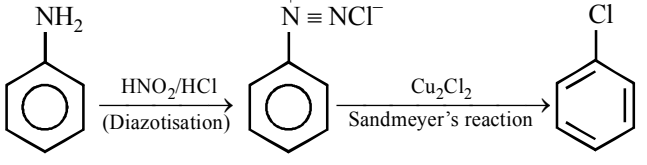
Sample Paper 3

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

SOLUTIONS

1. **(d)** $2H_3PO_4 \xrightarrow[-2H_2O]{600°C} 2HPO_3$

2. **(c)**

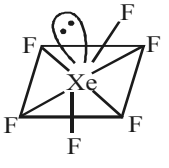


3. **(c)** Ethyl alcohol forms ethyl chloride with thionyl chloride in presence of pyridine.

$$CH_3CH_2OH + SOCl_2 \xrightarrow{\text{Pyridine}} CH_3CH_2Cl + SO_2 + HCl$$

4. **(a)** sp^3d^3 hybridization will give pentagonal bipyramid geometry with one trans position occupied by a lone pair and shape of the molecule will be distorted octahedral.

XeF_6 : sp^3d^3 hybridisation



5. **(d)** $2\overset{+7}{K}\overset{+7}{Mn}O_4 + 16HCl \rightarrow 2\overset{+2}{Mn}Cl_2 + 2KCl + 8H_2O + 5Cl_2$

O.S of Mn changes from +7 to +2 hence reduction occurs and Cl_2 is formed.

6. **(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.

7. **(a)** The solutions (liquid mixture) which boils at constant temperature and can distil as such without any change in composition are called azeotropes.

Solution of HNO_3 and H_2O will form maximum boiling point azeotrope. Maximum boiling azeotropes show negative deviation from Raoult's law.

	Composition (%)	Boiling Point
HNO_3	68.0	359 K
H_2O	32.0	373 K

Boiling point of the azeotrope of these two solutions is 393.5 K.

8. **(b)** In *hcp* type structure, each atom is surrounded by 12 nearest touching neighbours. Hence, coordination number in *hcp* is 12.

9. **(d)** The non-reactivity of chlorine atom in vinyl chloride is due to resonance stabilisation.

$$\overset{\curvearrowleft}{CH_2} = CH - \overset{\curvearrowleft}{\ddot{Cl}}: \longrightarrow \overset{-}{C}H_2 - CH = \overset{+}{\ddot{Cl}}:$$

10. **(d)**

11. **(c)** Greater the surface area, greater will be the boiling point of a compound. Surface area decreases with increase in branching.

Increasing order of boiling point

$$H_3C - \underset{\displaystyle Br}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}} - CH_3 < \begin{matrix} H_3C \\ \diagdown \\ \diagup \\ H_3C \end{matrix} CH - CH_2Br$$

$< CH_3CH_2CH_2CH_2Br$

12. **(c)** Among carbon, nitrogen, phosphorus and boron only phosphorus has vacant *d*-orbital hence, only phosphorus has the ability to form $p\pi - d\pi$ bonding.

13. **(d)**

14. **(a)** Seven crystal systems.

15. **(c)** Less powerful oxidizing agent, pyridinium chlorochromate $\left(C_5H_5\overset{+}{N}H\bar{C}lCrO_3\right)$ oxidises primary alcohols to aldehydes.

$$CH_3CH_2OH \xrightarrow{PCC} CH_3CHO$$

Ethanol Ethanal

16. **(d)** For very dil. solution the concentration is expressed in ppm.

17. **(b)**

18. **(a)** $2NH_3 + 5/2\,O_2 \xrightarrow[\Delta]{Pt} 2NO + 3H_2O$

19. **(d)**

20. **(b)** Alcohols and halogen acids react through S_N1 mechanism which involves carbocations as intermidate. In such reactions, order of reactivity follows the order of stability of carbocations; i.e. 3° > 2° > 1°. Thus the order in the presente case is C > B > A.

21. **(a)** Peroxide effect is observed only in case of HBr. Therefore, addition of HCl to propene even in the presence of benzoyl peroxide occurs according to Markonikov's rule:

$$CH_3-CH=CH_2 \xrightarrow[\text{Benzoyl peroxide}]{HCl} CH_3-CHCl-CH_3$$

22. **(c)** Bertlett had taken $O_2^+PtF_6^-$ as a base compound because O_2 and Xe both have almost same ionisation enthalpy.

23. **(b)** Low concentration of oxygen in the blood and tissues of people living at high altitude is due to low atmospheric pressure. Because at high altitude, the partial pressure of oxygen is less than at the ground level. This decreased atmospheric pressure causes release of oxygen from blood.

24. **(a)**

25. **(d)** $Hb + CO \longrightarrow \underset{\text{Carboxyhaemoglobin (stable)}}{HbCO}$

$$Hb + O_2 \rightleftharpoons \underset{\text{Oxyhaemoglobin (unstable).}}{HbO_2}$$

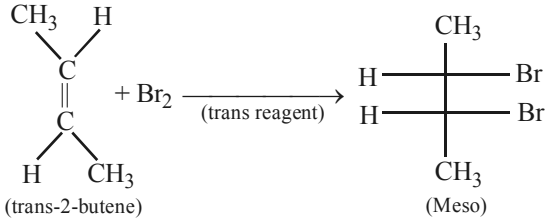
26. **(b)**

27. **(d)** Out of N, S and C, nitrogen has the highest electronegativity and it decrease in the order N > S > C. Thus the oxide of nitrogen in its highest (+5) oxidation state is the most acidic.
Next to N_2O_5 in the decreasing order of acidity will be SO_2 then CO_2 and finally CO which is neutral.

28. **(b)** $P_{Solution} = P^\circ_{solution}\, x_{Solvent}$

$$\frac{P^\circ - P}{P^\circ} = x_{solute}$$

29. **(d)**



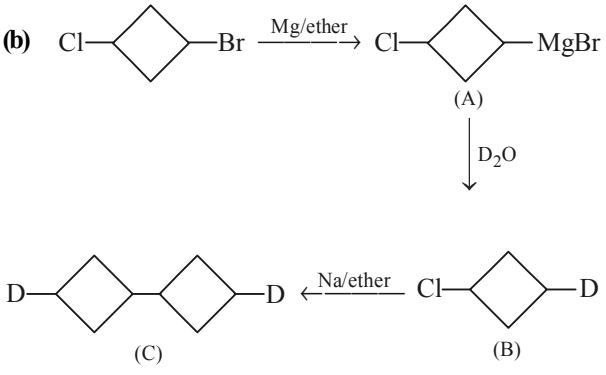
(trans-2-butene) (Meso)

30. **(a)** $\pi \propto \frac{1}{V}$, and not $\pi \propto V$.

31. **(d)** PH_3 (Lewis base) can react with B_2H_6 (Lewis acid).

32. **(a)** Cyclic structures of monosaccharides which differ in structure at carbon -1 are known as anomers.
Here, I and II are anomer because they differ from each other at carbon-1 only.

33. **(b)**



34. **(c)** Number of π-bonds

$$H_2S_2O_7 = HO-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-O-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-OH$$

$$H_2SO_4 = HO-\overset{\overset{O}{\|}}{\underset{\underset{O}{\|}}{S}}-OH \qquad 2$$

$$H_2SO_3 = HO-\overset{}{\underset{\underset{O}{\|}}{S}}-OH \qquad 1$$

35. **(b)** No. of atoms (A) = 6 (h.c.p.); no. of B atoms

$$= \frac{1}{3}\times 12 = 4$$

A_6B_4 or A_3B_2

36. **(a)**

37. **(d)** In solid state PCl_5 exists as an ionic solid with the cation $[PCl_4]^+$ (tetrahedral) and the anion $[PCl_6]^-$ (octahedral).

38. **(c)** Given $P_A = 750$ mm Hg

$\because$ 373 K is boiling point of water.

Thus, $P^\circ_A = 760$ mm Hg

$$m = \left(\frac{P^\circ - P}{P}\right) \times \frac{1000}{M_{solvent}} \Rightarrow \frac{10}{750} \times \frac{1000}{18} \Rightarrow 0.74$$

39. **(a)** More stable carbocation, more is the rate toward HBr (acid).

40. **(d)** $K_2Cr_2O_7 + H_2SO_4 + 3SO_2 \longrightarrow$

$$\underset{\text{Green}}{K_2SO_4 + Cr_2(SO_4)_3} + H_2O$$

41. **(b)** For each central atom there are two tetrahedral voids in AgI crystal. The number of Ag^+ ion is equal to number of I^- ion. It means only 50% of the void will be occupied by Ag^+ ion.

42. **(b)** PH_5 does not exist because *d*-orbital of 'P' interacts with *s*-orbital of H. Bond formed is not stable and not energetically favorable. It depends on size and orientation of interaction.

43. **(d)** **44.** **(c)**

45. **(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.

46. **(a)** Limitation of Williamson's synthesis is that only primary alkyl halide reacts with 1° or 2° or 3° sodium alkoxide to give ethers.

47. **(c)** Alkyl iodide can be prepared by treating alkyl halides with NaI in presence of acetone. It is called Finkelstein reaction.

$$R - X + NaI \xrightarrow{\text{acetone}} R - I + NaX$$

Also, NaI is soluble in acetone but NaBr/NaCl are not soluble.

48. **(c)** N_2 is less reactive than P_4 due to high value of bond dissociation energy which is due to presence of triple bond between two N-atoms of N_2 molecule.

49. **(a)** As the branching increases in isomeric alkyl groups, contact surface area of molecule decreases; therefore, van der Waal forces decrease reducing intermolecular interactions and hence the boiling points.

50. **(d)**

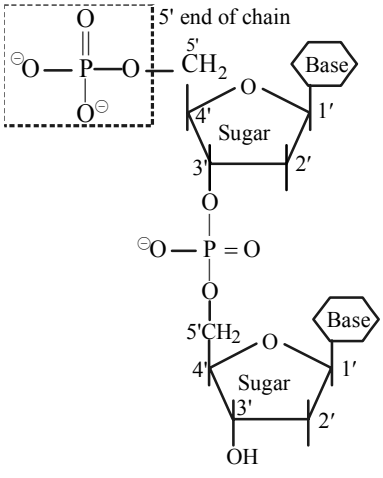
51. **(c)** $Xe + 2F_2 \xrightarrow{873\text{ k, }7\text{ bar}} \underset{(X)}{XeF_4}$

$$Xe + 3F_2 \xrightarrow{573\text{ k, }60-70\text{ bar}} \underset{(Y)}{XeF_6}$$

52. **(c)**

53. **(b)** The polymer of nucleotides in which nucleic acids are linked together by phosphodiester linkage are known as nucleic acid.

54. **(a)** Dinucleotides are formed by phosphodiester linkage between 5' and 3' carbon atom of pentose sugar.



55. **(b)** Sugar in DNA is 2-deoxyribose whereas sugar in RNA is ribose.