opened simultaneously at both ends. The white ammonium chloride ring first formed will be | | | | | | | |
|  | a) | At the centre of the tube | | | b) | Near the hydrogen chloride bottle | | |
|  | c) | Near the ammonia bottle | | | d) | Throughout the length of the tube | | |
| 36. | Equal weights of ethane and hydrogen are mixed in an empty container at . The fraction of the total pressure exerted by hydrogen is | | | | | | | |
|  | a) | 1:2 | b) | 1:1 | c) | 1:16 | d) | 15:16 |
| 37. | Which of the following statements is wrong for gases? | | | | | | | |
|  | a) | Gases do not have a definite shape and volume | | | | | | | |
|  | b) | Volume of the gas is equal to volume of container confining the gas | | | | | | | |
|  | c) | Confining gas exerts uniform pressure on the walls of container in all directions | | | | | | | |
|  | d) | Mass of gas cannot be determined by weighing a container in which it is enclosed | | | | | | | |
| 38. | A vessel is filled with a mixture of oxygen and nitrogen. At what ratio of partial pressures will the mass of gases be identical? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 39. | The van der Waals equation for one mol of gas at low pressure will be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 40. | At STP, the order of mean square velocity of molecules of and is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 41. | 2 mol ‘ is mixed with 2 gm of . The molar heart capacity at constant pressure for the mixture is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 42. | If is the volume of one molecule of a gas under given conditions, then van der Waals constant is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 43. | When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules | | | | | | | |
|  | a) | Are above the inversion temperature | | | b) | Exert no attractive forces on each other | | |
|  | c) | Do work equal to loss in kinetic energy | | | d) | Collide without losing energy | | |
| 44. | A gas obeys . Which of the following are correct about this gas?  Isochoric curves have slope =  Isobaric curves have slope and intercept b  For the gas compressibility factor =  The attraction forces are overcome by repulsive forces | | | | | | | |
|  | a) | I | b) | II, III | c) | III | d) | I, II, III, IV |
| 45. | The compressibility of a gas is less than unity at STP; therefore, | | | | | | | |
|  | a) | L | b) | L | c) | L | d) | L |
| 46. | At the top of the mountain, the thermometer reads and the barometer reads 710 mrn Hg. At the bottom of the mountain the temperature is and the pressure is 760 mm Hg. The ratio of the density of air at the top with that at the bottom is | | | | | | | |
|  | a) | 1:1 | b) | 1.04:1 | c) | 1 : 1.04 | d) | 1 : 1.5 |
| 47. | A liquid is in equilibrium with its vapour at its boiling point. On average, the molecules in the two phases have equal | | | | | | | |
|  | a) | Intermolecular forces | b) | Potential energy | c) | Kinetic energy | d) | Total energy |
| 48. | There is a depression in the surface of the liquid in a capillary when | | | | | | | |
|  | a) | The cohesive force is smaller than the adhesive force | | | | | | | |
|  | b) | The cohesive force is greater than the adhesive force | | | | | | | |
|  | c) | The cohesive and adhesive force are equal | | | | | | | |
|  | d) | None of the above is true | | | | | | | |
| 49. | 3.2 g oxygen is diffused in 10 min. In similar conditions, 2.8 g nitrogen will diffuse in | | | | | | | |
|  | a) | 9.3 min | b) | 8.2 min | c) | 7.6 min | d) | 11.8 min |
| 50. | Virial equation is: where ,… are first second, third,… virial coefficient, respectively, For an ideal gas | | | | | | | |
|  | a) | unity and are zero | | | b) | are all equal to unity | | |
|  | c) | is dependent of temperature | | | d) | All depend on temperature | | |
| 51. | A sample of gas occupies 100 mL at and 740 mm pressure. When its volume is changed to 80 mL at 740 mm pressure, the temperature of the gas will be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 52. | The temperature to which a gas must be cooled before it can be liquefied by compression is called | | | | | | | |
|  | a) | Boyle’s temperature | | | b) | Critical temperature | | |
|  | c) | Liquefaction temperature | | | d) | Inversion temperature | | |
| 53. | The rms velocity of hydrogen is times the rms velocity of nitrogen. If is the temperature of the gas, then | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 54. | Ideal gas equation in terms of KE per unit volume, , is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 55. | A quantity of heat is confined in a chamber of constant volume. When the chamber is immersed in a bath of melting ice, the pressure of the gas is 1000 torr. Final temperature when the pressure manometer indicates an absolute pressure of 400 torr is | | | | | | | |
|  | a) | 109 K | b) | 273 K | c) | 373 K | d) | 0 K |
| 56. | The pressure exerted by 1 mol of at 273 K is 34.98 atm. Assuming that volume occupied by molecules is negligible, the value of van der Waals’ constant for attraction of gas is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 57. | At what temperature will the molar kinetic energy of 0.3 mol of ‘He’ be the same as that of 0.4 mol of argon at 400 K? | | | | | | | |
|  | a) | 700 K | b) | 500 K | c) | 800 K | d) | 400 K |
| 58. | Among the plots of vs , as given below, which one corresponds to Boyle’s law? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 59. | Which among of the following has least surface tension? | | | | | | | |
|  | a) | Benzene | b) | Acetic acid | c) | Diethyl ether | d) | Chlorobenzene |
| 60. | A balloon filled with ethyne is pricked with a sharp point and quickly dropped in a tank of gas under identical conditions. After a while the balloon will | | | | | | | |
|  | a) | Shrink | | | b) | Enlarge | | |
|  | c) | Completely collapse | | | d) | Remain unchanged in size | | |
| 61. | For an ideal gas, the value of compressibility factor is | | | | | | | |
|  | a) | 0 | b) | 1 | c) |  | d) | Between 0 and 1 |
| 62. | At what temperature will hydrogen molecules have the same KE as nitrogen molecules at 280 K? | | | | | | | |
|  | a) | K | b) | K | c) | K | d) | K |
| 63. | According to kinetic theory of gases, for a diatomic molecule | | | | | | | |
|  | a) | The pressure exerted by the gas is proportional to the mean velocity of the molecules | | | | | | | |
|  | b) | The pressure exerted by the gas is proportional to the root mean square velocity of the molecules | | | | | | | |
|  | c) | The root mean square velocity is inversely proportional to the temperature | | | | | | | |
|  | d) | The mean transitional kinetic energy of the molecules is proportional to the absolute temperature | | | | | | | |
| 64. | gas is liquefied more easily than . Hence | | | | | | | |
|  | a) | Van der Waals constants and of that of | | | | | | | |
|  | b) | Van der Waals constant andofthat of | | | | | | | |
|  | c) | but | | | | | | | |
|  | d) | but | | | | | | | |
| 65. | When the temperature is increased, surface tension of water | | | | | | | |
|  | a) | Increases | | | b) | Decreases | | |
|  | c) | Remains constant | | | d) | Shows irregular behavior | | |
| 66. | For a monoatomic gas kinetic energy The relation with rms velocity is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 67. | The critical temperature of water is higher than that of because the molecule has | | | | | | | |
|  | a) | Fewer electrons than | | | b) | Two covalent bonds | | |
|  | c) | -shape | | | d) | Dipole moment | | |
| 68. | Which of the following contains greatest number of N atoms? | | | | | | | |
|  | a) | 22.4 L nitrogen gas at STP | | | b) | 500 mL of 2.00 M | | |
|  | c) | 1.00 mol of | | | d) | molecules of | | |
| 69. | 15 L of gas at STP is subjected to four different conditions of temperature and pressure as shown below. In which case the volume will remain unaffected? | | | | | | | |
|  | a) | 273 K, 2 bar pressure | | | b) | , pressure | | |
|  | c) | pressure | | | d) | and pressure | | |
| 70. | Actual graph for the given parameters. For the non-zero volume of the molecules, real gas equation for mol of the gas will be | | | | | | | |
|  | a) | I,III | | | | | | | |
|  | b) | I,II | | | | | | | |
|  | c) | II | | | | | | | |
|  | d) | I | | | | | | | |
| 71. | 1 of and 7/8 L of at the same temperature and pressure were mixed together. What is the relation between the masses of the two gases in the mixture? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 72. | At and , if the density of the liquid water is and that of water vapour is , then the volume occupied by water molecules in 1 L of steam at this temperature is | | | | | | | |
|  | a) | cc | b) | cc | c) | cc | d) | cc |
| 73. | A gas will approach ideal behaviour at | | | | | | | |
|  | a) | Low temperature and low pressure | | | b) | Low temperature and high pressure | | |
|  | c) | High temperature and low pressure | | | d) | High temperature and high pressure | | |
| 74. | At what temperature will both celsius and fahrenheit scales read the same value? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 75. | According to the kinetic theory of gases, for a diatomic molecule | | | | | | | |
|  | a) | The pressure exerted by the gas is proportional to the mean velocity of the molecule | | | | | | | |
|  | b) | The pressure exerted by the gas is proportional to the root mean velocity of the molecule | | | | | | | |
|  | c) | The root mean square velocity of the molecule is inversely proportional to the temperature | | | | | | | |
|  | d) | The mean translational kinetic energy of the molecule is proportional to the absolute temperature | | | | | | | |
| 76. | The average velocity of an ideal gas molecule at is . The average velocity at will be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 77. | The ratio of root mean square velocity to average velocity of a gas molecule at a particular temperature is | | | | | | | |
|  | a) | 1.086:1 | b) | 1:1.086 | c) | 2:1.086 | d) | 1.086:2 |
| 78. | If a gas is expended at constant temperature | | | | | | | |
|  | a) | The pressure decreases | | | | | | | |
|  | b) | The kinetic energy of the molecules remains the same | | | | | | | |
|  | c) | The kinetic energy of the molecules decreases | | | | | | | |
|  | d) | The number of molecules of the gas increases | | | | | | | |
| 79. | The volume of helium is 44.8 L at | | | | | | | |
|  | a) | and 1 atm | b) | and 1 atm | c) | and 0.5 atm | d) | and 0.5 atm |
| 80. | The temperature at which a real gas obeys the ideal gas laws over a wide range of pressure is called | | | | | | | |
|  | a) | Critical temperature | | | b) | Boyle temperature | | |
|  | c) | Inversion temperature | | | d) | Reduced temperature | | |
| 81. | According to Graham’s law, at a given temperature, the ratio of the rates of diffusion of gases and is given by | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 82. | When is deviation more in the behavior of a gas from the ideal gas equation ? | | | | | | | |
|  | a) | At high temperature and low pressure | | | b) | At low temperature and high pressure | | |
|  | c) | At high temperature and high pressure | | | d) | At low temperature and low pressure | | |
| 83. | The density of neon will be highest at | | | | | | | |
|  | a) | STP | b) |  | c) |  | d) |  |
| 84. | It is eaiser 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 higher inversion temperature than hydrogen | | | | | | | |
|  | d) | The critical temperature and inversion temperature of oxygen is very low | | | | | | | |
| 85. | The density of a gas at and 1 atm is . Pressure remaining constant, at which of the following temperature will its density become | | | | | | | |
|  | a) |  | b) |  | c) | 400 K | d) | 300 K |
| 86. | Equal weights of methane and hydrogen are mixed in an empty container at . The fraction of the total pressure exerted by hydrogen is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 87. | A helium atom 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) | Same as that of a hydrogen molecule | | |
|  | c) | Four times that of a hydrogen molecule | | | d) | Half that of a hydrogen molecule | | |
| 88. | At low pressures, the van der Waals equation is written as  The compressibility factor is then equal to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 89. | Which of the following expressions correctly represents the relationship between the average molar kinetic energy, KE of and molecules at the same temperature? | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) | Cannot be predicted unless volumes of the gases are given | | | | | | | |
| 90. | 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) are introduced. Considering the ideal gas behaviour, the total volume (in litre) of the gases at is close to | | | | | | | |
|  | a) | 3 | b) | 5 | c) | 7 | d) | 9 |
| 91. | What weight of hydrogen at STP could be contained in a vessel that holds 4.8 g oxygen at STP? | | | | | | | |
|  | a) | 4.8 g | b) | 3.0 g | c) | 0.6 g | d) | 0.3 g |
| 92. | A gas in an open container is heated from 27C to 127C. The fraction of the original amount of the gas remaining in the container will be | | | | | | | |
|  | a) | 3/4 | b) | 1/2 | c) | 1/4 | d) | 1/8 |
| 93. | Which of following correctly represents the relation between capillary rise ad capillary radius | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 94. | vs curves at different pressures and for an ideal gas are shown below:    Which one of the following is correct? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 95. | Equal weights of methane and oxygen are mixed in an empty container at . The fraction of the total pressure exerted by oxygen is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 96. | The ratio between the root mean square speed of at 50 K and that of at 800 K is | | | | | | | |
|  | a) | 4 | b) | 2 | c) | 1 | d) |  |
| 97. | A graph is plotted between and for 2 mol of gas at constant pressure of 0.0821 atm. and are in litre and . Which of the following statements are not correct?  The curve is straight line with slope  The curve is straight line with slope  The intercept on -axis is equal to 2  The intercept on -axis is equal to 0.3010 | | | | | | | |
|  | a) | I, II | b) | III, IV | c) | II, IV | d) | I, III |
| 98. | A mixture of and in the molar ratio 16:1 is diffused through a pin hole for successive effusions three times to give a molar ratio 1:1 of diffused mixture. Which one are not correct if diffusion is made at same and in each operation?  Eight operation are needed to get 1:1 molar ratio  Rate of diffusion for after eight operations in 0.707  Six operations are needed to get 2:1 molar ratio for and in diffusion mixture  Rate of diffusion for and after six operations is 2.41 | | | | | | | |
|  | a) | I,II,III | b) | II,III | c) | I,III | d) | IV |
| 99. | Which of the following is not a correct postulate of kinetic theory of gases? | | | | | | | |
|  | a) | The molecules of a gas are continuously moving in different directions with different velocities | | | | | | | |
|  | b) | The average kinetic energy of the gas molecules is directly proportional to the absolute temperature of the gas | | | | | | | |
|  | c) | The volume of the gas is due to the large number of molecules present in it | | | | | | | |
|  | d) | The pressure of the gas is due to the collision of the molecules on the walls of the container | | | | | | | |
| 100. | In van der Waals equation of state for a non-ideal gas, the term that accounts for intermolecular forces is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 101. | In the van der Waals equation | | | | | | | |
|  | a) | is the volume occupied by the gas molecules | | | | | | | |
|  | b) | is four times the volume occupied by the gas molecules | | | | | | | |
|  | c) | is the correction factor for intermolecular attraction | | | | | | | |
|  | d) | None of these | | | | | | | |
| 102. | An ideal gas obeying kinetic theory of gases can be liquefied, if | | | | | | | |
|  | a) | Its temperature is more than critical temperature | | | | | | | |
|  | b) | Its pressure is more than critical pressure | | | | | | | |
|  | c) | Its pressure is more than at a temperature less than | | | | | | | |
|  | d) | It cannot be liquefied at any value of and | | | | | | | |
| 103. | The term that corrects for the attractive forces present in a real gas in the van der Waals’ equation is | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 104. | Which of the following is true about gaseous state? | | | | | | | |
|  | a) | Thermal energy = Molecular attraction | | | b) | Thermal energy >> Molecular attraction | | |
|  | c) | Thermal energy << Molecular attraction | | | d) | Molecular forces >> Those in liquids | | |
| 105. | A quantity of hydrogen gas occupies a volume of 30.0 mL at a certain temperature and pressure. What volume would half this mass of hydrogen occupy at triple the absolute temperature if the pressure were one-ninth that of the original gas? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 106. | I, II, and III are three isotherms, respectively, at and . Temperature will be in order | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 107. | Surface tension does not vary with | | | | | | | |
|  | a) | Temperature | b) | Vapour pressure | c) | The size of surface | d) | Concentration |
| 108. | The value of for 5.6 L of an ideal gas is…. at NTP | | | | | | | |
|  | a) | 0.25 | b) | 0.30 | c) | 1.0 | d) | 0.45 |
| 109. | The average molecular speed is greatest in which of the following gas samples? | | | | | | | |
|  | a) | 1.0 mol at | | | b) | mol of at | | |
|  | c) | mol of at | | | d) | mol of at | | |
| 110. | Select one correct statement. In the gas equation, | | | | | | | |
|  | a) | is the number of molecules of a gas | | | | | | | |
|  | b) | moles of the gas have a volume | | | | | | | |
|  | c) | denotes volume of one mole of the gas | | | | | | | |
|  | d) | is the pressure if the gas when only one mole of gas is present | | | | | | | |
| 111. | A flask containing 12 g of a gas of relative molecular mass 120 at a pressure of 100 atm was evacuated by means of a pump until the pressure was 0.01 atm. Which of the following is the best estimate of the number of molecules left in the flask | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 112. | Which of the following has the maximum value of mean free path? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 113. | A gaseous mixture contains oxygen and nitrogen in the ratio of 1:8 by mass. The ratio of their respective number of molecules is | | | | | | | |
|  | a) | 1:8 | b) | 1:1 | c) | 7:64 | d) | 1:2 |
| 114. | The density of a gas is twice that of a gas at the same temperature. The molecular mass of gas is thrice that of . The ratio of the pressure acting on and will be | | | | | | | |
|  | a) | 1:6 | b) | 7:8 | c) | 2:5 | d) | 1:4 |
| 115. | 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 |
| 116. | The pressure of real gas is less than the pressure of an ideal gas because of | | | | | | | |
|  | a) | Increase in collisions | | | b) | Increase in intermolecular forces | | |
|  | c) | Infinite size of molecules | | | d) | Statement is incorrect | | |

**Multiple Correct Answers Type**

| 117. | The compressibility factor(s) for an ideal gas is/are: | | | | | | | |
|  | a) | Unity at all temperatures | | | | | | | |
|  | b) | Unity at all pressures | | | | | | | |
|  | c) | Unity at the critical temperature | | | | | | | |
|  | d) | Unity at Boyle’s temperature | | | | | | | |
| 118. | Which statement(s) is/are correct? | | | | | | | |
|  | a) | Molar volume of every gas at SATP is | | | | | | | |
|  | b) | Molar volume of every gas at STP is | | | | | | | |
|  | c) | All gases have same kinetic energy at a given temperature | | | | | | | |
|  | d) | Under critical conditions compressibility factor is | | | | | | | |
| 119. | Which of the following gases is/are heavier than dry air? | | | | | | | |
|  | a) | Moist air | b) | Oxygen | c) | Moist nitrogen | d) | Hydrogen sulphide |
| 120. | The given graph represents the variation of (compressibility factor) for three real gases and Identify the correct statements | | | | | | | |
|  | a) | For the gas and its dependence on I linear at all pressure | | | | | | | |
|  | b) | For the gas and its dependence on is linear at all pressure | | | | | | | |
|  | c) | For the gas which is typical real gas for which By knowing the minima and the point of intersection with and can be calculated | | | | | | | |
|  | d) | At high pressure, the slope is positive for all real gases | | | | | | | |
| 121. | Which of the following is/are correct about Charles’ law? | | | | | | | |
|  | a) | Constant | | | b) | at constant and | | |
|  | c) | at constant | | | d) | is constant at constant | | |
| 122. | A mixture of and in the molar ratio is diffused through a pin hole for successive effusions three times to give a molar ratio of diffused mixture. Which of the following are not correct if diffusion is made at same and in each operation? | | | | | | | |
|  | a) | Eight operations are needed to get molar ratio | | | | | | | |
|  | b) | Rate of diffusion for after 8 operations is | | | | | | | |
|  | c) | Six operations are needed to get molar ratio for and in diffusion mixture | | | | | | | |
|  | d) | Rate of diffusion for and after 6 operations is | | | | | | | |
| 123. | Which of the following statements is/are true? | | | | | | | |
|  | a) | Hydrogen diffuses four times faster than oxygen | | | | | | | |
|  | b) | The temperature of a real gas changes when it expands adiabatically in vacuum | | | | | | | |
|  | c) | An ideal gas undergoes cooling effect when it suffers an adiabatic expansion in vacuum | | | | | | | |
|  | d) | The Joule-Thomson coefficient of an ideal gas is zero | | | | | | | |
| 124. | Consider a collision between an oxygen molecule and a hydrogen molecule in a mixture of oxygen and hydrogen kept at room temperature. Which of the following is/are possible? | | | | | | | |
|  | a) | The kinetic energies of both the molecules increase | | | | | | | |
|  | b) | The kinetic energies of both the molecules decrease | | | | | | | |
|  | c) | The kinetic energy of the oxygen molecule increases and that of the hydrogen molecule decreases | | | | | | | |
|  | d) | The kinetic energy of the hydrogen molecule increases and that of the oxygen molecule decreases | | | | | | | |
| 125. | The compressibility factor of a gas is greater than unity at STP. Therefore | | | | | | | |
|  | a) | L | | | b) | L | | |
|  | c) | L | | | d) | The gas will become less liquefiable | | |
| 126. | At very high pressure, the van der-Waals equation reduces to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 127. | The value(s) of is/are: | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 128. | At very high pressures the van der Waals’ gas equation reduces to: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 129. | Frenkel defects generally appears in | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 130. | According to Charles’ law | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 131. | Which of the following plots is/are correct? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 132. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | All real gases are less compressible than ideal gases at high pressure | | | | | | | |
|  | b) | Hydrogen and helium are more compressible than ideal gases for all values of pressure | | | | | | | |
|  | c) | Except and, the compressibility factor for all gases at low pressure | | | | | | | |
|  | d) | The compressibility factor of real gases is independent of temperature | | | | | | | |
| 133. | Which of the following plots is/are correct? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 134. | The root mean square velocity of an ideal gas in a closed container of fixed volume is increased from to. Which of the following statements correctly explains how the change is accomplished? | | | | | | | |
|  | a) | By heating the gas, the temperature is doubled | | | | | | | |
|  | b) | By heating the gas, the pressure is quadrupled | | | | | | | |
|  | c) | By heating the gas, the temperature is quadrupled | | | | | | | |
|  | d) | By heating the gas, the pressure is doubled | | | | | | | |
| 135. | In van der Waals equation of gases, the kinetic equation for gas is modified with respect to | | | | | | | |
|  | a) | Repulsive forces | | | | | | | |
|  | b) | Attractive forces between the gaseous molecules | | | | | | | |
|  | c) | Actual volume of the gas | | | | | | | |
|  | d) | Pressure of the molecules | | | | | | | |
| 136. | Which of the following crystals have 8 : 8 coordination? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 137. | If a gas expands at constant temperature | | | | | | | |
|  | a) | The pressure decreases | | | | | | | |
|  | b) | The kinetic energy of the molecules remains the same | | | | | | | |
|  | c) | The kinetic energy of the molecules decreases | | | | | | | |
|  | d) | The number of molecules of the gas increases | | | | | | | |
| 138. | A gas described by van der Waals’ equation: | | | | | | | |
|  | a) | Behaves similar to an ideal gas in the limit of large molar volumes | | | | | | | |
|  | b) | Behaves similar to an ideal gas in the limit of large pressure | | | | | | | |
|  | c) | Is characterised by van der Waals’ coefficients that are dependent on the identity of gas but are independent of the temperature | | | | | | | |
|  | d) | Has the pressure that is lower than the pressure exerted by the same gas behaves ideally | | | | | | | |
| 139. | At extremely low pressures, the van der Waals’ gas equation for 1 mole of a gas may be written as: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 140. | Which of the following statements is/are correct? | | | | | | | |
|  | a) | The van der Waals constant is a measure of attractive force | | | | | | | |
|  | b) | The van der Waals constant is also called co-volume or excluded volume | | | | | | | |
|  | c) | is expressed in | | | | | | | |
|  | d) | is one-third of critical volume | | | | | | | |
| 141. | On expanding a gas at constant temperature: | | | | | | | |
|  | a) | The pressure decreases | | | | | | | |
|  | b) | The kinetic energy of gas molecules remains same | | | | | | | |
|  | c) | The volume of gas decreases | | | | | | | |
|  | d) | The number of molecules of the gas decreases | | | | | | | |
| 142. | Which of the value of ? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 143. | Which are correct for an ideal gas: | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) |  | | | | | | | |
| 144. | Precisely 1 mol of helium and 1 mol of neon are placed in a container. Indicate the correct statements about the system | | | | | | | |
|  | a) | Molecules of the two gases strike the wall of the container with same frequency | | | | | | | |
|  | b) | Molecules of helium strike the wall more frequently | | | | | | | |
|  | c) | Molecules of helium have greater average molecular speed | | | | | | | |
|  | d) | Helium exerts larger pressure | | | | | | | |
| 145. | The average momentum of a molecule in a sample of an ideal gas does not depends on: | | | | | | | |
|  | a) | Pressure | b) | Number of mole | c) | Volume | d) | Temperature |
| 146. | Which of the following is/are true? | | | | | | | |
|  | a) | Higher the value of , weaker is intermolecular force of attraction | | | | | | | |
|  | b) | At low pressure, for ideal gas | | | | | | | |
|  | c) | , for reversible adiabatic expansion | | | | | | | |
|  | d) | A gas can be liquified below critical temperature at high pressure | | | | | | | |
| 147. | Which forces of attraction are responsible for liquefaction of ? | | | | | | | |
|  | a) | Coulombic forces | b) | Dipole forces | c) | Hydrogen bonding | d) | Van der Waals forces |
| 148. | Which of the following possesses rock salt type structure? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 149. | According to Charles’ law: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | at constant |
| 150. | In the fluorite structure if the radius ratio is , how many ions does each cation touch? | | | | | | | |
|  | a) | 8 cations | b) | 4 cations | c) | 12 cations | d) | No cation |
| 151. | Which of the following statement(s) is/are incorrect? | | | | | | | |
|  | a) | The volume of a gas always increases when the temperature is increased | | | | | | | |
|  | b) | Equal volumes of gases under the same conditions of temperature and pressure contain the same number of molecules | | | | | | | |
|  | c) | The kinetic energy of a molecule is zero at | | | | | | | |
|  | d) | A gas in a closed container exerts higher pressure at the bottom than at the top due to gravity | | | | | | | |
| 152. | If 10 g of a gas at atmospheric pressure is cooled from to , keeping the volume constant, its pressure would become | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 153. | If the rms velocities of nitrogen and oxygen molecules are same at two different temperature and same pressure then | | | | | | | |
|  | a) | Most probable velocity of molecules is also equal | | | | | | | |
|  | b) | Average speed of molecules is also some | | | | | | | |
|  | c) | Number of moles of each gas is also equal | | | | | | | |
|  | d) | Density of nitrogen and oxygen is also equal | | | | | | | |
| 154. | In the equation , the value of will not depend upon | | | | | | | |
|  | a) | The nature of the gas | | | b) | The temperature of the gas | | |
|  | c) | The pressure of the gas | | | d) | Units of measurement | | |
| 155. | A - flask containing of hydrogen is heated from to Which of the following statement(s) is/are correct? | | | | | | | |
|  | a) | The pressure of the gas increases | | | | | | | |
|  | b) | The rate of collision increases | | | | | | | |
|  | c) | The energy of the gaseous molecules increases | | | | | | | |
|  | d) | The number of mole of the gas increases | | | | | | | |
| 156. | Boyle’s law may be expressed as | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 157. | Boyle’s law may be expressed as | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 158. | Molecular attraction and size of the molecules in a gas are not negligible at | | | | | | | |
|  | a) | Critical point | | | b) | High pressure | | |
|  | c) | High temperature and low pressure | | | d) | Low temperature and high pressure | | |
| 159. | Boyle’s law may be expressed as: | | | | | | | |
|  | a) |  | | | | | | | |
|  | b) |  | | | | | | | |
|  | c) |  | | | | | | | |
|  | d) | at constant | | | | | | | |
| 160. | Select the correct statements | | | | | | | |
|  | a) | Vapour may be condensed to liquid by the application of pressure | | | | | | | |
|  | b) | To liquefy a gas one must lower the temperature below and apply pressure | | | | | | | |
|  | c) | At , there is no distinction between liquid and vapour states | | | | | | | |
|  | d) | At the , density of liquid is very high as compared to its gaseous state | | | | | | | |
| 161. | According to the kinetic theory of gases | | | | | | | |
|  | a) | Pressure of a gas is due to collisions of molecules with each other | | | | | | | |
|  | b) | Kinetic energy is proportional to square root of the temperature | | | | | | | |
|  | c) | Pressure of a gas is due to collisions of molecules against the sides of the container | | | | | | | |
|  | d) | There is no force of attraction between gas molecules | | | | | | | |
| 162. | Consider the quantity of an ideal gas where is the mass of gas. It does not depend on the: | | | | | | | |
|  | a) | Temperature of the gas | | | | | | | |
|  | b) | Volume of the gas | | | | | | | |
|  | c) | Pressure of the gas | | | | | | | |
|  | d) | Nature of the gas | | | | | | | |
| 163. | A gas can 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 | | | | | | | |
| 164. | Which of the following statements are incorrect for the internal pressure of a van der Waals’ gas? | | | | | | | |
|  | a) | It is independent of molar volume | | | | | | | |
|  | b) | It is directly proportional to molar volume | | | | | | | |
|  | c) | It is directly proportional to square of molar volume | | | | | | | |
|  | d) | It is inversely proportional to square of molar volume | | | | | | | |
| 165. | For two gases and with molecular weights and , respectively, it is observed that at a certain temperature , the mean velocity of is equal to the of . Thus, the mean velocity of can be made equal to the mean velocity of , if | | | | | | | |
|  | a) | is at temperature and is at such that | | | | | | | |
|  | b) | Temperature of is lowered to while is at such that | | | | | | | |
|  | c) | Both and are raised to a higher temperature | | | | | | | |
|  | d) | Heat energy supplied to | | | | | | | |
| 166. | To raise the volume of the gas by four times, which of the following methods are correct? | | | | | | | |
|  | a) | Temperature is doubled and pressure is halved | | | | | | | |
|  | b) | Temperature is doubled and pressure is also doubled | | | | | | | |
|  | c) | Temperature is constant and pressure is one fourth | | | | | | | |
|  | d) | Keeping pressure constant, temperature raised by four times | | | | | | | |
| 167. | Which are correct for an ideal gas? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 168. | If for two gases of molecular weights and at temperature and respectively, , then which property has the same magnitude for both the gases? | | | | | | | |
|  | a) | if mass of gases taken are same | | | b) | Pressure | | |
|  | c) | KE per mole | | | d) |  | | |
| 169. | Which of the following pair of gases will have same rate of diffusion under similar conditions? | | | | | | | |
|  | a) | and | b) | and | c) | and | d) | and |
| 170. | In the equation the value of will not depend on: | | | | | | | |
|  | a) | The nature of the gas | | | | | | | |
|  | b) | The temperature of the gas | | | | | | | |
|  | c) | The pressure of the gas | | | | | | | |
|  | d) | Units of measurement | | | | | | | |
| 171. | Which of the following is/are the characteristics of a real gas? | | | | | | | |
|  | a) | The molecules attract each other | | | | | | | |
|  | b) | It shows deviations from the ideal gas law | | | | | | | |
|  | c) | It obeys the gas law at low temperature and high pressure | | | | | | | |
|  | d) | The mass of the molecules is negligible | | | | | | | |
| 172. | Which of the following is/are correct unit of viscosity? | | | | | | | |
|  | a) |  | b) | Dyne | c) | Poise | d) |  |
| 173. | Which of the following statements is/are 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 square of the rms 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 the rms speed and the mean speed at any temperature for different gases diminishes as larger, and yet larger molar masses are considered | | | | | | | |
| 174. | One mole of which of the following will have 22.7 L at STP(1 bar, 273.15K)? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 175. | To which of the following mixtures Dalton’s law is not applicable? | | | | | | | |
|  | a) | and at room temperature | | | | | | | |
|  | b) | Ammonia and hydrogen chloride at room temperature | | | | | | | |
|  | c) | and steam at room temperature | | | | | | | |
|  | d) | and | | | | | | | |
| 176. | Which of the following statements is/are correct about real gases? | | | | | | | |
|  | a) | The molecules do cause attractive forces on each another | | | | | | | |
|  | b) | They obey gas laws at low temperature and high pressure | | | | | | | |
|  | c) | They show deviations from ideal behaviour | | | | | | | |
|  | d) | The molecules have negligible mass | | | | | | | |
| 177. | A graph plotted between and for 2 moles of gas at constant pressure of are in and Which of the following statements are not correct? | | | | | | | |
|  | a) | The curve is straight line with slope | | | | | | | |
|  | b) | The curve is straight line with slope | | | | | | | |
|  | c) | The intercept on -axis is equal to 2 | | | | | | | |
|  | d) | The intercept on -axis is equal to | | | | | | | |
| 178. | Select the correct statement?  Greater is humidity, lesser will be rate of evaporation of water  Greater is the humidity, lesser will be density of air  If room temperature= dew point, relative humidity = 100%  Dew point is the temperature at which the gas a given atmospheric condition becomes saturated with (v) | | | | | | | |
|  | a) | I, II | b) | II, IV | c) | All | d) | None |
| 179. | Which of the following processes would lead to an increase in the average speed of the molecules of an ideal gas system? | | | | | | | |
|  | a) | Decreasing the temperature of the system | | | | | | | |
|  | b) | Compressing the gas with a piston | | | | | | | |
|  | c) | Expanding the gas into a vacuum | | | | | | | |
|  | d) | Heating the system keeping and constant | | | | | | | |
| 180. | Chemical laws obeyed by all gases is/are: | | | | | | | |
|  | a) | Avogadro’s law | | | | | | | |
|  | b) | Graham’s law | | | | | | | |
|  | c) | Dulong and Petit’s law | | | | | | | |
|  | d) | Boyle’s law | | | | | | | |
| 181. | Point in the given curve shifts to higher value of velocity if | | | | | | | |
|  | a) | is increased | | | b) | is decreased | | |
|  | c) | is decreased | | | d) | Molecular weight is decreased | | |
| 182. | The gas constant has units | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| 183. | Which of the following quantities is/are the same for all ideal gases at the same temperature? | | | | | | | |
|  | a) | The kinetic energy of 1 mole | | | | | | | |
|  | b) | The kinetic energy of | | | | | | | |
|  | c) | The number of molecules in 1 mole | | | | | | | |
|  | d) | The number of molecules in | | | | | | | |
| 184. | According to kinetic theory of gases: | | | | | | | |
|  | a) | Collisions are always elastic | | | | | | | |
|  | b) | Heavier molecules transfer more momentum to the wall of the container | | | | | | | |
|  | c) | Only a small number of molecules have very high velocity | | | | | | | |
|  | d) | Between collisions, the molecules move in straight lines with constant velocities | | | | | | | |

|  |  |  |  |
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| **Assertion - Reasoning Type** | | | |
| This section contain(s) 0 questions numbered 185 to 184. Each question containsstatement 1(Assertion) and statement 2(Reason). Each question has the 4 choices (a), (b), (c) and (d) out of which **only one** is correct. | | | |
|  | a) | Statement 1 is True, Statement 2 is True; Statement 2 **is** correct explanation for Statement 1 | |
|  | b) | Statement 1 is True, Statement 2 is True; Statement 2 **is not** correct explanation for Statement 1 | |
|  | c) | Statement 1 is True, Statement 2 is False | |
|  | d) | Statement 1 is False, Statement 2 is True | |

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| 185 |  | | |
|  | **Statement 1:** | | At low pressure, van der Waals’ equation is reduced to . |
|  | **Statement 2:** | | The compressibility factor corresponding to low pressure is given by . |

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| 186 |  | | |
|  | **Statement 1:** | | Most probable velocity is the velocity possessed by maximum fraction of molecules at the same temperature |
|  | **Statement 2:** | | On collision, more and more molecules acquire higher speed at the same temperature |

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| 187 |  | | |
|  | **Statement 1:** | | gas is easily liquefied while is not |
|  | **Statement 2:** | | has low critical temperature while has high critical temperature |

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| 188 |  | | |
|  | **Statement 1:** | | On cooling, the brown colour of nitrogen dioxide disappears |
|  | **Statement 2:** | | On cooling, undergoes dimerization resulting in the pairing of the odd electron in |

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| 189 |  | | |
|  | **Statement 1:** | | The pressure of a fixed amount of an ideal gas is proportional to its temperature |
|  | **Statement 2:** | | Frequency of collisions and their impact both increase in proportion of the square root of temperature |

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| 190 |  | | |
|  | **Statement 1:** | | The value of van der Waals constant a is larger for ammonia than for nitrogen |
|  | **Statement 2:** | | Hydrogen bonding is present in ammonia |

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| 191 |  | | |
|  | **Statement 1:** | | The hot air balloons in sports and for meteological observations is an application Charles law. |
|  | **Statement 2:** | | Hot air is less dense and hence gases expand on heating. |

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| 192 |  | | |
|  | **Statement 1:** | | Helium shows only positive deviations from ideal behaviour |
|  | **Statement 2:** | | Helium is an inert gas |

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| 193 |  | | |
|  | **Statement 1:** | | The pressure of a fixed amount of an ideal gas is proportional to its temperature |
|  | **Statement 2:** | | Frequency of collisions and their impact both increase in proportion to the square root of temperature |

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| 194 |  | | |
|  | **Statement 1:** | | A lighter gas diffuse more rapidly than a heavier gas |
|  | **Statement 2:** | | At a given temperature, the rate of diffusion of a gas is inversely proportional to the square root of its density |

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| 195 |  | | |
|  | **Statement 1:** | | Andrew’s worked on a temporary gas (so called at that time) and derived the condition to liquefy the permanent gases (so called at that time). |
|  | **Statement 2:** | | Andrew studied isotherms of and obtained the required condition for liquefaction of gas as (critical temperature). |

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| 196 |  | | |
|  | **Statement 1:** | | Of the gas is expelled if air present in an open vessel is heated from 27 to 127 |
|  | **Statement 2:** | | Rate of diffusion of a gas is inversely proportional to the square root of its molecular mass. |

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| 197 |  | | |
|  | **Statement 1:** | | Compressibility factor for non ideal gases is always greater than 1 |
|  | **Statement 2:** | | Non-ideal gases always exert higher pressure than expected |

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| 198 |  | | |
|  | **Statement 1:** | | The compressibility factor less than one is due to the van der Waals’ constant of a real gas |
|  | **Statement 2:** | | The compressibility factor less than one is due to excluded volume of the gas |

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| 199 |  | | |
|  | **Statement 1:** | | and He show same ideal gas behaviour |
|  | **Statement 2:** | | All real gases deviate from ideal gas behaviour at low temperature and high pressure |

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| 200 |  | | |
|  | **Statement 1:** | | Van der Waals equation is applicable only to non-ideal gases |
|  | **Statement 2:** | | Ideal gases obey the equation |

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| 201 |  | | |
|  | **Statement 1:** | | The value of van der Waals’ constant is larger for than for . |
|  | **Statement 2:** | | H-bonding is present in . |

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| 202 |  | | |
|  | **Statement 1:** | | in van der Waals’ equation is a measure of the inter molecular forces |
|  | **Statement 2:** | | Easily condensable gases have comparatively higher values of the van der Waals’ parameter ‘’ |

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| 203 |  | | |
|  | **Statement 1:** | | Doping of silicon with P or Al increases the conductivity |
|  | **Statement 2:** | | P gives rise to holes while Al gives rise to extra electrons |

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| 204 |  | | |
|  | **Statement 1:** | | Gases are easily absorbed on the surface of metals, especially transition metals |
|  | **Statement 2:** | | Transition metals have free valencies |

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| 205 |  | | |
|  | **Statement 1:** | | Ideal gas does not show Joule-Thomson effect as well as they cannot be liquefied. |
|  | **Statement 2:** | |  |

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| 206 |  | | |
|  | **Statement 1:** | | The heat absorbed during the isothermal expansion of an ideal gas against vacuum is zero |
|  | **Statement 2:** | | The volume occupied by the molecules of an ideal gas is zero |

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| 207 |  | | |
|  | **Statement 1:** | | The Poisson’s ratio for diatomic gases is more than for monoatomic gases. |
|  | **Statement 2:** | | Diatomic gases possess more degree of freedom. |

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| 208 |  | | |
|  | **Statement 1:** | | Compressibility factor z for non ideal gases is always greater than . |
|  | **Statement 2:** | | Non ideal gases always exert higher pressure than 1. |

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| 209 |  | | |
|  | **Statement 1:** | | When the temperature is raised, the viscosity of the liquid decreases |
|  | **Statement 2:** | | Increase in temperature increases the average kinetic energy of molecule which overcome the attractive force between them |

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| 210 |  | | |
|  | **Statement 1:** | | CO2 above 31.1 and 600 bar pressure is used to remove caffeine from coffee beans. |
|  | **Statement 2:** | | CO2 is gaseous in nature. |

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| 211 |  | | |
|  | **Statement 1:** | | All molecules of an ideal gas more with the same speed |
|  | **Statement 2:** | | There is no attraction between the molecules in an ideal gas |

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| 212 |  | | |
|  | **Statement 1:** | | for an ideal gas |
|  | **Statement 2:** | | for an ideal gas |

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| 213 |  | | |
|  | **Statement 1:** | | The plot of volume versus pressure at constant temperature is a hyperbola in the first quadrant |
|  | **Statement 2:** | | at constant temperature |

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| 214 |  | | |
|  | **Statement 1:** | | In the Schottky defect equal number of extra cations and electrons are present in the interstitial sites |
|  | **Statement 2:** | | In schottky defect equal number of cations and anions are missing |

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| 215 |  | | |
|  | **Statement 1:** | | On compressing a gas to half the volume, the number of molecules is halved |
|  | **Statement 2:** | | The number of moles present decreases with decrease in volume |

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| 216 |  | | |
|  | **Statement 1:** | | Noble gases can be liquefied |
|  | **Statement 2:** | | Attractive forces can exist between non-polar molecules |

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| 217 |  | | |
|  | **Statement 1:** | | Greater the value of van der Waal’s constant ‘a’ greater is the liquefication of gas. |
|  | **Statement 2:** | | ‘a’ indirectly measures the magnitude of attractive forces between the molecules. |

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| 218 |  | | |
|  | **Statement 1:** | | In van der Waals equation  Pressure correction is due to the force of attraction between molecules |
|  | **Statement 2:** | | Volume of gas molecule cannot be neglected due to force of attraction |

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| 219 |  | | |
|  | **Statement 1:** | | If and enclosed separately in the same vessel exert pressure of 100 and 200 mm respectively, their mixture in the same vessel at the same temperature will exert a pressure of 300 mm |
|  | **Statement 2:** | | Dalton’s law of partial pressure states that total pressure is the sum of partial pressures |

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| 220 |  | | |
|  | **Statement 1:** | | The conductivity of semiconductor increases with increase in temperature |
|  | **Statement 2:** | | The ionic solids conduct electricity due to presence of ions |

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| 221 |  | | |
|  | **Statement 1:** | | The compressibility factor for and is |
|  | **Statement 2:** | | The compressibility factor for and can be derived from van der Waals’ equation. |

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| 222 |  | | |
|  | **Statement 1:** | | At absolute zero temperature, vapour pressure, kinetic energy, and heat content of the gas reduce to zero |
|  | **Statement 2:** | | At absolute zero, temperature velocity reduces to zero |

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| 223 |  | | |
|  | **Statement 1:** | | Molar specific heat at constant volume of an ideal diatomic gas is |
|  | **Statement 2:** | | On heating an ideal diatomic gas at constant pressure, the increase in internal energy of gas is . |

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| 224 |  | | |
|  | **Statement 1:** | | Nitrogen is unreactive at room temperature but becomes reactive at elevated temperature (on heating or in the presence of catalysts) |
|  | **Statement 2:** | | In nitrogen molecule, there is extensive delocalization of electrons |

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| 225 |  | | |
|  | **Statement 1:** | | Sulphur dioxide and chlorine are bleaching agents |
|  | **Statement 2:** | | Both are reducing agents |

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| 226 |  | | |
|  | **Statement 1:** | | At constant temperature, if pressure on the gas is doubled, density is also doubled |
|  | **Statement 2:** | | At constant temperature, molecular mass of a gas is directly proportional to the density and inversely proportional to the pressure |

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| 227 |  | | |
|  | **Statement 1:** | | The numerical values of are and respectively. |
|  | **Statement 2:** | | The compressibility factor at critical conditions is . |

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| 228 |  | | |
|  | **Statement 1:** | | Under similar conditions of temperature and pressure, diffuses 1.4 times faster than |
|  | **Statement 2:** | | Density of is 1.4 times greater than that of |

|  |  |  |  |
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| 229 |  | | |
|  | **Statement 1:** | | In van der Waals’ equation of gases, the kinetic equation of gas is modified |
|  | **Statement 2:** | | This modification is carried out with respect to actual volume of molecules and attractive forces between the gaseous molecules |

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| --- | --- | --- | --- |
| 230 |  | | |
|  | **Statement 1:** | | A lighter gas diffuses more rapidly than a heavier gas |
|  | **Statement 2:** | | At a given temperature, the rate of diffusion of a gas is inversely proportional to the square root of its density |

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| --- | --- | --- | --- |
| 231 |  | | |
|  | **Statement 1:** | | A gas can be easily liquefied at any temperature below its critical temperature |
|  | **Statement 2:** | | Liquification of a gas takes place when the average kinetic energy of the molecules is low |

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| 232 |  | | |
|  | **Statement 1:** | | At 300K, kinetic energy of 16 g of methane is equal to the kinetic energy of 32 g of oxygen. |
|  | **Statement 2:** | | At constant temperature, kinetic energy of one mole of all gases is equal. |

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| 233 |  | | |
|  | **Statement 1:** | | The numerical value of for is higher than |
|  | **Statement 2:** | | has H-bonding. |

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| 234 |  | | |
|  | **Statement 1:** | | Crystalline solids are anisotropic |
|  | **Statement 2:** | | Crystalline solids are not as closely packed as amorphous solids |

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| 235 |  | | |
|  | **Statement 1:** | | The solid is a bad conductor of electricity |
|  | **Statement 2:** | | In solid there is no velocity of ions |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Matrix-Match Type** | | | | | | | | | |
| This section contain(s) 0 question(s). Each question contains Statements given in 2 columns which have to be matched. Statements (A, B, C, D) in **columns I** have to be matched with Statements (p, q, r, s) in **columns II**. | | | | | | | | | |

| 236. | Match the items of columns I and II | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Bar L | | (p) | | Most probable speed | |
|  | **(B)** |  | | (q) | |  | |
|  | **(C)** | Boyle’s temperature | | (r) | | at constant and | |
|  | **(D)** | Mean free path | | (s) | | at constant | |
|  | **(E)** | Collision frequency | | (t) | | Unit of ratio | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** | **E** |  |
|  | **a)** | p | t | r | s | q |  |
|  | **b)** | r | s | t | p | q |  |
|  | **c)** | q | r | p | q | q |  |
|  | **d)** | t | p | q | r | q |  |

| 237. | van der Waals’ equation for | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | High pressure | | (p) | |  | |
|  | **(B)** | Low pressure | | (q) | |  | |
|  | **(C)** | Force of attraction is negligible | | (r) | |  | |
|  | **(D)** | Volume of molecules is negligible | | (s) | |  | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | (i) | (iv) | (i) | (ii) |  |  |
|  | **b)** | (i) | (ii) | (iii) | (iv) |  |  |
|  | **c)** | (iv) | (iii) | (ii) | (i) |  |  |
|  | **d)** | (iv) | (ii) | (iii) | (i) |  |  |

| 238. | Match the items of columns I and II | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Critical temperature | | (p) | | Gas can be liquefied | |
|  | **(B)** | Boyle’s temperature | | (q) | | Deviate from ideal gas equation | |
|  | **(C)** | Compressibility factor | | (r) | | Gas follows the ideal gas equation | |
|  | **(D)** | High temperature and low pressure | | (s) | | Assumption of no intermolecular force of attraction is valid | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | r | s | p | q |  |  |
|  | **b)** | p | r | q | s |  |  |
|  | **c)** | s | q | r | p |  |  |
|  | **d)** | q | p | s | r |  |  |

| 239. | Match the items of columns I and II | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Attractive tendency dominate | | (p) | |  | |
|  | **(B)** | At Boyle’s temperature in the high pressure region | | (q) | |  | |
|  | **(C)** | For a gas at very low pressure and at very high temperature | | (r) | |  | |
|  | **(D)** | At the critical point | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | q | r | s | p |  |  |
|  | **b)** | r | q | p | s |  |  |
|  | **c)** | s | p | q | r |  |  |
|  | **d)** | p | s | r | q |  |  |

| 240. | Match the items of columns I and II | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Unit of van der Waals constant | | (p) | |  | |
|  | **(B)** | Unit of van der Waals constant | | (q) | |  | |
|  | **(C)** | Unit of | | (r) | |  | |
|  | **(D)** | Unit of surface tension | | (s) | |  | |
|  | **(E)** | Unit of coefficient of viscocity | | (t) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** | **E** |  |
|  | **a)** | t | s | p | q | r |  |
|  | **b)** | r | p | q | s | r |  |
|  | **c)** | s | t | r | q | r |  |
|  | **d)** | p | q | t | r | r |  |

| 241. | Match the items of columns I and II | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Boyle’s law | | (p) | |  | |
|  | **(B)** | Charles’ law | | (q) | |  | |
|  | **(C)** | Gay-Lussac’s law | | (r) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | q | p | r |  |  |  |
|  | **b)** | p | r | q |  |  |  |
|  | **c)** | r | q | p |  |  |  |
|  | **d)** | q | r | p |  |  |  |

| 242. | Match the items of columns I and II | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | for ideal gas | | (p) | |  | |
|  | **(B)** | for real gas at low *P* | | (q) | |  | |
|  | **(C)** | for real gas at high | | (r) | | 1 | |
|  | **(D)** | for critical state | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | p | q | s | r |  |  |
|  | **b)** | r | s | q | p |  |  |
|  | **c)** | q | p | r | s |  |  |
|  | **d)** | s | r | p | q |  |  |

| 243. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Boyle’s temperature | | (1) | |  | |
|  | **(B)** | Reduced temperature | | (2) | |  | |
|  | **(C)** | Inversion temperature | | (3) | |  | |
|  | **(D)** | Critical temperature | | (4) | |  | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | 4 | 3 | 1 | 2 |  |  |
|  | **b)** | 2 | 4 | 3 | 1 |  |  |
|  | **c)** | 1 | 2 | 3 | 4 |  |  |
|  | **d)** | 3 | 1 | 2 | 4 |  |  |

| 244. | Match the items of columns I and II | | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Co-volume | | (p) | | Molar volume of ideal gas | |
|  | **(B)** | Compressibility factor | | (q) | | Van der Waals constant | |
|  | **(C)** | Work done | | (r) | | Depends on and nature of liquid | |
|  | **(D)** | L at STP | | (s) | |  | |
|  | **(E)** | Vapour pressure of liquid | | (t) | | Universal gas constant | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** | **E** |  |
|  | **a)** | p | q | r | s | t |  |
|  | **b)** | t | r | s | q | t |  |
|  | **c)** | q | s | t | p | t |  |
|  | **d)** | r | t | p | s | t |  |

| 245. | Match the items of columns I and II | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Diffusion of gas | | (p) | | High when molecular mass is low | |
|  | **(B)** | Compressibility of gas ( | | (q) | |  | |
|  | **(C)** |  | | (r) | | Increases with increase in temperature | |
|  | **(D)** | Liquification of gas | | (s) | | Attractive force dominates | |
|  | **CODES :** | | | | | | | |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | q | p | s | r |  |  |
|  | **b)** | r | s | q | p |  |  |
|  | **c)** | p | q | r | s |  |  |
|  | **d)** | s | r | p | q |  |  |

| 246. |  | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Kinetic energy of 1 mole gas | | (1) | |  | |
|  | **(B)** | Root mean square speed | | (2) | |  | |
|  | **(C)** | Average speed | | (3) | |  | |
|  | **(D)** | Most probable speed | | (4) | |  | |
|  | **CODES :** | | | | | | | |

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| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | 2 | 1 | 3 | 4 |  |  |
|  | **b)** | 4 | 2 | 3 | 1 |  |  |
|  | **c)** | 1 | 2 | 3 | 4 |  |  |
|  | **d)** | 3 | 4 | 1 | 2 |  |  |

| 247. | Match the items of columns I and II | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Boyle’s law | | (p) | |  | |
|  | **(B)** | Charles’ law | | (q) | |  | |
|  | **(C)** | Gay-Lussac’s law | | (r) | |  | |
|  | **(D)** | Dalton’s law | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | s | q | p | r |  |  |
|  | **b)** | r | p | s | q |  |  |
|  | **c)** | p | r | q | p |  |  |
|  | **d)** | q | s | r | s |  |  |

| 248. | Match the items of columns I and II | | | | | | | | |

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|  | **Column-I** | | | **Column- II** | | | |
|  | **(A)** | Graham’s law of diffusion | | (p) | |  | |
|  | **(B)** | Ideal gas law | | (q) | |  | |
|  | **(C)** | Avogadro gas law | | (r) | |  | |
|  | **(D)** | Van der Waals gas equation | | (s) | |  | |
|  | **CODES :** | | | | | | | |

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|  |  | **A** | **B** | **C** | **D** |  |  |
|  | **a)** | s | r | q | p |  |  |
|  | **b)** | r | p | s | q |  |  |
|  | **c)** | p | q | r | s |  |  |
|  | **d)** | q | s | p | r |  |  |

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| **Linked Comprehension Type**  This section contain(s) 33 paragraph(s) and based upon each paragraph, multiple choice questions have to be answered. Each question has atleast 4 choices (a), (b), (c) and (d) out of which **only one** is correct.  **Paragraph for Question Nos. 249 to -249** | | | | | | | | |
| Sketch shows the plot of Z vs p for a hypothetical gas for one mole at three distinct temperatureBoyle’s temperature is the temperature at which a gas shows ideal behaviour over a pressure range in the low pressure region. Boyle’s temperature (Tb)=aRb. If a plot is obtained at temperature below Boyle’s temperature then the curve will show negative deviation in low pressure region and positive deviation in the high pressure region. Near critical temperature, the curve is more likely as CO2 and the temperature above critical temperature curve is more like H2 at 0℃ | | | | |

| 249. | For 500 K plot value of changes from 2 to 2.2 if pressure is varied from 1000 atm to 1200 atm (high pressure) then the value of will be | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 250 to - 250** | | | | | | | | |

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| The pressure volume relationship for gases helps to explain the mechanics of breathing. When we breathe in, the diaphragm is lowered and the chest wall is expanded, increasing the volume of the chest cavity. Boyle’s law tells us that the pressure inside the cavity must decrease outside air enters the lungs because it is at a higher pressure than the air in the chest cavity. When we breathe out the diaphragm rises and the chest will contract decreasing the volume of chest cavity | | | | |

| 250. | A 15.0 L cylinder of Ar gas is connected to an evacuated 235.0 L tank. If the final pressure is 750 mm Hg. What have been the original gas pressure in the cylinder? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 251 to - 251** | | | | | | | | |

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| Van der Waals’ equation for calculating the pressure of a non ideal gas isp+an2V2V-nb=nRTVan der Waals’ suggested that the pressure exerted by an ideal gas, pideal is related to the experimentally measured pressure, preal by the equation,pideal=preal+an2V2Constant 'a' is measure of intermolecular interaction between gaseous molecules that gives rise to non-ideal behaviour depends on how frequently any two molecules approach each other closely. Another correction concerns the volume occupied by the gas molecules. In the ideal gas equation, V represents the volume of the container. However each molecules does occupy a finite although small, intrinsic volume, so the effective volume of the gas becomes (V-nb), where n is the number of moles of the gas and b is a constant | | | | |

| 251. | Which of the following represents a plot of compressibility factor at room temperature for He? | | | | | | | |
|  | a) |  | | | b) |  | | |
|  | c) |  | | | d) |  | | |
| **Paragraph for Question Nos. 252 to - 252** | | | | | | | | |

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| In simple cubic lattice, the spheres are packed in the form of a square array by laying down a base of spheres and then piling upon the base other layers in such a way that each sphere is immediately above the other sphere. In this structure, each sphere is in contact with six nearest neighbours. The percentage of occupied volume in this structure can be calculated as followsThe edge length ‘a’ of the cube will be twice the radius of the sphere, ie, a=2r. Since, in the primitive cubic lattice, there is only one sphere present in the unit lattice, the volume occupied by the sphere isV=43πr3 or V=43πa23The fraction of the total volume occupied by the sphere isϕ=43πa23a3=π6=0.5236 or 52.36% | | | | |

| 252. | In a simple cubic cell, an atom at the corner contributes to the unit cell | | | | | | | |
|  | a) | part | b) | part | c) | 1 part | d) | part |
| **Paragraph for Question Nos. 253 to - 253** | | | | | | | | |

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| While dealing with X-ray diffraction, it is more convenient to express higher order reflections in terms of the first order reflection from planes of higher (hkl). For example, a second order reflection from (111) planes may be considered equivalent to the first order reflection from (222) planes. Similarly a third order reflection from (111) planes may be considered as the first order reflection from (333) planes. This fact can be introduced into the Bragg equation nλ=2dsinθ by rewriting it asλ=2dnsinθ =2dhklsinθWhere, dhkl is the perpendicular distance between adjacent planes having the indices (hkl) | | | | |

| 253. | represents | | | | | | | |
|  | a) | Crystal faces | b) | Lattice parameter | c) | Crystal systems | d) | Miller indices |
| **Paragraph for Question Nos. 254 to - 254** | | | | | | | | |

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| The figure given below shows three glass chambers that are connected by valves of negligible volume. At the outset of an experiment, the valves are closed and the chambers contain the gases as detailed in the diagram. All the chambers are at the temperature of 300 K and external pressure of 1.0 atmPext=1.0 atm | | | | |

| 254. | What will be the work done by gas when valve 2 is opened and value 1 remains closed? | | | | | | | |
|  | a) |  | b) |  | c) | 0 | d) |  |
| **Paragraph for Question Nos. 255 to - 255** | | | | | | | | |

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| The distribution of the molecular velocities of gas molecules at any temperature T is shown below. (The plot below is known as Maxwell’s distribution of molecular speeds.)Wherev is molecular velocityn is number of molecules having velocity vLet us define ∆Nv, which is equal to the number of molecules between the velocity range v and v+∆v, given by∆Nv=4πNa3e-bv2v2∆vWhereN is total number of moleculesa=M02πRT and b=M02RTR is universal gas constantT is temperature of the gasM0 is molecular weight of the gas | | | | |

| 255. | SI units of are | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 256 to - 256** | | | | | | | | |

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| Two flasks A and B have equal volume. A is maintained at 300 K and B at 600 K. WhileA contains H2 gas, B has an equal mass of CH4 gas. Assuming ideal behaviours for both the gases, answer the following: | | | | |

| 256. | Flask containing greater number of molecules | | | | | | | |
|  | a) |  | b) |  | c) | Both and | d) | None |
| **Paragraph for Question Nos. 257 to - 257** | | | | | | | | |

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| The van der Waals constant for gases A, B, and C are as follows:Gasa(dm6 kPa mol-2)b(dm3 mol-1)A 405.3 0.027B 1215.9 0.030C 607.95 0.032Answer the following: | | | | |

| 257. | Which gas has the highest critical temperature? | | | | | | | |
|  | a) |  | b) |  | c) |  | d) | None |
| **Paragraph for Question Nos. 258 to - 258** | | | | | | | | |

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| For the given ideal gas equation PV=nRT, answer the following questions: | | | | |

| 258. | In the above equation, the value of universal gas constant depends only upon | | | | | | | |
|  | a) | The nature of the gas | | | b) | The pressure of the gas | | |
|  | c) | The temperature of the gas | | | d) | The units of measurement | | |
| **Paragraph for Question Nos. 259 to - 259** | | | | | | | | |

|  |  |  |  |  |
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| Using van der Waals equation P+aV2V-b=RT, answer the following equations: | | | | |

| 259. | The van der Waals equation explains the behaviour of | | | | | | | |
|  | a) | Ideal gases | b) | Real gases | c) | Vapours | d) | Non-real gases |
| **Paragraph for Question Nos. 260 to - 260** | | | | | | | | |

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| Compressibility factor Z=PVRT. Considering ideal gas, real gas, and gases at critical state, answer the following questions: | | | | |

| 260. | The compressibility factor of an ideal gas is | | | | | | | |
|  | a) | 0 | b) | 1 | c) | 2 | d) | 3 |
| **Paragraph for Question Nos. 261 to - 261** | | | | | | | | |

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| Two gaseous molecules A and B are traveling towards each other. Let the mean free path of the molecule be σ and Z be the collision number with other molecules at pressure 1 atm. Answer the following questions | | | | |

| 261. | The free path of a gas molecule is the distance | | | | | | | |
|  | a) | Between the two opposite walls of the container | | | | | | | |
|  | b) | That molecules travel in the second | | | | | | | |
|  | c) | Through which a molecule moves between two successive collisions | | | | | | | |
|  | d) | None of these | | | | | | | |
| **Paragraph for Question Nos. 262 to - 262** | | | | | | | | |

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| The constant motion and high velocities of gas particles lead to some important practical consequences. One such consequence is that gases mix rapidly when they come in contact. Take the stopper off a bottle of perfume, for instance, and the odour will spread rapidly through the room as perfume molecules mix with the molecules in the air. This mixing of different gases by random molecular motion and with frequent collision is called diffusion. A similar process in which gas molecules escape without collision through a tiny hole into a vaccum is called effusion. Both the processes follow Graham’s law which is mathematically put as r∝1d. The average distance travelled by molecules between successive collisions is called mean free pathAnswer the following questions on the basis of the above information: | | | | |

| 262. | The stopcocks of the bulbs (containing ) and (containing ), both under identical conditions, are opened simultaneously. White fumes of , are formed at point . If=36.5 cm, then is approximately | | | | | | | |
|  | a) | 18.0 cm | b) | 25.0 cm | c) | 20.0 cm | d) | 36.5 cm |
| **Paragraph for Question Nos. 263 to - 263** | | | | | | | | |

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| The behaviour of ideal gas is governed by various gas laws which are described by mathematical statements as given below:PV=k (constant) at constant n and TVT=k2 (constant) at constant n and PVn=k3 (constant) at constant T and PPV=nRTPT=k4(constant) at constant n and VAnswer the following | | | | |

| 263. | The value of is | | | | | | | |
|  | a) | Independent of nature and amount of gas | | | | | | | |
|  | b) | Depends on temperature and pressure conditions | | | | | | | |
|  | c) | Depends on pressure and amount of gas | | | | | | | |
|  | d) | Depends only on nature of gas | | | | | | | |
| **Paragraph for Question Nos. 264 to - 264** | | | | | | | | |

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| Consider the adjacent diagram. Initially, flask A contained oxygen gas at 27℃ and 950 mm of Hg, and flask B contained neon gas at 27℃ and 900 mm. Finally, two flask were joined by means of a narrow tube of negligible volume equipped with a stopcock and gases were allowed to mixup freely. The final pressure in the combined system was found to be 910 mm of Hg | | | | |

| 264. | Which of the following statements concerning oxygen and neon gas is true in the beginning, when the stopcock was just opened? | | | | | | | |
|  | a) | moved at faster rate toward flask | | | | | | | |
|  | b) | moved at faster rate towards flask | | | | | | | |
|  | c) | Both and gases moves at equal rate | | | | | | | |
|  | d) | Insufficient information to compare the rate of effusion | | | | | | | |
| **Paragraph for Question Nos. 265 to - 265** | | | | | | | | |

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| The system shown in the figure is in equilibrium, where A and B are isomeric liquids and form an ideal solution at T K. Standard vapour pressures of A and B are PA0 and PB0, respectively, at T K. We collect the vapour of A and B in two containers of volume V, first container is maintained at 2 T K and second container is maintained at 3T2. At the temperature greater than T K, both A and B exist in only gaseous formWe assume than collected gases behave ideally at 2 T K and there may take place an isomerization reaction in which A gets converted into Bby first-order kinetics reaction given as:A k B, where k is a rate constantIn container (II) at the given temperature3T2, A and B are ideal in nature and non reacting in nature. A small pin hole is made into container. We can determine the initial rate of effusion of both gases in vacuum by the expressionr=K∙PM0Where, P=pressure difference between system and surroundingK=positive constantM0=molecular weight of the gas | | | | |

| 265. | If partial vapour pressure of is twice that of partial vapour pressure of and total pressure 2 atm at K, where K and L, then the number of moles of and in vapour phase is: | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |
| **Paragraph for Question Nos. 266 to - 266** | | | | | | | | |

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| 200 g of gas 'X'(cp=0.125 cal/g and cv=0.075 cal/g) is placed in a container of 5 litre volume at pressure P and temperature 27℃. The gas is heated from 27℃ to 327℃. It shows positive deviation, i.e.,Z>1 at high pressure. | | | | |

| 266. | Which of the following statement is wrong about the gas? | | | | | | | |
|  | a) | The gas is monoatomic | | | | | | | |
|  | b) | The gas is | | | | | | | |
|  | c) | The gas is a rare gas or inert gas | | | | | | | |
|  | d) | The number of molecules of gas in | | | | | | | |
| **Paragraph for Question Nos. 267 to - 267** | | | | | | | | |

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| Ideal gas obey PV=nRT at all the conditions of P and T. At STP all the gases deviate from ideal behaviour. All gases are thus real gases, however they behave ideally at Boyle’s temperature TB=aRb. van der Waals’ suggested a modified gas equation to describe the behaviour of real gases over wider range of pressure and temperature. The van der Waals’ equation for one mole of gas is written as:P+aV2V-b=RTIf n moles of gas are present in volume V; the volume of one mole of gas would be Vn. So, van der Waals’ equation changes to P+n2aV2V-nb=nRT where, P,V and T are the observed pressure, volume and temperature for the gas under study. 'a' and 'b' are van der Waals’ parameters, (i.e., constant of attraction and constant of volume respectively) which vary from gas to gas. The parameters a and b take care of the intermolecular forces and size of the molecules respectively. | | | | |

| 267. | At high pressure, the van der Waals’ equation is reduced to | | | | | | | |
|  | a) |  | b) |  | c) |  | d) |  |

**Integer Answer Type**

| 268. | Root mean square speed of a gas is If some molecules out of 10 molecules in all are moving with and rest all the molecules moving with then number of molecules moving with higher speed is … | | | | | | | |
| 269. | A certain gas is at a temperature of 350 K. If the temperature is raised to 700 K, the average translational kinetic energy of the gas will increase by | | | | | | | |
|  | a) | 2 | b) | 3 | c) | 4 | d) | 5 |
| 270. | The value of compressibility factor () for an ideal gas is | | | | | | | |
|  | a) | 2 | b) | 1 | c) | 3 | d) | 4 |
| 271. | A cylinder containing of at was leaking. When the leakage was detected and checked, the pressure inside cylinder was reduced from to The ratio of amount of initially present to that left after leakage is equal to … | | | | | | | |
| 272. | A gas having molecular formula If its vapour density is The value of is … | | | | | | | |
| 273. | The rate of diffusion of methane is twice that of X. The molecular mass of X is divided by 32. What is value of is? | | | | | | | |
|  | a) | 1 | b) | 2 | c) | 3 | d) | 4 |
| 274. | What is the ratio of diffusion of gas and . The molecular mass of is 11 and molecular mass of is 44 | | | | | | | |
|  | a) | 1 | b) | 2 | c) | 3 | d) | 4 |
| 275. | of gas effuse through a pin hole in from a container having equal to If same container is filled with having pressure how much volume (in mL) of will be leaked through same pin hole in . | | | | | | | |
| 276. | The ratio of excluded volume (b) to molar volume of a gas molecule is | | | | | | | |
|  | a) | 1 | b) | 2 | c) | 3 | d) | 4 |
| 277. | Molecular weight of air is The volume of (in mL) in mL of sample of this air is… | | | | | | | |
| 278. | The ratio of rate of diffusion of and (1 ) through same pin hole at constant temperature is … | | | | | | | |
| 279. | Calculate the moles of an ideal gas at pressure 2 atm and volume 1 L at a temperature of 97.5 K | | | | | | | |
|  | a) | 1 | b) | 2 | c) | 3 | d) | 4 |
| 280. | The mass of molecule is twice the mass of molecule The speed of is twice the speed of If two samples of and contain same number of molecule, the ratio of pressure of gas samples of and in separate containers of equal volume is …. | | | | | | | |
| 281. | What is the average speed of a molecule, having a molecular mass of 5. At temperature 100 K | | | | | | | |
|  | a) | 1 | b) | 2 | c) | 3 | d) | 4 |
| 282. | A bulb is having ideal gas at On heating the bulb to litre of gas measured at is expelled out. The volume of bulb in is … | | | | | | | |
| 283. | The ratio of the inversion temperature of a gas to its Boyle temperature is | | | | | | | |
|  | a) | 1 | b) | 2 | c) | 3 | d) | 4 |
| 284. | A metallic carbonyl is in gaseous state. The rate of diffusion of is time faster than this gas under identical conditions. If at. weight of metal is the closest integer value of is … | | | | | | | |
| 285. | At the root mean square speed of a gas (molecular weight ) is equal to the most probable speed of gas at The molecular weight of the gas is: | | | | | | | |
| 286. | Initial volume of a gas is 1 L at temperature 100 K. What is the volume of a gas at 300 K | | | | | | | |
|  | a) | 1 | b) | 2 | c) | 3 | d) | 4 |
| 287. | of at is 6 times of of at The temperature of gas is … times of is .. | | | | | | | |
| 288. | To an evacuated vessel with movable piston under external pressure of an unknown compound (vapour pressure . at ) are introduced. Considering the ideal gas behaviour, the total volume () of the gases at is close to … | | | | | | | |
| 289. | of a liquid [] having density is placed in a container of It is connected to another empty container of at 400 K. The resultant pressure of liquid shown is … | | | | | | | |
| 290. | A 10 L box contains 41.4 g of a mixture of gases and. The total pressure at in flask is 1.56 atm. Analysis revealed that the gas mixture has 87% total C and 13% total H. Find out the value of | | | | | | | |
|  | a) | 1 | b) | 3 | c) | 5 | d) | 2 |

**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 523**

**Time :** 17:21:00 **CHEMISTRY**

**Marks :** 1033

5.STATES OF MATTER

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| --- |
| **: ANSWER KEY :** |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **1) d 2) a 3) a 4) a**  **5) d 6) d 7) b 8) b**  **9) c 10) a 11) a 12) d**  **13) a 14) b 15) a 16) b**  **17) c 18) c 19) a 20) b**  **21) b 22) d 23) c 24) b**  **25) c 26) c 27) b 28) a**  **29) c 30) a 31) b 32) d**  **33) c 34) b 35) b 36) d**  **37) d 38) d 39) a 40) a**  **41) a 42) d 43) b 44) d**  **45) b 46) b 47) c 48) b**  **49) a 50) a 51) c 52) d**  **53) c 54) b 55) a 56) a**  **57) d 58) c 59) c 60) b**  **61) b 62) a 63) d 64) c**  **65) b 66) a 67) d 68) a**  **69) d 70) c 71) c 72) c**  **73) c 74) d 75) d 76) a**  **77) a 78) a 79) c 80) b**  **81) c 82) b 83) b 84) c**  **85) c 86) b 87) b 88) a**  **89) a 90) c 91) d 92) a**  **93) b 94) b 95) a 96) c**  **97) c 98) a 99) c 100) c**  **101) b 102) d 103) b 104) b**  **105) c 106) c 107) c 108) a**  **109) d 110) b 111) b 112) b**  **113) c 114) a 115) c 116) b**  **1) a,b 2) a,b,c,d 3) b,d 4) a,c,d**  **5) a,b 6) a,b,c 7) a,d 8) c,d**  **9) a,d 10) a,c 11) a,b,d 12) a,b**  **13) a,b,d 14) a,d 15) a,b,c,d 16) a,c**  **17) a,b,c 18) b,c 19) c,d 20) a,b,d**  **21) a,b 22) a,c,d 23) c,d 24) a,b,c,d**  **25) a,b 26) a,b,d 27) b,c,d 28) b,c**  **29) a,b,c 30) b,c,d 31) b,d 32) a,c**  **33) a,d 34) a,c 35) a,c,d 36) c,d**  **37) a,b,d 38) a,b,c 39) a,b,c 40) b,d**  **41) b,d 42) a,b,d 43) b,c,d 44) a,b,c**  **45) c,d 46) a,b,c 47) a,b,d 48) a,b,c**  **49) a,d 50) a,c,d 51) a,b,d 52) a,d**  **53) b,c 54) a,b,c 55) a,b 56) a,b,c**  **57) a,c,d 58) a 59) b,c 60) a,c**  **61) b,d 62) a,b 63) b,d 64) a,b,d**  **65) a,d 66) a,c 67) a,c 68) a,b,c,d**  **1) a 2) c 3) c 4) a**  **5) c 6) a 7) a 8) b**  **9) d 10) b 11) c 12) b**  **13) e 14) c 15) b 16) b**  **17) c 18) b 19) c 20) a**  **21) c 22) b 23) b 24) d**  **25) a 26) b 27) d 28) b**  **29) a 30) d 31) e 32) a**  **33) a 34) c 35) d 36) c**  **37) c 38) a 39) d 40) c**  **41) c 42) c 43) d 44) c**  **45) a 46) a 47) a 48) a**  **49) b 50) a 51) a 1) d 2) a 3) b 4) a**  **5) c 6) a 7) b 8) b**  **9) c 10) c 11) a 12) b**  **13) a 1) b 2) c 3) a 4) d**  **5) d 6) c 7) b 8) a**  **9) b 10) d 11) b 12) b**  **13) c 14) b 15) b 16) b**  **17) a 18) b 19) c 1) 4 2) a 3) b 4) 4**  **5) 3 6) b 7) b 8) 8**  **9) d 10) 8 11) 8 12) d**  **13) 8 14) b 15) 3 16) b**  **17) 4 18) 4 19) c 20) 6**  **21) 7 22) 8 23) c** | | | | |

**ACTIVE SITE TUTORIALS**

**Date :** 20-08-2019 **TEST ID: 523**

**Time :** 17:21:00 **CHEMISTRY**

**Marks :** 1033

5.STATES OF MATTER

|  |
| --- |
| **: HINTS AND SOLUTIONS :** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | **(d)**  The expression of root mean square speed is | | | | | | | |
| 2 | **(a)**  Given | | | | | | | |
| 3 | **(a)**  For mol of a real gas  When volume of molecules can’t be neglected,    when | | | | | | | |
| 4 | **(a)**  Now,  is negligible)  Since, is constant at given and , thus, discriminant is 0 | | | | | | | |
| 5 | **(d)**  Molar ratio of and CO is 3:2, i.e., 300 bar and 200 bar, respectively | | | | | | | |
| 7 | **(b)**  Compressibility factor  For ideal gas, , so | | | | | | | |
| 8 | **(b)** | | | | | | | |
| 9 | **(c)**  The van der Waals constant is used in presence correction, and its value depends upon the intermolecular forces between the gas molecules The larger the value of for a gas, the more easily that gas van be liquefied | | | | | | | |
| 10 | **(a)** | | | | | | | |
| 11 | **(a)** | | | | | | | |
| 12 | **(d)**  For mol of a real gas  When volume of molecules can’t be neglected, | | | | | | | |
| 13 | **(a)**  Number of molecules  Where Boltzman constant | | | | | | | |
| 15 | **(a)**  Effective pressure  Use | | | | | | | |
| 16 | **(b)**  For the same volume diffused,  (Graham’s law) | | | | | | | |
| 17 | **(c)**  of mol | | | | | | | |
| 18 | **(c)** | | | | | | | |
| 19 | **(a)**  (Graham’s law)  Or  Or | | | | | | | |
| 20 | **(b)** | | | | | | | |
| 22 | **(d)**  According to Graham’s law of diffusion, the rate at which a gas diffuses is inversely proportional to the density of the gas. The movement of gas molecules from one place to the other along the concentration gradient is called diffusion. When they are allowed to escape through a tiny hole under pressure, this phenomenon is called effusion  Rate of diffusion of gas  Since the vapour density is (molar mass) | | | | | | | |
| 23 | **(c)**  For real behaviour, | | | | | | | |
| 24 | **(b)**  Number of molecules | | | | | | | |
| 25 | **(c)**  Escaped | | | | | | | |
| 26 | **(c)**  Gases and liquid do not posses definite volume | | | | | | | |
| 27 | **(b)**  (for vapours of )  Since, relative humidity = 60%, therefore, amount of | | | | | | | |
| 28 | **(a)**  Pressure on the walls of the container is equal to the change of momentum per unit area. At constant volume, for a fixed number of moles of a gas, the pressure increases with rise in temperature due to increase in average molecular speed. This increases the change in momentum during collisions | | | | | | | |
| 29 | **(c)**  Charles’ law | | | | | | | |
| 30 | **(a)** | | | | | | | |
| 31 | **(b)**  Point represents the most probable distribution of molecules. Hence, the most probable velocity is | | | | | | | |
| 32 | **(d)** | | | | | | | |
| 33 | **(c)**  if ,  Also | | | | | | | |
| 34 | **(b)** | | | | | | | |
| 35 | **(b)**  and  From opposite ends of a tube    being lighter than diffuses faster (according to Graham’s law). So a white ring of fumes is formed by the reaction between and in the region of the tube | | | | | | | |
| 36 | **(d)**  Let 30 g of both be mixed  Moles of  Moles of  Mole fraction of  Which is also the fraction of total pressure executed by | | | | | | | |
| 38 | **(d)**  …(i)  …(ii) | | | | | | | |
| 39 | **(a)**  At low pressure, volume is high and may be ignored. So van der Waals equation becomes  Hence, the answer is (a) | | | | | | | |
| 40 | **(a)**  Hence, | | | | | | | |
| 41 | **(a)**  for ‘He’ | | | | | | | |
| 42 | **(d)**  is equal to 4 times the volume of molecules in one mole of a gas molecules)  Volume of one molecule  Volume of molecule  Hence, | | | | | | | |
| 43 | **(b)**  When a non-ideal gas suddenly expands from a high pressure to a low pressure, there is a temperature change. This is called Joule-Thomson effect. It is an adiabatic effect. The temperature of a real gas is either decreased or increased by letting the gas expand freely at constant enthalpy. When a real gas expands freely at constant enthalpy, the temperature may either decrease or increase, depending on the initial temperature and pressure. For any given pressure, a real gas has an inversion temperature above which the expansion at constant enthalpy causes the temperature to rise, and below which the expansion at constant enthalpy causes cooling. For most gases at atmospheric pressure, the inversion temperature is fairly high (above room temperature), and so most gases at those temperature and pressure conditions are cooled by is isenthalpic expansion. For an ideal gas, there are no intermolecular forces, so no temperature change is expected when the distance between the molecules changes | | | | | | | |
| 44 | **(d)**  slope and intercept  i.e., repulsive forces predominate | | | | | | | |
| 45 | **(b)**  compressibility factor for ideal gases,  L and for 1 mol  For , at NTP, 22.4 L  Only when the equations are satisfied | | | | | | | |
| 46 | **(b)** | | | | | | | |
| 48 | **(b)**  Depression in the surface takes place when intermolecular attraction force of liquid called cohesive force dominates the force of attraction between the liquid and the capillary called adhesive force | | | | | | | |
| 49 | **(a)**  Rate of diffusion  Or | | | | | | | |
| 50 | **(a)**  for ideal gases | | | | | | | |
| 51 | **(c)**  Or | | | | | | | |
| 53 | **(c)** | | | | | | | |
| 54 | **(b)** | | | | | | | |
| 55 | **(a)**  Melting point of ice = 273 K  (at constant) | | | | | | | |
| 56 | **(a)**  Or  Since, is constant at given and can have only one value or discriminant = 0 | | | | | | | |
| 57 | **(d)**  for molar kinetic energy | | | | | | | |
| 58 | **(c)**    Boyle’s law  (constant) | | | | | | | |
| 60 | **(b)**  gas is greater than diffuses into balloon because rate of diffusion of is greater than the rate of diffusion of ethyne. Hence, it is enlarged | | | | | | | |
| 62 | **(a)** | | | | | | | |
| 63 | **(d)**  Or | | | | | | | |
| 64 | **(c)**  Gases which can be liquefied easily have high value of and low value of . So the answer is (c) | | | | | | | |
| 65 | **(b)**  On increasing the temperature, mobility of the molecules increases or vaporization increases. Thus, the surface tension decreases | | | | | | | |
| 66 | **(a)**  RMS velocity  and  For a molecule    So,  Kinetic energy | | | | | | | |
| 68 | **(a)**  **a**. gas at  molecules of  atoms of N  **b**. mol of  molecules of  atoms of  **c**. mol of atoms of  **d**. moleculesatoms of N | | | | | | | |
| 69 | **(d)**  or K  or K | | | | | | | |
| 70 | **(c)**  As increases, also increases, hence graph II | | | | | | | |
| 71 | **(c)**  Dividing equation (i) by (ii), we get | | | | | | | |
| 72 | **(c)**  For water vapours,  Mass  Density of liquid water =  Volume occupied by water | | | | | | | |
| 73 | **(c)**  A real gas approaches ideal behaviour at high temperature and low pressure. Both and can be neglected under these conditions | | | | | | | |
| 74 | **(d)** | | | | | | | |
| 75 | **(d)**  Kinetic energy per mole or per molecule of a gas depends only on temperature and not on the nature of the gas  KE per molecule = | | | | | | | |
| 76 | **(a)**  K  K | | | | | | | |
| 77 | **(a)** | | | | | | | |
| 78 | **(a)**  According to Boyle’s law, at constant | | | | | | | |
| 79 | **(c)**  Use | | | | | | | |
| 80 | **(b)**  The temperature at which the real gas behaves ideally is called Boyle’s temperature. At Boyle’s temperature, the value of remains nearly equal to unity over a good range of pressure  Boyle’s temperature, | | | | | | | |
| 81 | **(c)**  Rate of diffusion is directly proportional to the pressure and inversely proportional to the mass of the gas. Hence, | | | | | | | |
| 82 | **(b)**  At low temperature and high pressure, gases deviate more from ideal condition | | | | | | | |
| 83 | **(b)**  Density  For maximum density, will be maximum which is for option (b) | | | | | | | |
| 84 | **(c)**  Therefore, the ratio is 1 | | | | | | | |
| 85 | **(c)** | | | | | | | |
| 86 | **(b)**  Let 16 g of both be mixed  Moles of  Moles of  Mole fraction of  Which is also the fraction of total pressure executed by | | | | | | | |
| 87 | **(b)**  Kinetic energy per mole or per molecule of a gas depends only on the temperature and not on the nature of the gas | | | | | | | |
| 88 | **(a)**  (compressibility factor) | | | | | | | |
| 89 | **(a)**  Because . It only depends upon temperature | | | | | | | |
| 90 | **(c)**  Since, the external pressure is 1.0 atm, the gas pressure is also 1.0 atm as piston is movable. Out of this 1.0 atm partial pressure due to unknown compound is 0.68 atm.  Therefore, partial pressure of He=1.00-0.68=0.32 atm. | | | | | | | |
| 91 | **(d)** | | | | | | | |
| 92 | **(a)** | | | | | | | |
| 93 | **(b)**  Capillary rise decreases with increase in the radius of tube | | | | | | | |
| 95 | **(a)**  Let 32 g of each gas be present  Moles of  Moles of  Mole of fraction of  Which is same as fraction of pressure | | | | | | | |
| 96 | **(c)**  For at,  For at K, | | | | | | | |
| 97 | **(c)**  or  Slope  Intercept | | | | | | | |
| 98 | **(a)**  where and are moles present initially  Or  also  If then  Rate of diffusion is i.e., 0.707 in each operation | | | | | | | |
| 100 | **(c)**  The above equation is called van der Waals equation, represents the pressure correction, where is constant | | | | | | | |
| 101 | **(b)**  (co-volume)  (Volume occupied by gaseous molecule) | | | | | | | |
| 102 | **(d)**  Ideal gas has no force of attraction and has negligible volume. Hence, it cannot be liquefied at any and | | | | | | | |
| 103 | **(b)**  In the van der Waals’ equation :  The pressure correction factor accounts for intermolecular attraction in real gas. | | | | | | | |
| 104 | **(b)**  Thermal energy >> Molecular attraction | | | | | | | |
| 105 | **(c)**  mL | | | | | | | |
| 106 | **(c)**  Draw a line at constant parallel to volume axis. Take volume corresponding to each temperature  From volume axis,  Hence, | | | | | | | |
| 108 | **(a)** | | | | | | | |
| 109 | **(d)** | | | | | | | |
| 110 | **(b)**  moles of the gas have a volume | | | | | | | |
| 111 | **(b)** | | | | | | | |
| 112 | **(b)**  Mean free path is the average distance travelled by a particle between two collisions  Where is collision, is the number of molecules per unit volume  So, will be the highest for small value of  will have small  Hence, the answer is (b) | | | | | | | |
| 114 | **(a)** | | | | | | | |
| 115 | **(c)**  By Graham’s diffusion law,  Thus, the ratio of rate of diffusion of He and is 2. | | | | | | | |
| 121 | **(a,b)**  Charles’ law, | | | | | | | |
| 123 | **(a,d)**  **Hint**:  (for ideal gas)  Because (for ideal gas)  (constant) | | | | | | | |
| 125 | **(a,d)**  L (Because L)  Hence, when volume is higher, the gases are far apart and, therefore, difficult to liquefy | | | | | | | |
| 126 | **(a,c)**  , at high pressure | | | | | | | |
| 129 | **(a,b,d)**  Frenkel defect occurs in compounds with low coordination number and possesses cations and anions of different sizes | | | | | | | |
| 130 | **(a,d)**  Charles’ law, | | | | | | | |
| 134 | **(b,c)**  **Hint**: or  Or  Similarly, | | | | | | | |
| 135 | **(c,d)**  Volume and pressure of gas | | | | | | | |
| 136 | **(a,b,d)**  It is bcc arrangement and ions have 8:8 coordination. Each unit cell has only one unit | | | | | | | |
| 137 | **(a,b)**  According to Boyle’s law, when a gas is expanded at constant temperature, its pressure decreases. Kindly energy is a function of temperature only, it remains the same | | | | | | | |
| 144 | **(b,c)**  **Hint:** Helium gas has lower molecular mass and hence it moves faster than neon and strikes the wall more frequently  Hence, He has higher speed than neon | | | | | | | |
| 146 | **(b,c,d)**  for reversible adiabatic expansion. According to van der Waals’ equation  At low pressure is high so ‘’ can be neglected | | | | | | | |
| 147 | **(b,d)**  Dipole and van der Waals force | | | | | | | |
| 148 | **(a,c)**  and possess rock salt type structure. has type structure while has zinc blende () type structure | | | | | | | |
| 150 | **(a,c)**  In fluorite structure, cations form the lattice and anions occupy each of tetrahedral voids | | | | | | | |
| 152 | **(c,d)**  **Hint:**Given,  or 546.15K  or 273.15 K | | | | | | | |
| 153 | **(a,b,d)**  Then and is also same  and  if then | | | | | | | |
| 154 | **(a,b,c)**  (gas constant) depends only upon the units of measurement | | | | | | | |
| 156 | **(b,d)**  According to Boyle’s law  …(i)  differenting Eq.(i) w.r.t at constant | | | | | | | |
| 157 | **(b,d)**  Boyle’s law | | | | | | | |
| 158 | **(a,b,d)**  **Hint**: At critical point, the gases can be liquefied and hence there is force of attraction  At high pressure and low temperature, gases are close to each other and hence they experience force of attraction | | | | | | | |
| 164 | **(a,b,c)**  From van der Waals’ equation  Internal pressure is due to van der Waals’ force | | | | | | | |
| 165 | **(a,d)**  **Hint:** and | | | | | | | |
| 166 | **(a,c,d)**  From  If then ratio may be changed in following ways :  (i) and  (ii) and  (iii) and | | | | | | | |
| 168 | **(a,d)**  **Hint**: When or  or  and or  When | | | | | | | |
| 169 | **(b,c)**  Because molecular mass is almost same | | | | | | | |
| 172 | **(a,b,c)**  Viscosity is expressed in dynes/ s, called poise. In MKS system viscosity is expressed as kg or | | | | | | | |
| 173 | **(a,c,d)**  Hence the ratio of and is independent of temperature.  (hence, it is independent of mean speed) | | | | | | | |
| 174 | **(a)**  gas | | | | | | | |
| 175 | **(b,c)**  These gas mixtures react with each other | | | | | | | |
| 176 | **(a,c)**  Real gases have volume and force of attraction | | | | | | | |
| 178 | **(a,b)**  each molecule moves with altogether different speed | | | | | | | |
| 179 | **(b,d)**  **Hint**: Average speed | | | | | | | |
| 181 | **(a,d)**  **Hint**: Average speed | | | | | | | |
| 182 | **(a,c)** | | | | | | | |
| 185 | **(a)** | | | | | | | |
| 186 | **(c)**  Collision is perfectly elastic in nature. In such a case, gas molecules neither loss nor gain energy | | | | | | | |
| 187 | **(c)**  has weak intermolecular attraction. Hence, is not easily liquefied | | | | | | | |
| 188 | **(a)**  (Brown colour) (Colourless) | | | | | | | |
| 189 | **(c)** | | | | | | | |
| 190 | **(a)**  Both assertion and reason are correct and reason is the correct explanation for assertion. The value of van der Waals constant is larger for ammonia than for nitrogen  Nitrogen is a non- polar molecule. Ammonia is a polar molecule and it shows hydrogen bonding | | | | | | | |
| 191 | **(a)**  According to Charles’ law;  So, hot air is less dense. | | | | | | | |
| 192 | **(b)**  For | | | | | | | |
| 193 | **(d)**  Assertion is true; reason is true; reason is not the correct explanation for assertion  The pressure of a fixed amount of an ideal gas is proportional to its temperature  Collision frequency is directly proportional to . On increasing the collision frequency, the pressure increases | | | | | | | |
| 194 | **(b)**  Rate of diffusion Hence lighter gas moves rapidly than heavier gas molecules | | | | | | | |
| 195 | **(c)**  Andrew’s studied isotherms of and found that even (the so called temporary gas at that time) cannot be liquefied above the critical temperature of although pressure may be increased manifolds. | | | | | | | |
| 196 | **(b)**  So, air expelled  According to Graham’s law of diffusion | | | | | | | |
| 197 | **(e)** | | | | | | | |
| 198 | **(c)**  In van der Waals’ equation of state  If we neglect  that is  It we neglect  that is | | | | | | | |
| 199 | **(b)**  Hydrogen and helium have weak van der Waals’ forces of attraction. The intermolecular forces of attraction increases and volume occupied by gas molecules becomes appreciable and can’t be neglected | | | | | | | |
| 200 | **(b)**  The van der Waals equation is applicable to real gases only, while is applicable to ideal gases | | | | | | | |
| 201 | **(c)**  The higher value of for than is due to H-bonding in . | | | | | | | |
| 202 | **(b)**  ‘’ measures intermolecular forces. The distance between molecules of an easily condensable gas will least | | | | | | | |
| 203 | **(c)**  Doping of Si with P gives extra electrons while doping with Al gives rise to holes | | | | | | | |
| 204 | **(a)**  Because of free valencies of transition metal, gases easily gets absorbed on the surface of metal | | | | | | | |
| 205 | **(c)**  Internal energy of an ideal gas depends only on temperature and since, they have no attractions among their molecules. | | | | | | | |
| 206 | **(b)**  (for ideal gas), because heat depends upon temperature | | | | | | | |
| 207 | **(b)**  for diatomic gases and for monoatomic gases. No doubt degree of freedom for a gas is given by where is no. of atoms in molecule. | | | | | | | |
| 208 | **(d)**  Z is greater than 1 or less than 1. Non ideal gases exert less pressure than expected due to backward pull by other molecules. | | | | | | | |
| 209 | **(a)**  With increase in temperature, viscosity of liquid decreases as the average kinetic energy of the molecules increases | | | | | | | |
| 210 | **(b)**  above and 600 bar pressure acts is super critical fluid, which dissolves many organic substances (alkaloids-caffeine) and hence used for separation of mixture. | | | | | | | |
| 211 | **(d)**  Speed of gases depend upon molecular mass of gas. Therefore, all ideal gas does not move with same speed | | | | | | | |
| 212 | **(b)**  Both are correct, but reason is not the correct explanation of assertion  Or | | | | | | | |
| 213 | **(a)**  According to Charles’ law, | | | | | | | |
| 214 | **(d)**  In schottky defect equal number of cations and anions are missing | | | | | | | |
| 215 | **(e)**  Number of molecules is independent of pressure, and moles number is independent of volume | | | | | | | |
| 216 | **(a)**  Noble gases also have force of attraction and can be liquefied | | | | | | | |
| 217 | **(a)**  Considering the attractive force, pressure in ideal gas equation is corrected by introducing a factor of where is van der Waals’ constant. | | | | | | | |
| 218 | **(c)**  Volume is independent of the force of attraction | | | | | | | |
| 219 | **(d)**  Partial pressure  Where mole fraction | | | | | | | |
| 220 | **(c)**  Ionic solids conduct electricity not due to presence of ions but due to presence of defects | | | | | | | |
| 221 | **(c)**  for and is very small because of low Thus, . Now | | | | | | | |
| 222 | **(a)**  At absolute zero (0 K) temperature, the thermal motion of gas molecules becomes negligible and hence their KE and vapour pressure also reduce to zero | | | | | | | |
| 223 | **(d)**  and Also  Average energy of diatomic molecule at constant  Average energy of diatomic molecule at constant  ∴ Increase in internal energy for diatomic gas at constant P | | | | | | | |
| 224 | **(c)**  In , Nitrogen atoms are bonded with covalent bond and there is no delocalization of electrons | | | | | | | |
| 225 | **(c)**  Both are not reducing agents, chlorine is oxidizing agent | | | | | | | |
| 226 | **(c)**  Molecular mass does not depend upon | | | | | | | |
| 227 | **(d)**  . | | | | | | | |
| 228 | **(c)**  diffuse 1.4 times faster than because is higher than | | | | | | | |
| 229 | **(a)**  In the van der Waals’ equation. ‘’ refers to the attractive forces between the molecules and ‘’ is the volume correction | | | | | | | |
| 230 | **(a)**  Rate of diffusion | | | | | | | |
| 231 | **(a)**  Above critical temperature, gas cannot be liquefied. On cooling, the average energy of molecules decreases | | | | | | | |
| 232 | **(a)**  Kinetic energy for one mole gas is given by equation,  Thus, at constant temperature kinetic energy of one mole of any gas is equal. | | | | | | | |
| 233 | **(b)**  is more for due to high of . | | | | | | | |
| 234 | **(a)**  Crystalline solids possess the properties of rigidity. They are anisotropic and undergo a clean cleavage. The constituent particles are arranged in a definite and orderly pattern through the entire three dimensional space | | | | | | | |
| 235 | **(a)**  Solid is a bad conductor of electricity because ions are not free to move | | | | | | | |
| 237 | **(a)**  **At high**  is negligible  **At low**Neither nor are negligible  At is negligible  At is negligible or  Thus, | | | | | | | |
| 239 | **(a)**  Attractive forces: ; in high-pressure region,  At critical points for gas at low pressure and very high temperature | | | | | | | |
| 242 | **(b)**  (**a r**)  for ideal gas  (**b s**) van der Waals equation  For 1 mol gas,  At low pressure, gas equation becomes  Or  Dividing by , we get  Or  (**c q**) van der Waals equation for 1 mol gas  At high pressure, ; hence, equation becomes  Or  Or  Dividing by , we get  Or  (**d p**) | | | | | | | |
| 245 | **(c)**  (**a p**) because diffusion proportion to . Therefore, low molar mass has high rate of diffusion | | | | | | | |
| 249 | **(b)**  We know that  In the high pressure region  …(i)  …(ii)  Solving both the equation we get | | | | | | | |
| 250 | **(c)**  From Boyle’s law  mm Hg = 16.45 atm | | | | | | | |
| 251 | **(a)**  Graph given in option (a) correct, for helium | | | | | | | |
| 252 | **(d)**  An atom on the corner contributes to the unit cell part | | | | | | | |
| 253 | **(d)**  ( represents Miller indices of a plane | | | | | | | |
| 254 | **(c)**  Work done during the expansion of at 0.82 atm to chamber at | | | | | | | |
| 255 | **(b)** | | | | | | | |
| 256 | **(a)**  Let be the amount of and be the amount the  We know that  Where is the mass of the gas of two flasks and  Now, the number of molecules in these flasks are given as  Where is Avogadro’s constant | | | | | | | |
| 257 | **(b)**  Since,  **Hint:** Gas has the highest value of a, therefore, it has the highest critical temperature | | | | | | | |
| 258 | **(d)**  The units of measurement | | | | | | | |
| 259 | **(b)**  Real gas | | | | | | | |
| 260 | **(b)** | | | | | | | |
| 261 | **(c)**  distance between two successive collisions | | | | | | | |
| 262 | **(b)**  Average distance travelled by Average distance travelled by | | | | | | | |
| 263 | **(b)**  Depends only on and | | | | | | | |
| 264 | **(b)**  At  Therefore, Ne will diffuse at faster rate | | | | | | | |
| 265 | **(a)** | | | | | | | |
| 266 | **(b)**    thus, gas is monoatomic  The monoatomic gas with . | | | | | | | |
| 267 | **(c)**  At high pressure, volume of molecules being appreciably significant in comparison to volume of gas as well as gases show positive deviations which is possible only when | | | | | | | |
| 269 | **(a)**  (Translation)  KE increase by a factor of | | | | | | | |
| 270 | **(b)** | | | | | | | |
| 273 | **(b)**  , we know  Or  Given Molecular mass is divided by 32 therefore, | | | | | | | |
| 274 | **(b)**  Rate of diffustion = | | | | | | | |
| 276 | **(d)**  (volume of gas molecule) | | | | | | | |
| 279 | **(d)** | | | | | | | |
| 281 | **(b)**  Average speed of molecule is 2 or (b) | | | | | | | |
| 283 | **(b)**  Inversion temperature  Boyle’s temperature | | | | | | | |
| 286 | **(c)**  Given  We know, | | | | | | | |
| 288 | **(7)**  Saturated vapours do not obey gas laws except Dalton’s law of vapour pressure) | | | | | | | |
| 290 | **(c)**  Given,  Total moles mol  Let be a mol, therefore moles of mol; mass of in a mol of g; mass of C in mol of  Total mass of in mixture = g  =41.4 g  % of C in mixture =  Given % of  Or or | | | | | | | |