ANSWERS

I. Multiple Choice Questions (Type-I)

1. (iii) 2. (ii) 3. (iii) 4. (iii) 5. (iii) 6. (iii)
7. (i) 8. (iv) 9. (ii) 10. (i) 11. (i) 12. (iii)
13. (ii)

II. Multiple Choice Questions (Type-II)

14. (ii), (iii) 15. (i), (iv) 16. (ii), (iii)
17. (ii), (iv)

III. Short Answer Type

18. a. CH_4 b. NO

19. Remains the same i.e., H_2O.

20. Pressure, temperature, mass and volume

21. (a) In HCl, HBr and HI, dipole-dipole and London forces because molecules possess permanent dipole. In HF dipole-dipole, London forces and hydrogen bonding.

    (b) Electronegativity of chlorine, bromine and iodine decreases in the order :

    $$Cl > Br > I$$

    Therefore, dipole moment should decrease from HCl to HI. Thus, dipole-dipole interaction should decrease from HCl to HI. But boiling point increases on moving from HCl to HI. This means that London forces are predominant. This is so because London forces increase as the number of electrons in a molecule increases and in this case number of electrons is increasing from HCl towards HI.

    (c) Hydrogen fluoride has highest dipole moment due to highest electronegativity of fluorine and hydrogen bonding is also present in it. Therefore, HF has highest boiling point.

22. 22.4 litre

23. Low pressure and high temperature

24. Gas 'A' is at or below its critical temperature and gas 'B' is at a temperature higher than critical temperature.

25. Unit of R depends upon those units in which p, *V* and *T* are measured, $R = \frac{pV}{nT}$. If pressure is measured in Pascal, per mole volume is measured in m^3 and temperature is measured in Kelven then. Units of '*R*' are $Pam^3K^{-1}\ mol^{-1}$ or $J\ mol^{-1}\ K^{-1}$. Jule is the unit of work done so '*R*' is work done per mole per kelvin.

26. In the absence of intermolecular forces of attraction, it will not be possible to liquefy ideal gas.

27. hexane < alcohol < water

28. $P_{\text{Dry gas}} = P_{\text{Total}}$ – aqueous tension

29. Thermal energy. It is a measure of average kinetic energy of particles. It increases with increase in temperature.

30. (i) Dipole - dipole interaction

(ii) Hydrogen - bonding

31. Real gases can be liquefied on cooling and compressing proving that forces of attraction exist between the molecules.

32. (i) $Z = 1$ for ideal gas

(ii) For a real gas $Z > 1$ above Boyle's temperature.

33. CO_2 cannot be liquefied at 32°C by applying a pressure of 80 atm. This is because the temperature is greater than critical temperature of CO_2.

34. (i) $H_2 < He < O_2 < CO_2$ because size increases in the same order.

(ii) $CH_4 > O_2 > H_2$ intermolecular attractions are the highest in CH_4 and lowest in H_2 because intermolecular forces increase with number of electrons in a molecule.

35. $p_{\text{ideal}} = p_{\text{real}} + \dfrac{an^2}{V^2}$

We write the known units in the above equation.

$$\text{Nm}^{-2} = \text{Nm}^{-2} + \frac{a.\,\text{mol}^2}{(\text{m}^3)^2}$$

If two values with same units are added then the units of result are same as added units.

$$\therefore \quad \text{Nm}^{-2} = \frac{a.\text{mol}^2}{\text{m}^6}$$

$$a = \frac{\text{Nm}^{-2}.\text{m}^6}{\text{mol}^2}$$

$$a = \text{Nm}^4\ \text{mol}^{-2}$$

Similarly, when p is in atm and volume in dm^3

$$a = \frac{\text{atm}(\text{dm}^3)^2}{\text{mol}^2} = \text{atm dm}^6\ \text{mol}^{-2}$$

36. (i) Rise or fall of the liquid in a capillary - capillary action.

(ii) Spherical shape of small liquid drops.

37. In water and glycerine – Hydrogen bonding. Hexane – Dispersion forces / London forces. The order of viscosities of these liquids is hexane < water < glycerine.

Hexane has weakest intermolecular forces and glycerine the strongest. (three OH groups). Therefore, hexane has minimum viscosity and glycerine has maximum viscosity.

38. The viscosity of a liquid decreases with the increase in temperature since the kinetic energy of the molecules can overcome intermolecular forces. So the liquid can flow more easily.

39. (1) The volume of a gas will decrease if the pressure on the gas is increased keeping the temperature constant.

(2) On increasing temperature, the volume of a gas will increase if the pressure is kept constant.

IV. Matching Type

41. (i) → (c) (ii) → (a) (iii) → (d)

42. (i) → (e) (ii) → (d) (iii) → (b) (iv) → (a)

43. (i) → (b) (ii) → (c) (iii) → (a)

V. Assertion and Reason Type

44. (i) 45. (ii) 46. (iii) 47. (i) 48. (i) 49. (iv)

VI. Long Answer Type

50. (i) gaseous state (ii) at point b

(iii) at point g (iv) No, since $T_3 > T_c$

(v) between b and c.

51. (i) Boiling point of A = approximately 315 K, B = approximately 345 K

(ii) Will not boil

(iii) approximately 313 K

(iv) A liquid boils when vapour pressure becomes equal to the atmospheric pressure. Water boils at low temperature on hills because atmospheric pressure is low. Therefore even at low temperature vapour pressure becomes equal to atmospheric pressure.