Sample Paper 1

ANSWER KEYS																			
1	(b)	**7**	(a)	**13**	(b)	**19**	(d)	**25**	(a)	**31**	(c)	**37**	(b)	**43**	(b)	**49**	(c)	**55**	(c)
2	(b)	**8**	(a)	**14**	(b)	**20**	(b)	**26**	(b)	**32**	(d)	**38**	(c)	**44**	(d)	**50**	(d)		
3	(b)	**9**	(b)	**15**	(c)	**21**	(d)	**27**	(a)	**33**	(c)	**39**	(b)	**45**	(a)	**51**	(c)		
4	(a)	**10**	(d)	**16**	(c)	**22**	(a)	**28**	(a)	**34**	(a)	**40**	(d)	**46**	(c)	**52**	(b)		
5	(c)	**11**	(d)	**17**	(d)	**23**	(b)	**29**	(c)	**35**	(b)	**41**	(b)	**47**	(c)	**53**	(a)		
6	(a)	**12**	(d)	**18**	(d)	**24**	(d)	**30**	(a)	**36**	(c)	**42**	(d)	**48**	(a)	**54**	(d)		

SOLUTIONS

1. **(b)** Among the given crystals, only silicon exists as a covalent solid. It has diamond like structure.

2. **(b)** In graphite, the electrons are spread out between the sheets.

3. **(b)** It is the most electronegative element. Hence, it strongly attract the electron pair in a covalent bond.

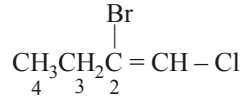
4. **(a)** In crystalline solid, there is perfect arrangement of the constituent particles only at 0 K. As the temperature increases the chance that a lattice site may be unoccupied by an ion increases. As the number of defects increases with temperature, solid changes into liquid.

5. **(c)** For ideal solution,

$\Delta V_{mixing} = 0$ and $\Delta H_{mixing} = 0$.

6. **(a)** Schottky defect is found in ionic solids.

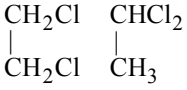
7. **(a)**



2-Bromo-1-chloro but-1-ene

8. **(a)**

9. **(b)**



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

10. **(d)**

11. **(d)** Due to inter-molecular hydrogen bonding in alcohols boiling point of alcohols is much higher than ether.

12. **(d)** In graphite, the carbon atoms are arranged in regular hexagons in flat parallel layers.

13. **(b)** The process of conversion of alkyl halides into alcohols involves substitution reaction.

$$R-X \xrightarrow{OH^-} R-OH$$

Alkyl halide Alcohol

14. **(b)** An increase in temperature of the solution increases the solubility of a solid solute.
The amount of solute that dissolve depends on what type of solute it is.
For solids and liquid solutes, changes in pressure have practically no effect on solubility.

15. **(c)** Ethyl alcohol has strongest hydrogen bonding due to large electronegativity difference.

16. **(c)** Hybridisation in $PCl_5 = \frac{1}{2}(5+5+0-0) = 5$; sp^3d

17. **(d)**

18. **(d)** Ethylene dichloride can be prepared by adding HCl to ethylene glycol ($CH_2OH.\ CH_2OH$).

19. **(d)** Due to resonance, the electron density increases more at ortho- and para-positions than at meta-positions. Further, the halogen atom because of its – I effect has some tendency to withdraw electrons from the benzene ring. As a result, the ring gets somewhat deactivated as compared to benzene and hence the electrophilic substitution reactions in haloarenes occur slowly and require more drastic conditions as compared to those in benzene.

20. **(b)** On heating, lead nitrate produces brown coloured nitrogen dioxide (NO_2) and lead (II) oxide.

$$2Pb(NO_3)_2 \xrightarrow{\Delta} 4NO_2 + 2PbO + O_2$$

21. **(d)** CCl_4 is non-polar and $CHCl_3$ is polar.

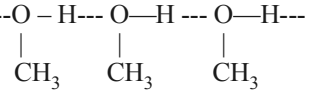
22. **(a)** Collectively these elements are called pnicogens and their compound pniconides.

23. **(b)** Insulin is a biochemically active peptide hormone secreted by pancreas.

24. **(d)** Metallic character increases down the group, Bi is most metallic

25. **(a)** Nitrogen does not show allotropy due to its small size and high electronegativity. The N–N bond is weak due to high inter–electronic repulsions among non-bonding electrons due to the small bond distance. Hence, it does not show allotropy.

26. **(b)** Positive deviations are shown by such solutions in which solvent-solvent and solute-solute interactions are stronger than the solute-solvent interactions. In such solution, the interactions among molecules becomes weaker. Therefore their escaping tendency increases which results in the increase in their partial vapour pressures. In pure methanol, there exists intermolecular H–bonding.



On adding benzene, its molecules come between ethanol molecules, thereby breaking H-bonds which weaken intermolecular forces. This results in increase in vapour pressure.

27. **(a)** Given $P_P = 80$ torr

$P_Q = 60$ torr

$P_{total} = P_P \times x_p + P_q \times x_q$

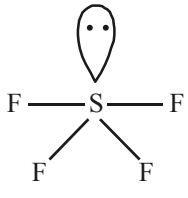
$$= \left[80 \times \frac{3}{5} + 60 \times \frac{2}{5}\right] = 16 \times 3 + 12 \times 2$$

$P_{total} = 48 + 24 = 72$ torr

28. **(a)** Density is directly related to molecular mass. Higher the molecular mass, higher will be the density of the compound. The order of molecular mass is

benzene < chlorobenzene < dichlorobenzene < bromochlorobenzene

29. **(c)** SF_4 has sea-saw shape as shown below:

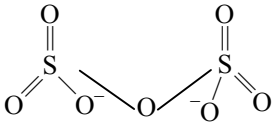


It has trigonal bipyramidal geometry having sp^3d hybridisation.

30. **(a)** The sequence in which the α-amino acids are linked to one another in a protein molecule is called its primary structure.

31. **(c)** For S_N2 reaction polar aprotic solvent is needed.

32. **(d)**



33. **(c)** Glass is amorphous solid.

34. **(a)** The correct order of increasing bond length is

$CH_3F < CH_3Cl < CH_3Br < CH_3I$

35. **(b)** $HF + XeF_6 \longrightarrow XeF_5^+ + HF_2^-$

36. **(c)** If $H_2O = x$ mole

Mass of x mole of $H_2O = 18x$ g

Then urea = x mole

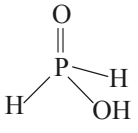
Mass of x mole of $NH_2 - \overset{\overset{O}{\|}}{C} - NH_2 = 60x$ g

Total mass of the solution $= 18x + 60x = 78x$ g

$$\text{Mass \% of urea} = \frac{60x}{78x} \times 100 = 76.92\%$$

37. **(b)** The solubility of alcohols depend on number of C-atoms of alcohols. The solubility of alcohols in water decreases with the increase in number of C-atoms of alcohol. As resulting molecular weight increases, the polar nature of – OH bond decreases and hence strength of hydrogen bond decreases.

38. **(c)** The acids which contain P–H bond have strong reducing properties. Thus, H_3PO_2 is a strong reducing agent due to the presence of two P–H bonds and one – OH group



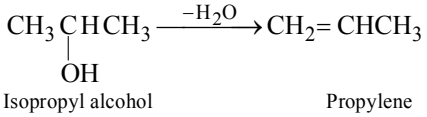
Hypophosphorus acid

39. **(b)** In Na_2O, negative ions form the *ccp* arrangement so that each positive ion is surrounded by 4 negative ions and each negative ion is surrounded by 8 positive ions.

$\therefore$ coordination no. of Na^+ is 4 and that of O^{2-} is 8.

40. **(d)** Bismuth forms metallic bonds in elemental state.

41. **(b)** Since the compound is formed by hydration of an alkene, to get the structure of alkene remove a molecule of water from the alcohol.



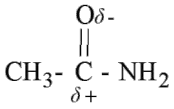
Isopropyl alcohol Propylene

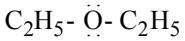
42. **(d)** The two components should be $(CH_3)_3CONa$ + $(CH_3)_3CBr$. However, tert-alkyl halides tend to undergo elimination reaction rather than substitution leading to the formation of an alkene, $Me_2C = CH_2$

43. **(b)** $PCl_3 + H_2O \longrightarrow POCl_3 + 2HCl$

$POCl_3 + 3H_2O \longrightarrow H_3PO_4 + 3HCl$

44. **(d)** Diethyl ether, being a Lewis base, is not attacked by nucleophiles, while all others contain electrophilic carbon, hence attacked by nucleophiles like OH^- ions.





45. **(a)** α-halo carbonyl compounds (such as $C_6H_5COCH_2Cl$) are more reactive because conjugation with carbonyl group is more effective than simple alkene or benzene ring.

46. **(c)** Bond angle of H_2S (92°) < H_2O (104°31). As the electronegativity of the central atom decreases, bond angle decreases. In the present case, S is less electronegative than oxygen. Thus, bond pairs in H_2S are more away from the central atom than in H_2O and thus repulsive forces between bond pairs are smaller, producing smaller bond angle.

47. **(c)** alkyl fluorides are obtained by heating alkyl chloride or bromide in the presence of metallic fluorides like AgF or SbF_3. the reaction is known as Swartz reaction.

$$R-X + AgF/Hg_2F_2 \rightarrow R-F + AgX/Hg_2X_2$$

48. **(a)**

49. **(c)** At higher temperatures, dinitrogen combines with metals to form ionic nitrides.

50. **(d)**

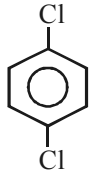
51. **(c)** Histidine is basic amino acid while aspartate is acidic amino acid.

52. **(b)** XeF_6 → (+Excess H_2O) → XeO_3 + HF (X); (XeF_6 + $2H_2O$) → XeO_2F_2 + HF (Y)

Y is not an oxyacid of xenon.

53. **(a)** Boiling point of CH_3I is 42°C which indicates that it is liquid at room temperature. CH_3I is larger molecule so it has stronger vander Waal's force of attraction than others.

54. **(d)** Para-dichlorobenzene has most symmetrical structure than others. It is found as crystalline lattice form, therefore, it has highest melting point (52°C) due to symmetrical structure.



55. **(c)** For the same alkyl group, the boiling points of alkyl halides decrease in the order :

RI > RBr > RCl > RF

This is because with the increase in size and mass of halogen atom, the magnitude of van der Waal's forces increases.