# CHEMISTRY (043)
## Marking Scheme

### SECTION A

1.(d)N-N is weaker than P-P
other statements as incorrect as Phosphorus has a higher melting point due to bigger size than Nitrogen.   Nitrogen is inert due to formation of triple bonds and has a lower covalence due to non - availability of d –orbitals

2. (c)metal deficiency defect (anion is missing from lattice site)
In Frenkel defect the smaller ion occupies the interstitial sites and Schottky defect equal number of cations and anions are missing. Interstitial defect an atom or molecule occupies intestinal sites so in these three defects the ratio of positive and negative ions (Stoichiometric) of a solid is not disturbed in these three

3. (b) Raoult's law

4. (c) Metal excess defect (formation of F centres)

5. (c) 1,4-dicholorbenzene ( para isomers are more symmetric and ortho and meta )

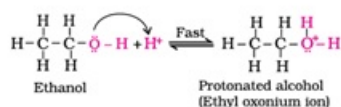6. (d)    existence of alpha and beta forms of glucose .

7. (c) $S_N^2$ reaction (alkoxide ion reacts with primary alkyl halide in a single step to form ether)

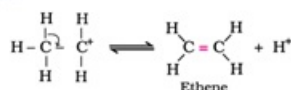8. (b) a mixture of HOCl and HCl is produced in the presence of sunlight
$Cl_2(g) + H_2O (l) \rightarrow HCl (g) + HOCl(aq)$
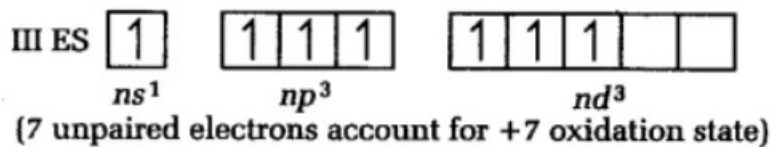
9. (a)protonation of alcohol molecule



10. Amorphous solids are:
(a) isotropic (the value of any physical property is same along any direction)

11. (c) Reimer- Tiemann reaction   ( Kolbe's reaction is used to prepare salicylic acid, Etard reaction for benzaldehyde, Reimer- Tiemann reaction  for salicylaldehyde and  Stephen's reduction for aldehyde)

12. (d)22 carat gold (it is an alloy so solid in solid solution)

13. (a) Hydrogen bonding (alcohols form intermolecular hydrogen bonds)

14. (b)$H_2S$ (boiling point increases down the group but water forms strong hydrogen bonds so has higher boiling point than $H_2S$)

15. (d)pH does not affect the primary structure of protein (pH effects the tertiary structure)

16. (b) 1 –Phenyl -3- bromopropane
(($C_6H_5$)$CH_2CH=CH_2$ + HBr (organic peroxide) → ($C_6H_5$)$CH_2CH_2CH_2Br$ anti-Markovnikov addition)

17. (b) It gives nitroethane on heating with aqueous solution of $AgNO_2$
($C_2H_5Br$ reacts with metallic Na to give butane , gives ethene on boiling with alcoholic potash. and forms $C_2H_5SH$ (thiol) on heating with alcoholic KSH)

18. (c)4  (Covalency of nitrogen is restricted to 4 due to non availability of d orbitals)

19. (b)exothermic and reversible process (according to Le -Chatlier principle Solubility of gases in liquids decreases with rise in temperature)

20. (a)Nitrogen (due to small size and high electronegativity N-N is weak)

21.(c)glycogen (It is a polymer of glucose)

22. (d) Helium (He is monoatomic and has low atomic mass)

23.(c) miscible in water in all proportions Lower molecular mass alcohols are able to form hydrogen bonds with water

24.(d)+7   (Cl : $1s^2 2s^2 2p^6 3s^2 3p^5$)

III ES | 1 | | 1 | 1 | 1 | | 1 | 1 | 1 | | |
$ns^1$       $np^3$              $nd^3$
(7 unpaired electrons account for +7 oxidation state)

25.(a)When placed in water containing more than 0.9% (mass/ volume) NaCl solution because fluid inside blood cells is isotonic with 0.9% NaCl solution
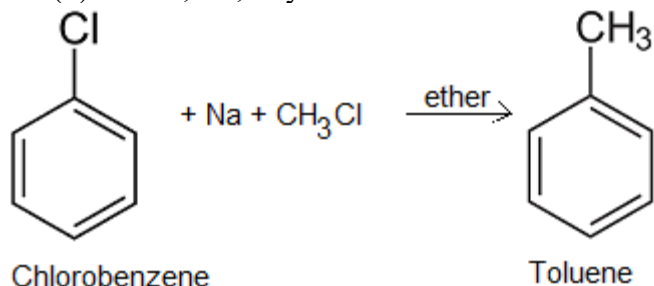
## SECTION B

26. (a) 7.5 mol

$\Delta T_f = K_f\, m$
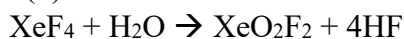
$\Delta T_f = K_f\, \dfrac{n_2 \times 1000}{w_1}$

$14 = 1.86 \times \dfrac{n_2 \times 1000}{1000}$

$n_2 = 7.5$ mol

27. (b) $CH_3Cl$, Na, Dry ether



Chlorobenzene + Na + $CH_3Cl$ $\xrightarrow{\text{ether}}$ Toluene

28. (d) $XeO_2F_2$ + 4HF

$XeF_4 + H_2O \rightarrow XeO_2F_2 + 4HF$

29. (c) It undergoes inversion in the configuration on hydrolysis

30. (b) partial double bond character of C-OH bond

31. (a)Nitrogen (High IE of N is because of smallest size in the group and completely half - filled p subshell)

32. (d) $M_2O_3$

Metal M ions form ccp structure. Let number of ions of M be : X

No. of tetrahedral voids $= 2x$

No. of octahedral voids $= x$

Number of oxide ions will be $1/2\ x + ½\ (2x) = 3/2\ x$
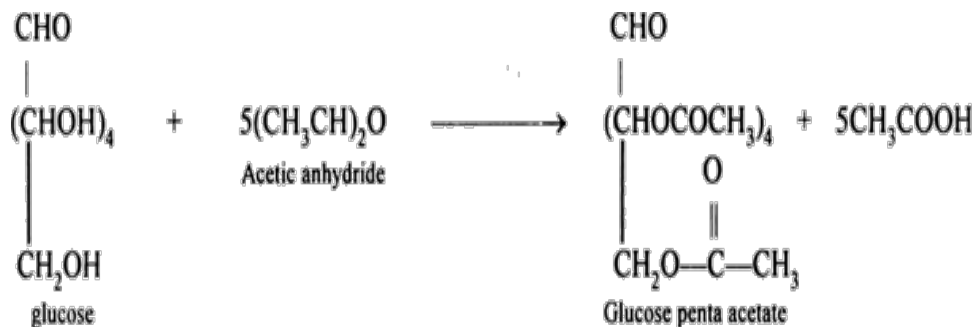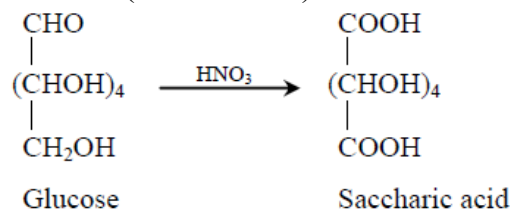
Formula of oxide $= MxO3/2\ x = M_2O_3$

33. c) X = o and p–chlorotoluene Y = trichloromethylbenzene

The reaction of toluene with $Cl_2$ in presence of $FeCl_3$ gives 'X' due to electrophilic substitution reaction taking place at ortho and para positions and reaction in the presence of light gives 'Y', due to substitution reaction occurring via free radical mechanism
. Thus 'X' and 'Y'are X = o and p–chlorotoluene Y = trichloromethylbenzene

34. (d)angular, 128pm ; 128pm (Ozone is a resonance hybrid of two equivalent structures)

35. (c) Osmosis

36. d)  A= OHC-(CHOCOCH₃)₄-CH₂OCOCH₃      B= COOH-(CH₂)₄ -COOH

$$
\begin{array}{ccc}
\text{CHO} & & \text{COOH}\\
|\ & & |\ \\
\text{(CHOH)}_4 & \xrightarrow{\ \text{HNO}_3\ } & \text{(CHOH)}_4\\
|\ & & |\ \\
\text{CH}_2\text{OH} & & \text{COOH}\\
\text{Glucose} & & \text{Saccharic acid}
\end{array}
$$



CHO
|
(CHOH)₄ + 5(CH₃CH)₂O ――――→ (CHOCOCH₃)₄ + 5CH₃COOH
|                    Acetic anhydride           O
|                                                      ‖
CH₂OH                                          CH₂O—C—CH₃
glucose                                         Glucose penta acetate

37. (d) Adsorption of litmus by Al(OH)₃
In lake test for $Al^{3+}$ ions, there is the formation of coloured 'floating lake' In lake test for $Al^{3+}$ ions, there is the formation of coloured 'floating lake' due to adsorption

38. (c) 3 g/cm³
Using formula
Density = $\dfrac{(Z \times m)}{(a^3 \times Na)}$

D = $\dfrac{4 \times 58.5}{(0.5 \times 10^{-7})^3 \times 6.023 \times 10^{23}}$

= 3.1 g/cm³

39. **(d)** BiH₃<SbH₃<AsH₃<PH₃<NH₃ [ increasing  bond angle ] correct order
　　(a) I₂ < Br₂<F₂<Cl₂ [ increasing bond dissociation enthalpy]:  incorrect order , correct order is  Cl₂ > Br₂ > F₂ > I₂.
　　(b) H₂O > H₂S<H₂Te<H₂Se   [ increasing  acidic strength]: incorrect order , correct order is
　　　H₂O<H₂S<H₂Se<H₂Te
　　(c) NH₃ < N₂O< NH₂OH<N₂O₅   [ increasing oxidation state ] : incorrect order NH₃ (Oxidation state -3) N₂O (Oxidation state +1) NH₂OH(Oxidation state -1) N₂O₅ (Oxidation state +5)

40. (d) 2- methylpropanal and isopropyl magnesium iodide

$$CH_3-CH-C=O + (CH_3)_2CHMgI \longrightarrow$$

2-Methylpropanal    Isopropyl magnesium iodide

$$(CH_3)_2CH-\overset{H}{\underset{CH(CH_3)_2}{C}}-OMgI \xrightarrow{H_2O} (CH_3)_2CH-\overset{H}{\underset{CH(CH_3)_2}{C}}-OH$$
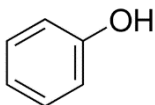
2, 4-Dimethylpentan-3-ol
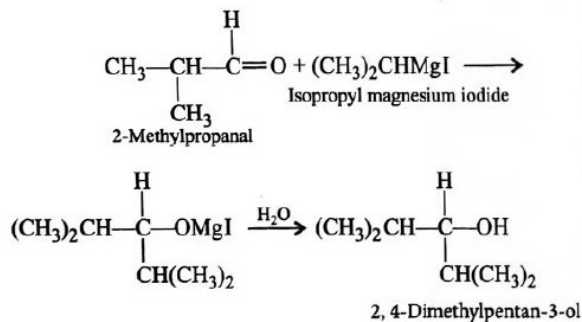
41. (b) 2- chloromethylphenol
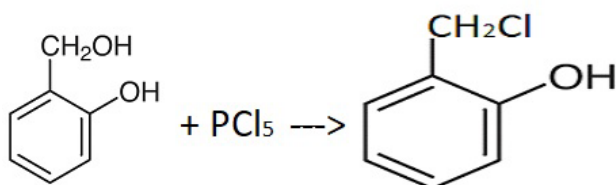


42. (a)Ammonia is the weakest reducing agent and the strongest base among Group 15 hydrides. The reducing character of hydrides increases down the group due to decrease in bond dissociation enthalpy.
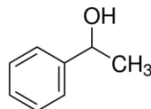
43  (a)(i) and (iv)
 (i)$CH_3CH_2CH(OH)CH_3$  (secondary)  (ii) $(C_2H_5)_3COH$ (tertiary)
(iii)                                                   (iv)



Phenol not an alcohol                         secondary

44. (d)vicinal dibromide
$CH_2=CH_2 + Br_2 \rightarrow BrCH_2 - CH_2Br$
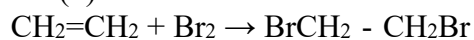
45. (c)
**Assertion:** Electron gain enthalpy of oxygen is less than that of Flourine but greater than Nitrogen. (correct)
**Reason:** Ionisation enthalpies of the elements follow the order Nitrogen > Oxygen > Fluorine (incorrect)
Ionisation enthalpies of the elements follow the order  Fluorine >Nitrogen > Oxygen

46. (b) **Assertion:** Alkyl halides are insoluble in water. (correct)
**Reason:** Alkyl halides have halogen attached to $sp^3$ hybrid carbon. (correct)
Alkyl halides are insoluble in water because they are unable to form hydrogen bonds with water or break pre-existing hydrogen bonds.

47. ( c)**Assertion:** Molarity of a solution changes with temperature. (correct)
**Reason:** Molarity is a colligative property. (incorrect)
Molarity is a means to express concentration. It is not a physical property.

48. (a) **Assertion:** $SO_2$ is reducing while $TeO_2$ is an oxidising agent. (correct)
**Reason:** Reducing property of dioxide decreases from $SO_2$ to $TeO_2$ (correct and reason for Assertion)

49. (c ) **Assertion:** Cryoscopic constant depends on nature of solvent. (correct)
**Reason:** Cryoscopic constant is a universal constant (incorrect)
Cryoscopic constant various with type of solvent

# SECTION C

50. (b)  i-D, ii-C, iii- A, iv-B
Amino acids form proteins and exist as zwitter ion , Thymine is a nitrogenous base in DNA, Insulin is a protein , phosphodiester linkage is found in nucleic acids so also in DNA and Uracil is nitrogenous base found in RNA which is a nucleic acid.

51.  (d)Helium: meteorological observations :: Argon: metallurgical processes
 Nitrogen: $1s^2 2s^2 2p^3$ :: Argon:$1s^2 2s^2 2p^6$  is configuration of Neon not Argon
Carbon: maximum compounds :: Xenon: no compounds , Xenon forms compounds
$XeF_2$: Linear :: $ClF_3$: Trigonal planar ,  $ClF_3$ is T shaped not trigonal planar

52.  (a) A : Isomers  B: Enantiomer
Isomers have Same molecular formula but different structure
Enantiomers are Non superimposable mirror images

Q53. (c)6
The radius of Ag+ ion is 126pm and of I- ion is 216pm. The coordination number of Ag+ ion is:
$\rho = r_{cation}/r_{anion} = 126/ 216 = 0.58$
Radius ratio lies in the range 0.414 – 0.732, so has coordination number 6 or 4 according to the table.
Since none of the options is 4, so the answer is 6

Q54. (d)290 pm
Square planar means ratio ratio is between 0.414 – 0.732
If radius of cation is 120 pm then anion should be in the range $\rho = r_{cation}/r_{anion}$
$0.414 = 120/ x$ so $x = 289.8 = 290$ pm
$0.732 = 120/ x$ so $x = 163.9 = 164$ pm

Q55. (a)all of its nearest neighbour anions