Sample Paper 5
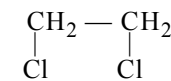
⊙ SOLUTIONS

1. **(a)** On moving down the group, size of halogen atom increases hence, the H–X bond length increases. As a result, bond dissociation enthalpy decreases.
   Hence, the correct order of bond enthalpy is :
   $H – F > H – Cl > H – Br > H – I$.

2. **(c)** RNA does not contain thymine.

3. **(b)**

4. **(a)** 1° Alkyl halides (having least steric hindrance at α-carbon atom) are most reactive towards S_N2 reaction.

5. **(a)** Due to presence of F-centre yellow colour is observed.

6. **(b)** The amount of energy released when cation and anions are brought from infinity to their respective sites in the crystal lattice to form one mole of the ionic compounds is called the lattice energy. Na^+ being smallest in size have highest lattice energy.

7. **(b)**

8. **(d)** Anisotropy arises due to the difference in kinds or densities or both of the atoms in different directions.

9. **(b)** $P = P_A^\circ x_A + P_B^\circ x_B = P_B^\circ + x_A\left(P_A^\circ - P_B^\circ\right)$
   $$[\because x_B = 1 - x_A]$$

10. **(d)** Graphite can't be classified as ionic solid as graphite is not made up of ions. It is a covalent solid.

11. **(c)** $–CH_3$ group is *o, p*–directing.

12. **(d)**

13. **(d)** $C_6H_5NH_2 \xrightarrow[HCl]{HONO}$

    $C_6H_5N_2Cl \xrightarrow{CuCl} C_6H_5Cl$

14. **(c)** Argon is used in high temperature welding and other operations which require a non-oxidising atmosphere and the absence of nitrogen.

15. **(b)** Due to greater electronegativity of sp^2-hybridized carbon atoms of the benzene ring, diaryl ethers are not attacked by nucleophiles like $I^–$.

16. **(d)** Ionic compounds are dissociated in solution state and form ions. Ions are good carrier of charge which make solution conducting.

17. **(d)** The order of reactivity of alcohol with Lucas reagent is *tert. > sec. > pri*.

18. **(a)** Mixture of methanol and acetone show a positive deviation from Raoult's law. Molecules in pure methanol are hydrogen bonded. On adding acetone, its molecules enters in between the host molecules and break some of the hydrogen bonds between them.
    Therefore, the intermolecular attractive forces between the solute-solvent molecules are weaker than those between the solute-solute and solvent-solvent molecules.
    Other three remaining options will show negative deviation.

19. **(b)** Presence of electron withdrawing group at ortho position increase the acidic strength. In *o*-nitrophenol, nitro group is present at ortho position. On the other hand, in *o*-methylphenol and in *o*-methoxyphenol, electron releasing group ($–CH_3$, $–OCH_3$) are present.
    Presence of these groups at ortho and para positions of phenol decreases the acidic strength of phenols. So, phenol is less acidic than *o*-nitrohenol.

20. **(a)** $4NH_3 + 5O_2 \xrightarrow{Pt. \text{ gauge}} 4NO + 6H_2O$

21. **(d)**

22. **(c)**
    $$CH_3 - \overset{\overset{\displaystyle Br}{|}}{CH} - CH_2 - CH_3 \xrightarrow{Alc. KOH}$$
    $$CH_3 - CH = CH - CH_3 + HBr$$
    The formation of 2-butene is in accordance to **Saytzeff's rule** according to which more substituted alkene is formed in major quantity.
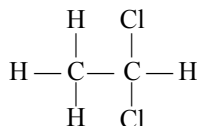
23. **(b)** Halides in which two halogen atoms are present on the two adjacent carbon atoms are known as *vic* - dihalides.
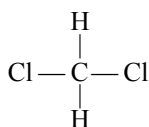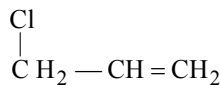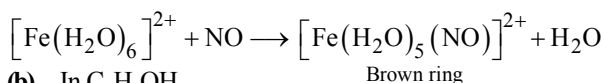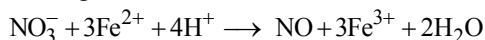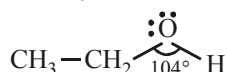

Dichloromethane

1,2-Dichloroethane

Ethylidene chloride

Allyl chloride

24. **(a)** N_2O is used as an anaesthetic

25. **(a)** According to definition of osmotic pressure we know that $\pi = CRT$. For concentrated solution C has higher value that dilute solution.

Hence, as concentration of solution increases osmotic pressure will also increase.

26. **(d)** HCl acid at 25° C is a gas and polar in nature.

27. **(a)** (a) and (d) are L^- sugar but (a) gives an optically active dibasic acid.

28. **(a)** When freshly prepared solution of $FeSO_4$ is added to an aqueous solution containing NO_3^- ion, it leads to the formation of a brown coloured complex. This is known as brown ring test for nitrate ion.

$$NO_3^- + 3Fe^{2+} + 4H^+ \longrightarrow NO + 3Fe^{3+} + 2H_2O$$

$$\left[Fe(H_2O)_6\right]^{2+} + NO \longrightarrow \left[Fe(H_2O)_5(NO)\right]^{2+} + H_2O$$

Brown ring

29. **(b)** In C_2H_5OH,

$$CH_3 - CH_2 \overset{\ddot{\ddot{O}}}{\underset{104°}{\frown}} H$$

Due to presence of lone pair of electrons on oxygen, there occurs a small decrease in bond angle from the normal tetrahedral bond angle (109°28′).

**30.** **(c)** The electron gain enthalpy order for halogens is Cl > F > Br > I

Due to small size of fluorine the extra electron to be added feels more electron-electron repulsion. Therefore fluorine has less value for electron affinity than chlorine.

31. **(d)**

32. **(b)** $M_B = \dfrac{W_B \times R \times T}{\pi \times V} = \dfrac{4 \times 0.0821 \times 300}{3 \times 10^{-4} \times 2}$

$\approx 1.6 \times 10^5$

33. **(c)**

34. **(c)** $MF + XeF_4 \longrightarrow M^+\left[XeF_5^-\right]$

The hybridisation of Xe in XeF_5^- is sp^3d^3.
The geometry is pentagonal bipyramidal.
To minimise lp-lp repulsion, the two lone pairs of electrons occupy the axial positions. Thus, the shape of molecule is pentagonal planar.
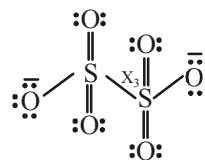
35. **(c)** Glucose is present in pyranose form,
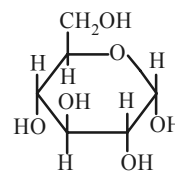
Pyranose means six membered ring containing oxygen.

36. **(a)**

(Balz-Schiemann's reaction)

**37.** **(a)**

According to L.P – L.P > L.P – B.P > B.P – B.P repulsion, the correct order of S-S bond length will be : $x_1 > x_2 > x_3$

38. **(c)** F.C.C. unit cell ABCABCABC packing efficiency is 74 %. So, void fraction will be 0.260.

39. **(d)** All given reactions give the vinyl chloride by substitution (a), by dehydrohalogenation (b) and by addition (c)

40. **(d)** OF_2; among the following O and F, F is more electronegative than oxygen.

So OF_2 cannot be called oxide because in that case O is in –2 oxidation state which is not possible, so OF_2 is called oxygen difluoride.

41. **(d)** The maximum amount of solute dissolved in a given amount of solvent is its solubility.

42. **(a)** With increase in molecular mass boiling point increases. Thus the b.p. of pentan-1-ol will be more than other given compounds. Now, among isomeric alcohols 1° alcohols have higher boiling points than 2° alcohols due to higher surface area in 1° alcohols.

Hence, increasing order of b.p. will be

Propan-1-ol < butan-2-ol < butan-1-ol < pentan-1-ol.

43. **(c)** Oxygen does not show oxidation state +4 and +6.

44. **(c)**   **45.** **(b)**

46. **(c)** Alcohols are highly polar in nature, threfore, they show intermolecular hydrogen bonding and are miscribe with water.

47. **(b)** In Williamson's synthesis, only primary alkyl halides (RX) react with sodium alkoxide (RONa 1° or 2° or 3°) giving ether, therefore, both symmetrical and unsymmetrical ethers can be prepared.

48. **(b)** Ozone is thermodynamically less stable than oxygen due to large negative Gibb's free energy.

49. **(b)** Due to the presence of intramolecular hydrogen bonding. *o*-nitrophenol does not form hydrogen bonds with H_2O but m and *p*-nitrophenol form hydrogen bonds with water.

50. **(c)** In allylic halides hydrogen atom is bonded to sp^3 hybridised carbon atom. Whereas in vinylic halide, hydrogen atom is bonded to sp^2 hybridised carbon atom.

$$CH_3CHCl_2$$

$$\underset{\underset{Cl}{|}}{CH_2} - \underset{\underset{Cl}{|}}{CH_2}$$
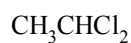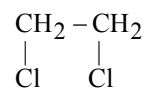
Ethylidene chloride   Ethylene dichloride

(*gem*-dihalide)   (*vic*-dihalide)

51. **(c)**   52. **(a)**

53. **(c)** Elevation in boiling point, freezing point depression and osmotic pressure are colligative presents.

54. **(a)** Since the concentration of sample A is less, so it will show less depression in freezing point. Consequently, its freezing point will be higher than other solutions.

55. **(c)** When non-volatile solid is added to pure solvent the boiling point of solution increases and freezing point of solution decreases.