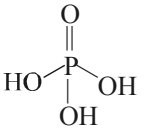
Sample Paper 8

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

SOLUTIONS

1. **(b)** Orthophosphoric acid, H_3PO_4 contains three P – OH bonds and is therefore, tribasic.



orthophosphoric acid

2. **(b)** $CH_3-CH_2-CH_2-Cl \xrightarrow[KOH]{alc.} \underset{(B)}{CH_3CH=CH_2}$

$\xrightarrow{HBr} CH_3-\underset{(C)}{\overset{Br}{\overset{|}{C}}H}-CH_3 \xrightarrow[ether]{Na} \underset{(D)}{CH_3\overset{1}{C}H_2-\overset{2}{\overset{|}{C}}H-\overset{3}{\overset{|}{C}}H\overset{4}{C}H_3}$ (CH_3 groups on C-2 and C-3)

3. **(d)** No. of millimoles $= 500 \times 0.2 = 100$

Thus, molarity of diluted solution $= \frac{100}{700}$

(Molarity = No. of moles L^{-1} = No. of millimoles mL^{-1})

$= 0.1428$ M

4. **(c)** $Ca_3P_2 + 6H_2O \rightarrow 3Ca(OH)_2 + 2PH_3$; *i.e.* 2 moles of phosphine are produced from one mole of calcium phosphide.

5. **(b)** Let total moles in solution = 1, Moles of solute = 0.2, Moles of solvent = 0.8, Mass of solvent $= 0.8 \times 78 \times 10^{-3}$ kg.

$$\text{Molality X} = \frac{\text{moles of solute}}{\text{Mass of solvent}} = \frac{0.2}{0.8 \times 78 \times 10^{-3}} = 3.2$$

6. **(b)**

7. **(a)** We know that empirical formula of hypophosphorus acid is H_3PO_2. In this only one ionisable hydrogen atom is present *i.e.* it is monobasic. Therefore, option (a) is correct structural formula of it.

8. **(d)** $\underset{\text{Ethyl bromide}}{C_2H_5Br} \xrightarrow{AgCN} \underset{\text{Ethyl isocyanide}}{C_2H_5NC} \xrightarrow{\text{Reduction}} \underset{\text{Ethyl methyl amine}}{C_2H_5NHCH_3}$

9. **(b)** $Z = 12 \times \frac{1}{6} + 2 \times \frac{1}{2} + 3 = 6$

10. **(b)** Liquid ammonia has high vapour pressure which is lowered down by cooling, otherwise the liquid will bump.

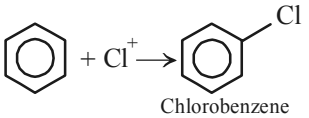
11. **(c)** Tetrahedral & octahedral holes are present in hcp and ccp.

12. **(d)** Dissolution of sugar in water will be most rapid when powdered sugar is dissolved in hot water because powder form can easily insert in the vacancies of liquid particles. Further dissolution of sugar in water in an endothermic process. Hence, high temperature will favour the dissolution of sugar in water.

13. **(a)** $\frac{r_c}{r_a} = 0.732$

$r_c = 0.732 \times 200 = 146.4$ pm

14. **(b)** $AlCl_3 + Cl_2 \longrightarrow [AlCl_4]^- + Cl^+$



Chlorobenzene

15. **(c)** In α-helix structure, — NH group of one amino acid is hydrogen bonded to $>C=O$ group of adjacent amino acid, forming a helix.

16. **(c)** $CH_3Cl + \underset{\text{Excess}}{NH_3} \rightarrow \underset{\text{Methanamine}}{CH_3NH_2} + HCl$

However, if the two reactants are present in the same amount, then the mixture of amines (i.e., primary, secondary and tertiary) are obtained.

17. **(d)** N_2O_3, N_2O_4 and N_2O_5 are acidic oxides. Only N_2O is neutral oxide.

18. **(c)** Alcoholic beverages contain ethyl alcohol (C_2H_5OH) which is drinking alcohol. CH_3OH is poisonous alcohol.

19. **(b)** Triclinic-unsymmetrical

$\alpha \neq \beta \neq \gamma \neq 90°$, $a \neq b \neq c$

Cubic-symmetrical

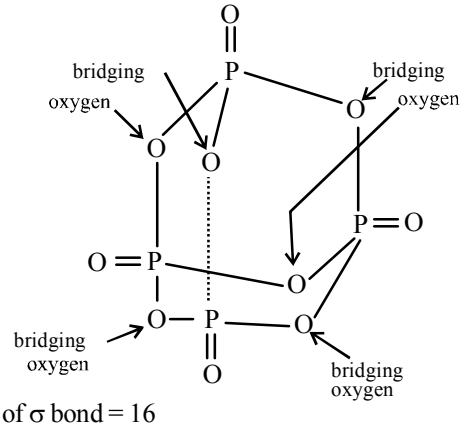
$\alpha = \beta = \gamma = 90°$, $a = b = c$

20. **(b)**

21. **(d)** H_3PO_4 is tribasic so $N = 3M = 3 \times 1N = 3N$.

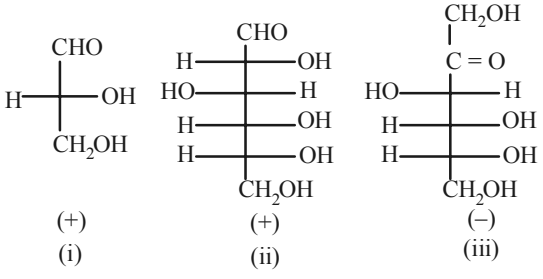
22. **(b)**

23. **(b)**



No. of σ bond = 16

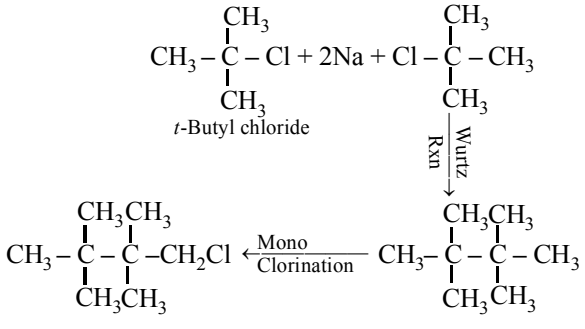
24. **(a)**



(+) (i) (+) (ii) (–) (iii)

When OH on lowest asymmetric carbon is written at right hand side, it is represented as D configuration and when OH is written on left hand side, it is represented as L configuration.

25. **(a)**



26. **(d)** Boiling point is directly proportional to size of the molecule. All contains same halogen atom but different hydrocarbon part. Larger the different hydrocarbon part larger the boiling point.

27. **(c)** $3CuSO_4 + 2PH_3 \rightarrow Cu_3P_2 + 3H_2SO_4$

$3HgCl_2 + 2PH_3 \rightarrow Hg_3P_2 + 6HCl$

28. **(b)** A mixture of bromoethane and chloroethane is an example of ideal solution. For an ideal solution, the A — A or B — B type intermolecular interaction is nearly equal to A — B type interaction.

Chloroform and acetone mixture is an example of non-ideal solution having negative deviation while ethanol-acetone mixture shows positive deviation.

29. **(c)** From the given options we find option (i) is correct. The oxidising power of halogens follow the order $F_2 > Cl_2 > Br_2 > I_2$. Option (ii) is incorrect because it is not the correct order of electron gain enthalpy of halogens. The correct order is $Cl_2 > F_2 > Br_2 > I_2$. The low value of F_2 than Cl_2 is due to its small size.

Option (iii) is incorrect. The correct order of bond dissociation energies of halogens is

$Cl_2 > Br_2 > F_2 > I_2$.

Option (iv) is correct. It is the correct order of electronegativity values of halogens.

30. **(c)** Structures having different configuration at C-1 if they are aldohexoses are known as anomers.

31. **(d)** All halogens (leaving F-F) have stronger bond then that in interhalogens.

32. **(b)** $(CH_3)_3CBr + NaOC_2H_5$ can't be applied for synthesising the ether because sod. ethoxide, being a strong base, will preferentially cause elimination reaction.

$$(CH_3)_3CBr \xrightarrow{^-OC_2H_5} (CH_3)_2C = CH_2 + HBr$$

In isobutene + ethanol, isobutene will form *tert*-butyl cation which reacts with ethanol, a nucleophile to form ether.

$$(CH_3)_2C = CH_2 \xrightarrow{H^+} (CH_3)_2\overset{+}{C}CH_3$$

$$\xrightarrow[\text{(ii) } -H^+]{\text{(i) } CH_3CH_2OH} (CH_3)_3COCH_2CH_3$$

33. **(b)** Physical state of iodine is different from other halogens as iodine is solid, bromine is a liquid whereas fluorine and chlorine are gases.

34. **(b)** $2Na^+_{(aq)} + 2OH^-_{(aq)} + SnO_{2(s)} \rightarrow 2Na^+_{(aq)} + SnO^{2-}_{3(aq)} + H_2O$

The number of ions decreases in the ratio of 4 to 3, and so also the colligative property.

35. **(a)** According to Raoult's law,

$P_T = x_A p^\circ_A + x_B p^\circ_B$

Given, $P_{T_1} = 500\,\text{mm Hg}$

$n_A = 1$ and $n_B = 2 \therefore x_A = 1/3$ and $x_B = 2/3$

$$\Rightarrow 500 = \frac{1}{3} p^\circ_A + \frac{2}{3} p^\circ_B$$

$\Rightarrow 1500 = p_A^\circ + 2p_B^\circ$ ...(i)

Also given that, one more mole of B is added to the solution, the pressure of the ideal solution increases by 25 mm Hg.

$\therefore\ P_{T_2} = 500 + 25 = 525$ mm Hg

Also, $n_B = 3\ \therefore x_A = 1/4$ and $x_B = 3/4$

$525 = \frac{1}{4}p_A^\circ + \frac{3}{4}p_B^\circ$ ...(ii)

$2100 = p_A^\circ + 3p_B^\circ$ Subtract (i) and (ii),

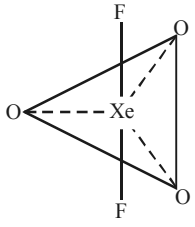
$p_B^\circ = 600$ mm Hg

$p_A^\circ + 2p_B^\circ = 1500 \Rightarrow p_A^\circ = 300$ mm Hg.

36. **(c)** Stability of the three corresponding carbocations

$CH_2 = \underset{\text{Allyl Carbocation}}{CH\overset{+}{C}HCH_3} > \underset{\text{2° Carbocation}}{CH_3CH_2\overset{+}{C}HCH_3} > \underset{\text{1° Carbocation}}{CH_3CH_2\overset{+}{C}H_2}$

37. **(b)** The hybridization of XeO_3F_2 is sp^3d and its structure is trigonal bipyramidal in which oxygen atoms are situated on the plane and the fluoride atoms are on the top and bottom.



38. **(d)** The hydrophilic/ hydrophobic character of amino acid residues is important to tertiary structure of protein rather than to secondary structure. In secondary structure, it is the steric size of the residues that is important and residues are positioned to minimise interactions between each other and the peptide chain.

39. **(d)** **40.** **(b)**

41. **(b)** In NaCl crystal, each Cl^- ion is surrounded by 6 Na^+ ions. Similarly, each Na^+ is surrounded by 6 Cl^- ions.

42. **(a)** N-Phenylacetanilide, $C_6H_5N(C_6H_5)COCH_3$, precipitates out to a complex with anhydrous $AlCl_3$.

43. **(a)** (X) is borax, $Na_2B_4O_7.10H_2O$

(i) $Na_2B_4O_7 + 7H_2O \rightleftharpoons \underset{\text{(Strong) Base}}{2NaOH} + \underset{\text{(Weak) acid}}{4H_3BO_3}$

Due to presence of NaOH, the aqueous solution is alkaline to litmus.

(ii) $Na_2B_4O_7.10H_2O \xrightarrow[\text{(swells)}]{\text{Heat}} Na_2B_4O_7 + 10H_2O \longrightarrow \underset{\text{Glassy bead}}{2NaBO_2 + B_2O_3}$

(iii) $Na_2B_4O_7 + H_2SO_4 + 5H_2O \longrightarrow Na_2SO_4 + \underset{\text{white crystals}}{4H_3BO_3}$

44. **(d)** Azeotropic mixture is constant boiling mixture, it is not possible to separate the components of azeotropic mixture by boiling.

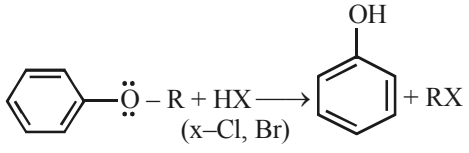
45. **(a)** Methanol is injurious to the nervous system. It mainly damages central nervous system and optic nerve, therefore, ingestion of small amount of methanol cause blindness and death.

46. **(c)** HNO_2 makes iron passive due to formation of passive form of oxide on the surface. Hence, Fe does not dissolve in conc HNO_3 solution.

47. **(d)** KBr shows schottky defect.

48. **(b)** HI cannot be prepared by the reacton of Kl with concentrated H_2SO_4 because HI is converted into I_2 on reaction with H_2SO_4.

49. **(a)** Aryl-oxygen bond is highly stable due to stabilisation of lone pair of electrons on oxygen atom due to resonance effect and sp^2 hybridization of the carbon atom.



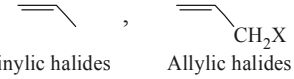
50. **(b)** **51. (c)**

52. **(c)**

Bond	μ
$CH_3 - F$	1.847
$CH_3 - Cl$	1.860
$CH_3 - Br$	1.830

(a) $H_3C - CHCl_2$, $\underset{\underset{Cl\ \ Cl}{|\quad|}}{H_2C - CH_2}$

Ethylene chloride (Gem dihalide) Ethylene dichloride (vic-dihalide)

(b)  ,

Vinylic halides Allylic halides

(d) Para isomers are more symmetric than ortho and meta isomers.

53. **(b)** $\overset{5}{CH_3} - \underset{\underset{OH}{|}}{\overset{4}{CH}} - \overset{3}{CH_2} - \underset{\underset{OH}{|}}{\overset{\overset{CH_3}{|}2}{C}} - \overset{1}{CH_3}$

2-Methyl-2, 4-pentanediol.

54. **(b)**

55. **(b)** Alcohols are versatile compounds. They react both as nucleophiles and electrophiles. The bond between