# Chapter 3
STATES OF MATTER

INTERMOLECULAR FORCES

1. The intermolecular forces include the electrostatic forces that exist between the two oppositely charged ions. T/F
2. Ion-dipole forces are also van der waals forces. T/F
3. Name the 3 types of van der Waals forces.
4. London forces are also called -
5. The interaction energy in London forces is inversely proportional to which power of r (distance between two interacting particles) ?
6. Dipole-dipole interaction energy between stationary polar molecules (as in solids) is proportional to _____ between rotating polar molecules is proportional to _____.
7. Polar molecules can interact through London forces also. T/F
8. In dipole-induced dipole, interaction energy is proportional to -
9. Energy of hydrogen bond varies between ___ to ___ kJ/mol.
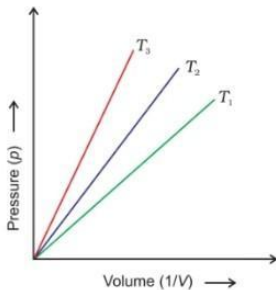10. Molecules also exert repulsive forces on one another. T/F

THE GASEOUS STATE

11. Describe Boyle's Law.
12. Arrange the T_1, T_2 and T_3 in decreasing order
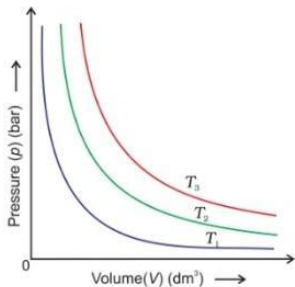
13. Arrange the T_1, T_2 and T_3 in decreasing order

14. Gay Lussac's Law give relationship between _____-_____.
15. Charle's Law give relationship between _____-_____.
16. Avogadro Law give relationship between _____-_____.
17. _____ scale is also called thermodynamic scale of temperature.

18. Arrange the p_1, p_2, p_3 and p_4 in increasing order

19. Word used for constant pressure -
20. Word used for constant volume -
21. All gases obey Charles' law at very high pressures and low temperatures. T/F
22. What does Standard Temperature and Pressure (STP) mean ? (NEET)
23. At STP, molar volume of ideal gas is -
24. At SATP, molar volume of ideal gas is -
25. R value in J/K mol unit equals to -

26. According to the kinetic theory of gases, there is no force of attraction between the particles of a gas. T/F
27. Collisions of gas molecules are perfectly inelastic. T/F
28. At any particular time, different particles in the gas have different speeds and hence different kinetic energies. T/F
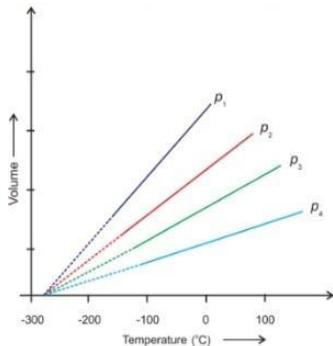29. Graham's law of diffusion is - (NEET)
30. Arrange the R.M.S speed, average speed and most probable speed in increasing order - (NEET)
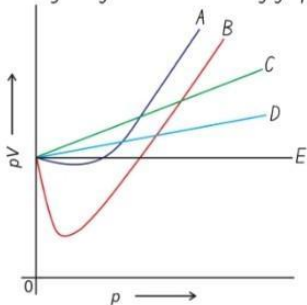31. R.M.S speed of ideal gas = (NEET)
32. Average speed of ideal gas = (NEET)
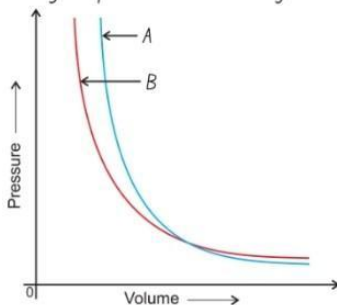33. Most probable speed of ideal gas = (NEET)

REAL GASES

34. Identify the gases in the following graph.
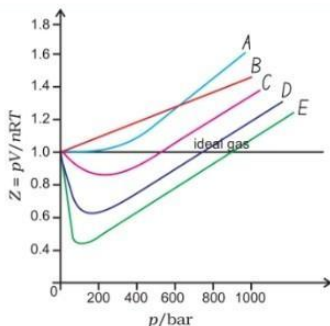

35. Identify the plot for ideal and real gas.

36. The pressure exerted by real gas is lower than the pressure exerted by the ideal gas. T/F
37. Write van der Waals equation.
38. nb in V - nb represents -
39. 'a' in the real gas eq. is a measure of - (NEET)

40. 'a' is dependent on temperature and pressure. T/F

41. Label the gases H2, N2, O2, CO2, CH4 in the following graph.

42. At high pressure all the gases have $Z < 1$. T/F

43. At intermediate pressures, most gases have $Z < 1$. T/F

44. *Gases show ideal behavior when volume occupied is large/small and pressure is high/low. (NEET)*

45. The temperature at which a real gas obeys ideal gas law over an appreciable range of pressure is called ____ or ____.

46. Boyle point of a gas depends upon its nature. T/F

47. Above their Boyle point, real gases show positive deviations from ideality. T/F

48. Boyle temp. =

49. Z is called -

50. $Z = V(ideal)/V(real)$. T/F

The graph shows $Z = pV/nRT$ on the y-axis (ranging 0.4 to 1.8) versus p/bar on the x-axis (0 to 1000), with curves labeled A, B, C, D, E and a horizontal line labeled ideal gas at $Z = 1.0$.

LIQUEFACTION OF GASES

51. What is critical temperature?

52. What is critical volume?

53. What is critical pressure?

54. If process is carried out at the critical temperature, substance always remains in one phase. T/F

55. The term fluid is used for liquids only. T/F

56. What is vapour?

LIQUID STATE

57. Process of vapourisation is temperature dependent. T/F

58. At 1 atm pressure, boiling temperature is called -

59. If pressure is 1 bar, then the boiling point is called -

60. What is boiling temperature?

61. Standard boiling point of the liquid is slightly higher than the normal boiling point. T/F

62. The standard boiling point of water is -

63. *Since water boils at low temperature on hills, _____ is used for cooking food. (NEET)*

64. In autoclaves, the boiling point of water is increased by -

65. At critical temperature, the surface separating the gas and liquid phase disappears. T/F

66. Liquids tend to have minimum number of molecules at their surface. T/F

67. Fire polishing of glass use the principle of _____

68. Surface tension is independent of temperature. T/F
69. Stronger the intermolecular forces, more the viscosity. T/F
70. Force of viscosity is equal to -
71. SI unit of coefficient of viscosity is -
72. CGS unit of coefficient of viscosity is -
73. Viscosity of liquids decreases as the temperature rises. T/F

ANSWERS

• INTERMOLECULAR FORCES

1. F
2. F
3. London forces, dipole-dipole forces, and dipole-induced dipole forces
4. Dispersion forces
5. r^6
6. $1/r^3$, $1/r^6$
7. T
8. $1/r^6$
9. 10-100
10. T

• THE GASEOUS STATE

11. at constant temperature, the pressure of a fixed amount (i.e., number of moles n) of gas varies inversely with its volume
12. $T_3 > T_2 > T_1$
13. $T_3 > T_2 > T_1$
14. P, T
15. V, T
16. V, n
17. Kelvin
18. $p_1 < p_2 < p_3 < p_4$
19. Isobar
20. Isochore
21. F
22. 273.15 K (0°C) temperature and 1 bar (i.e., exactly 10^5 pascal) pressure.
23. 22.7
24. 24.7
25. 8.314
26. T
27. F
28. T
29. Rate of diffusion is inversely proportional to square root of molecular mass, i.e. $r_1/r_2 = \sqrt{(M_2/M_1)}$
30. R.M.S > Average > Most Probable
31. $\sqrt{(3RT/M)}$
32. $\sqrt{(8RT/\pi M)}$
33. $\sqrt{(2RT/M)}$

• REAL GASES

34. Plot of pV vs p for real gas and ideal gas
   A - CO
   B - CH4
   C - H2
   D - He
   E - ideal gas
35. Plot of p vs V for real gas and ideal gas
   A - real gas
   B - ideal gas
36. T
37. $\left(p + \dfrac{an^2}{V^2}\right)(V - nb) = nRT$
38. Volume of the molecules themselves
39. Magnitude of intermolecular attraction
40. F
41. Variation of compressibility factor for some gases
   A - N2
   B - H2
   C - O2
   D - CH4
   E - CO2

42. F

43. T

44. Large, low

45. Boyle temperature or boyle point

46. T

47. T

48. a/Rb

49. Compressibility factor

50. F, $Z = V(real)/V(ideal)$

• LIQUEFACTION OF GASES

51. The highest temperature at which liquid CO_2 is observed

52. Volume of one mole of the gas at critical temperature

53. Pressure at critical temperature

54. T

55. F, it is used for both liquid and gases

56. A gas below the critical temperature

• LIQUID STATE

57. T

58. Normal boiling point

59. Standard boiling point

60. The temperature at which vapour pressure of liquid is equal to the external pressure

61. F

62. 99.6°C

63. Pressure cooker

64. Increasing the pressure by using a weight covering the vent

65. T

66. T

67. Surface tension

68. F

69. T

70. $F = \eta A(du/dz)$

 η = coefficient of viscosity

 A = area of contact

 (du/dz) = velocity gradient

71. Pa s

72. Poise

73. T