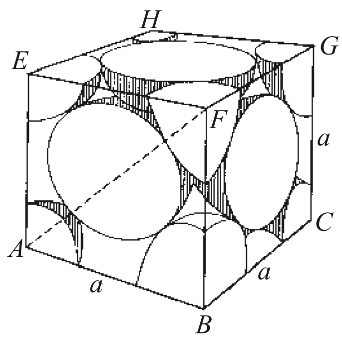
Sample Paper 6

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

SOLUTIONS

1. **(a)** A strong nucleophile favours the S_N2 reaction and a weak nucleophile favours the S_N1 reaction.
   First reaction is S_N1 reaction because C_2H_5OH is used as solvent which is a weak nucleophile.
   Second reaction is S_N2 reaction because $C_2H_5O^-$ is strong nucleophile.
2. **(b)** Show negative deviation from Raoult's law.
3. **(c)** Let oxidation state of P in NaH_2PO_2 is x.
   $$1 + 2 \times 1 + x + 2 \times (-2) = 0$$
   $$1 + 2 + x - 4 = 0$$
   $$+x - 1 = 0$$
   $$x = +1$$
4. **(c)** Dissolution of gases in liquids is generally an exothernic process accompanied by a large decrease in volume. Follow Le chatelier’s principle.
5. **(b)** The letter ‘D’ or ‘L’ before the name of any compound indicate, the relative configuration of a particular stereoisomer.
6. **(d)** Due to hydrogen bonding, HF is a liquid.
7. **(a)** It is a substitution reaction which involves the replacement of 1° and 2° hydrogens of alkanes by chlorine. It occurs in presence of ultraviolet light.
   $$\overset{10}{CH_3}\overset{20}{CH_2}\overset{20}{CH_2}\overset{10}{CH_3} \xrightarrow[\text{UV light}]{Cl_2}$$
   $$CH_3CH_2\dot{C}HCH_3 + CH_3CH_2CH_2\dot{C}H_2$$
8. **(d)** SO_2 acts as an oxidising agent as well as reducing agent.
9. **(d)** Crystals show good cleavage because their constituent particles are arranged in planes.
10. **(a)** As we know from elevation in boiling point that
    $$\Delta T_b = K_b m \quad \Rightarrow \quad K_b = \frac{\Delta T_b}{m}$$
    $$\text{Unit of } K_b = \frac{\text{unit of } \Delta T_b}{\text{unit of m}} = \frac{K}{\text{molality}}$$
    $$= \frac{K}{\text{mol kg}^{-1}} = K\ \text{mol}^{-1}\ \text{kg}$$
11. **(c)**



An isolated *fcc* cell is shown here. Each face of the cell is common to two adjacent cells. Therefore, each face centre atom contributes only half of its volume and mass to one cell. Arranging six cells each sharing the remaining half of the face centred atoms,constitutes fcc cubic lattice. e.g., Cu and Al.

12. **(d)** $Cl_3C - CH_2CH_3 + KOH \xrightarrow{\text{heat}}$
    $$(OH)_3C - CH_2CH_3 + 3KCl$$
    $$\longrightarrow CH_3CH_2\overset{\overset{\displaystyle O}{\|}}{C}-OH$$
    Propanoic acid
13. **(b)** Amino acids exist as zwitterions in which acidic character is due to $-NH_3^+$ and basic due to $-COO^-$ group.

$$H_3\overset{+}{N}\underset{}{\overset{R}{C}}HCOOH \xleftarrow{\text{acid}} H_3\overset{+}{N}\overset{R}{C}HCOO^-$$

$$\xrightarrow{\text{base}} H_2N\overset{R}{C}HCOO^-$$

14. **(b)** $CH_3-CH_2-CHCl_2 \xrightarrow[\Delta]{NaNH_2}$

$$CH_3-CH=CHCl \xrightarrow[\Delta]{NaNH_2} \underset{\text{Final Product}}{CH_3-C\equiv CH}$$

15. **(a)** $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2+4H_2O+Cr_2O_3$

16. **(c)**

17. **(b)** For tetrahedral shape radius ratio is 0.225 – 0.414.

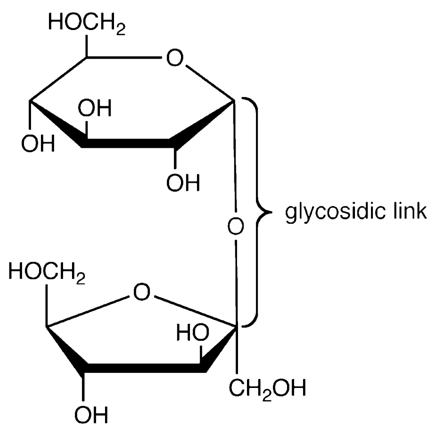
18. **(a)** Phenol, being more acidic in nature, reacts with sodium hydroxide solution gives phenoxide ion. This phenoxide ion is resonance stabilised.

19. **(a)** Normal saline is 0.16 M NaCl solution.

20. **(c)** Electron withdrawing group stabilises the benzene ring due to delocalisation of charge.
$-CH_3$ and $-CH_2OH$ are electron donating group and hence decrease the stability of benzene ring $-OCH_3$ is weaker electron withdrawing group than $-COCH_3$. Hence $-COCH_3$ group more stabilize the phenoxide ion at *p*-position.

21. **(b)** $H_2O+\overset{0}{Br_2} \longrightarrow HO\overset{+1}{Br}+H\overset{-1}{Br}$
Thus, here oxidation number of Br increases from 0 to +1 and also decreases from 0 to –1. Thus, it is oxidised as well as reduced.

22. **(b)** Glycosidic linkage is actually an ether bond as the linkage forming the rings in an oligosaccharide or polysaccharide is not just one bond, but the two bonds sharing an oxygen atom e.g. sucrose



23. **(c)** Potassium ethoxide is a strong base, and 2-bromopentane is a 2º bromide, so elimination reaction predominates

$$CH_3CH(Br)CH_2CH_2CH_3 \xrightarrow{OC_2H_5^-}$$

$$\underset{\text{Pentene - 2(major) } trans}{CH_3CH=CHCH_2CH_3} + \underset{\text{Pentene–1(minor) } cis}{CH_2=CHCH_2CH_2CH_3}$$

Since *trans*- alkene is more stable than *cis, thus trans*-pentene -2 is the main product.

24. **(d)** Fluoroalkanes are difficult to prepare directly because flourination of hydrocarbons with pure F_2 gas occurs explosively. Therefore these are prepared by treating alkyl chloride or bromide with salts such as Hg_2F_2, AgF. The reaction is called swarts reaction.
$CH_3Br+AgF \rightarrow CH_3F+AgBr$

25. **(N)** (a) All form monobasic oxyacids *e.g.* HOF, HOCl, HOBr and HOI. But HOF is unstable at room temperature $2HOF \rightarrow 2HF+O_2$
(b) All halogens are good oxidizing agents.
(c) Electron gain enthalpy order: Cl > F > Br > I
(d) Fluorine is the most electronegative atom, thus, it shows only –1 oxidation state. The oxidation states of elements in HOF are $\overset{+1}{H}-\overset{0}{O}-\overset{-1}{F}$
All other halogens can show odd positive oxidation number *i.e.* +1, +3, +5 and +7.

26. **(c)** $M_B=\dfrac{\Delta T_b \times W_B \times 1000}{K_b \times W_A}$ is wrong. The correct form is
$$M_B=\frac{K_b \times W_B \times 1000}{\Delta T_b \times W_A}$$

27. **(b)** At 2.2 K, liquid helium can flow.

28. **(c)** In a DNA molecule, A ═ T (Two H–bonds)
C ≡ G (Three H–bonds)
Purine → Adenine (A), Guanine (G)
Pyrimidine → Cytosine (C), Thymine (T)
So the complimentary sequence of ATGCTTGA is TACGAACT.

29. **(a)** SO_3 forms trimer in solid state.

30. **(a)** $(CH_3)_2CHO^-\overset{+}{Na}+CH_3I \longrightarrow$
$(CH_3)_2CH-O-CH_3+NaI$

31. **(c)** $NH_4Cl+KNO_2 \xrightarrow{\Delta} KCl+N_2+2H_2O$

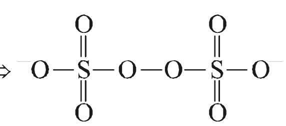
32. **(d)** According to Henry's law

$$\frac{P_1}{P_2}=\frac{S_1}{S_2} \Rightarrow \frac{500}{750}=\frac{0.01}{S_2}$$

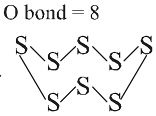
$$\therefore S_2=\frac{750\times 0.01}{500}=0.015\ g/L$$

33. **(c)** $N_1V_1+N_2V_2=NV$
$4x+10(1-x)=6\times 1; -6x=-4; x=0.67$
Thus 0.67 litre of 4N HCl
$1-x=1-0.67=0.33$ litre of 10 N HCl

34. **(a)** $C_2H_6\text{ (excess)}+Cl_2 \xrightarrow{\text{UV light}} C_2H_5Cl+HCl$

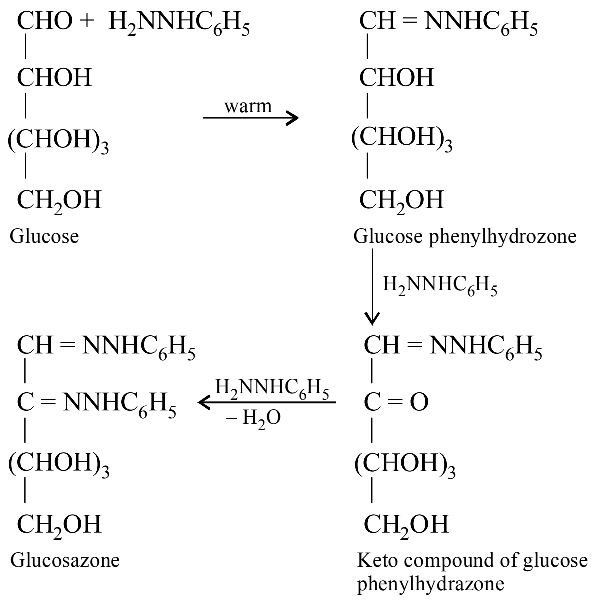
35. **(b)** $S_2O_8^{2-} \Rightarrow$ 

No. of S – O bond = 8

$S_8 \Rightarrow$ 

No. of S – S bond = 8

36. **(d)** We know that glucose reacts with one molecule of phenylhydrazine to give phenylhydrazone. When warmed with excess of phenylhydrazine, the secondary alcoholic group adjacent to the aldehyde group is oxidised by another molecule of phenylhydrazine to a ketonic group. With this ketonic group, the third molecule of phenylhydrazine condenses to glucosazone. Therefore the value of X is 3.



37. **(d)** –Cl is *o, p*–directing.

38. **(b)**

39. **(c)** In a *fcc* lattice, the distance between the cation and anion is equal to the sum of their radii, which is equal to half of the edge length of unit cell,

i.e. $r^+ + r^- = \frac{a}{2}$ (where a = edge length)

$r^+ = 95$ pm, $r^- = 181$ pm

Edge length $= 2r^+ + 2r^- = (2 \times 95 + 2 \times 181)$ pm

$= (190 + 362)$ pm $= 552$ pm.

40. **(d)** Due to conjugation of lonepair of Cl with π bond, partial double bond character decreases bond length that's why compound (d) has shortest C–Cl bond length.

41. **(a)** Conc. HNO_3 oxidises I_2 to iodic acid (HIO_3).

$$I_2 + 10HNO_3 \rightarrow \underset{Y}{2HIO_3} + 10NO_2 + 4H_2O$$

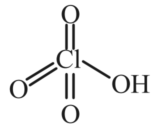
In HIO_3 oxidation state of iodine is +5.

42. **(d)** In case of exothermic dissolution, the solubility of the solid increases on lowering the temperature. On cooling, the solution becomes unsaturated and solid solute does not separate. At 0°C, water in the solution does not freeze.

43. **(d)** Phenol has active (acidic) hydrogen so it reacts with CH_3MgI to give CH_4, and not anisole

$$C_6H_5OH + CH_3MgI \longrightarrow CH_4 + C_6H_5OMgI$$

44. **(b)** The structure of perchloric acid is



The number Cl = O bond in $HClO_4$ is 3.

45. **(a)** No. of Atom 'A' per unit cell =

$6(8-2=6)$ corners $\times \frac{1}{8}$ atom per unit cell $= \frac{6}{8} = \frac{3}{4}$

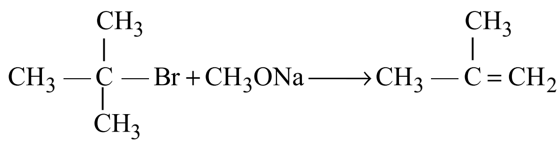
No. of atom 'B' per unit cell = 6 faces $\times \frac{1}{2}$ atom per unit cell = 3

Hence, the formula of the compound = $A_{3/4}B_3$ or A_3B_{12} i.e., AB_4.

46. **(c)** A mixture of He and O_2 is used for respiration by deep sea divers but Helium is not soluble in blood.

47. **(a)**

48. **(b)** *Ter*-butyl bromide and sodium methoxide reacts to form 2-methylpropene and ethanol (elimination reaction).



49. **(a)** **50.** **(d)**

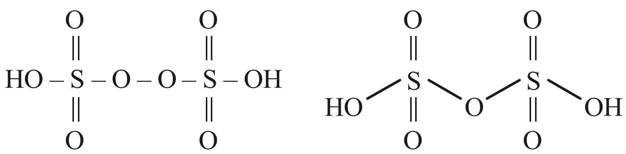
51. **(b)** $CH_3Br + AgF \longrightarrow CH_3F + AgBr$

Swartz reaction

$CH_3Cl + NaI \longrightarrow CH_3I + NaCl$

Finkelstein reaction

52. **(d)** $H_2S_2O_8$ Peroxodisulphuric acid; $H_2S_2O_7$ Pyrosulphuric acid



	A	B
No. of S = O bonds	4	4
No. of S – OH bonds	2	2

53. **(c)** Quartz glass is an example of amorphous solid and crystalline solids are anisotropic in nature.

54. **(b)** Crystalline solids are anisotropic in nature that is some of their physical properties like electrical resistance or refractive index show different values when measured along different directions in the same crystals.

55. **(b)** Amorphous solids are isotropic, because these substances show same properties in all directions.