

MAINS+ADVANCED

TOPIC

PERIODIC TABLE

SOLUTIONS

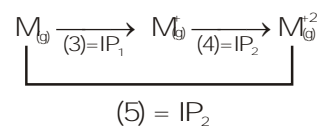
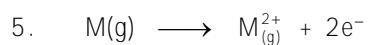
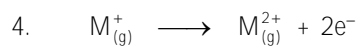
PERIODIC TABLE

Exercise-01

7. $4d^35s^2$
Block – d
Period – 5
Group – number electrons + (n-1) d electrons =
 $2 + 3 = 5$ or (VB)
8. Z N^{-3} O^{-2} F^{-}
 es^{-} 7 8 9
 z/e 0.7 0.8 0.9
Radius $\propto \frac{1}{(z/e)}$
Order of radius = $N^{-3} > O^{-2} > F^{-}$
15. The difference of IP_4 and IP_5 is maximum
Valency = 4
Group = IVA or 14^{th}
Family = Carbon family
24. EN of P and H is almost same = 2.1
33. For A particular atom successive I. P is are always increase. So $E_1 < E_2 < E_3$
40. Vanderwall's Radii > Covalent radii

Exercise-02

2. P^{-3} S^{-2} Cl^{-}
Size \propto negative $\propto \frac{1}{Z_{eff}}$
Order of size = $P^{-3} > S^{-2} > Cl^{-}$
9. Al – $1s^2, 2s^22p^6, 3s^2 3p^1$
 Al^{+} – $1s^2, 2s^22p^6, 3s^2$
 Al^{2+} – $1s^2, 2s^22p^6, 3s^1$
 Al^{3+} – $1s^2, 2s^22p^6$
Stability = $Al^{3+} > Al^{+} > Al^{2+}$
28. ${}_5B$ – $1s^2, 2s^22p^1$
Two electrons of 1s and 2s subshells
32. Size \propto number of shell
35. 2^{nd} pd. N O
 3^{rd} pd. S Cl
 $EA^{3^{rd}pd} > EA^{2^{nd}pd}$
(More repulsion of electrons)
 $Cl > S > O > N$
40. Size \propto negative charge $\propto \frac{1}{\text{positive charge}}$
41. $X = \frac{IP + EA}{2}$
 $2X - IP - EA = 0$
He $1^{st}pd$
48. Be N
Ne $11^{th}pd$
- Group – Ionization energy $\propto \frac{1}{\text{size}}$
Period – Ionization energy $\propto z_{eff}$
I.P. – He > Ne > N > Be
51. $M_{(g)} \xrightarrow[IP_1]{100\text{ ev}} M_{(g)} \xrightarrow[IP_2]{} M_{(g)}^{2+}$
 $\Delta H = IP_1 + IP_2$
 $IP_2 = 250 - 100 = 150\text{ ev}$
68. IP_1 Be B
 $1s^2, 2s^2$ $1s^2, 2s^2, 2p^1$
(more stable)
- Be > B
71. IP_1 B C
N O
 $[He]2s^2, 2p^1$ $[He]2s^2, 2p^2$
 $[He]2s^2, 2p^3$ $[He]2s^2, 2p^4$
(More stable) (Half filled)
- IP_1 B < C < O < N
83. 1. $M(s) \longrightarrow M(g)$
2. $M(s) \longrightarrow M_{(g)}^{2+} + 2e^{-}$
3. $M(g) \longrightarrow M_{(g)}^{+}$



$$\text{I.P.} = IP_1 + IP_2$$

$$(5) = (3) + (4)$$

$$(5) = \text{I.P.} - IP_1 \text{ or } (5) - (3)$$

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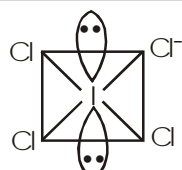
CHEMICAL BONDING

SOLUTIONS

CHEMICAL BONDING

Exercise-01

1. (i) Vapour pressure of (B) is higher than (A) due to intra molecular H-bonding present in (B).
 (B) $\text{Cl}-\text{Cl}$ (A) $\text{H}-\text{Cl}$ mPp gSD; kfid bl ea vUr% vkf.od H-Cl/k mi fLFkr gkrk gA
5. Tetracyanoethylene $\text{V}\text{S}/\text{kl k}; \text{uka}, \text{Fkhyhu}$
- $$\begin{array}{c} \text{N}\equiv\text{C} \quad \quad \quad \text{C}\equiv\text{N} \\ \quad \quad \quad \diagdown \quad \diagup \\ \quad \quad \quad \text{C}=\text{C} \\ \quad \quad \quad \diagup \quad \diagdown \\ \text{N}\equiv\text{C} \quad \quad \quad \text{C}\equiv\text{N} \end{array}$$
- 9 σ , 9 π
8. Bond strength \propto Direction of orbital $\text{Cl}/\text{k I keF}; \text{L}\propto$
 $\text{d}\{\text{kdka dh fn'kk}$
 $\text{P}-\text{P} > \text{P}-\text{S} > \text{S}-\text{S}$
11. % Ionic character = $\frac{\text{observer dipole moment}}{\text{Theoretical dipole moment}}$
 $= \frac{1.03 \times 10^{-18} \text{ esu} \times \text{cm}}{1.275 \times 10^{-8} \text{ cm} - 4.8 \times 10^{-10} \text{ esu}} \times 100 = 16.83\%$
13. Ionic character $\propto \Delta \text{EN}$
14. Due to presence of vacant d-orbital in P atom but not in N atom. P $\text{ea fjä d-d}\{\text{kd mi fLFkr gkr's gä}$
 $\text{yfd u N i j ek. kq ea ughA}$



16. (B.P. - L.P.)
 repulsion at $90^\circ = 8$
28. $\text{A}^{+3} \text{B}^{-2}$
 A_2B_3 compound
29. Valency of $x = 2 \Rightarrow x^{+2}$
 Valency of $y = 1 \Rightarrow y^{+1}$
 $\therefore x^{+2} y^{-1}$
 xy_2
30. Polarisability \propto Size of anions
31. Bond order $\frac{1}{\text{Bond length}}$

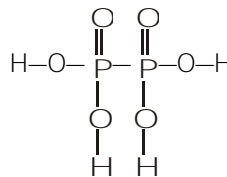
 Order of Bond length = $\text{H}_2\text{O}_2 > \text{O}_3 > \text{O}_2$

Exercise-02

4. According to M.O.T.
 $\text{H}_2 \rightarrow \sigma 1s^2 \sigma^* 1s^1$
 Bond order = $\frac{2-1}{2} = \frac{1}{2}$
7.
 $\text{Cl}-\text{Be}-\text{Cl}$
 sp , linear, lone pair = 0
 sp^3d , lone pair = 3
 Linear
12. $\text{sp}^3 - 109^\circ 28'$
 P_x and $\text{P}_y - 90^\circ$

- H-O-H - $104'.5^\circ$
 $\text{sp} - 180^\circ$
19. Hydrolysis \propto Covalent character
 $\text{NCl}_3 > \text{PCl}_3 > \text{AsCl}_3 > \text{SbCl}_3 > \text{BiCl}_3$
21. $\text{Ca}^{+2} \text{C}_2^{2-}$
 Ionic bond
38. $\text{N}_3^- \Rightarrow \bar{\text{N}} \equiv \text{N}^+ \rightarrow \bar{\text{N}} \quad \text{CO}_2$
 16 outer electrons Total electron - 22
 total electron - 22
44. $\text{MgO} \quad \text{BaO}$
 L.P. $\text{MgO} > \text{BaO}$
 M.P. $\text{MgO} > \text{BaO}$
 Ionic character $\propto \Delta \text{EN}$

- 49. BF_3 has number lone pair and planar dipole moment $\mu = 0$
 NF_3 has polar bond and pyramidal $\mu \neq 0$
- 50. Bond length $\propto \frac{1}{\text{size of central atom}}$
- 52. Pyrophosphoric acid $\text{H}_4\text{P}_2\text{O}_7$



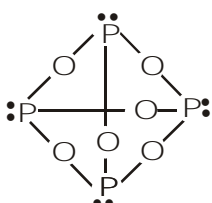
Tetra basic acid

Exercise-4(A)

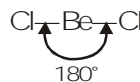
- 1.(a) $\text{K}^+ \text{HF}_2^-$
 $\text{F}-\text{H}-\text{F}$
 H-bonding
 H-bonding present in KHF_2 so it exist but there is no H-bonding in KCl_2 due to less polarity in between HCl and Cl^-
 KHF_2 esgkMst u cu/k mi fLFkr gksusdsdkj .k bl dk vflRk gkrk gA yfdu KCl_2 es HCl o Cl^- ds e/ ; de kprk gksusdsdkj .k dk bZ H-cl/ku ughagkrkA
- (b) In $(\text{CH}_3)_3\ddot{\text{N}}$, hybridisation is sp^3 and pyramidal shape but in $(\text{SiH}_3)_3\ddot{\text{N}}$, due to present of vacant d-orbital in Si atom, lone pair of N shifted in vacant orbital so its hybridisation is sp^2 with trigonal planar geometry.
 $(\text{CH}_3)_3\ddot{\text{N}}$ es sp^3 l dj .k , oafij kfeMy vldfr gkrh gA yfdu $(\text{SiH}_3)_3\ddot{\text{N}}$ es Si i jek .k q ds i kl fjä d-d(kd mi fLFkr gksus ds dkj .k ukbVst u ds , dkdh byDVWll ; de fjä d-d(kd es LFkkukUrfjr gks tkrk gA bl fy, bl dk l dj .k sp^2 o f=dkskh; l erylh; T; kferh gkrh gA
- (c) Due to presence of vanderwaal's force in between CO_2 molecule it is gas but SiO_2 is a 3-d network structure so it is solid in nature.
 CO_2 v .k q ka ds e/ ; ok .Mjoky cyka dh mi fLFkr ds dkj .k ; g xS gkrh gA tcf d SiO_2 v .k q dh 3-d tkyd l j puk gkrh gA bl fy ; s ; g idfr es Bkl gkrk gA

- 2.(a) N_2O_3

P_2O_3 exist in P_4O_6 (Ring structure)



- (b) $\text{H}-\text{Cl}, \text{H}-\text{Br}, \text{H}-\text{I}$
 Due to increase in size of I, the difference between electronegativity of H and I is less, so bond length is more and but bond strength is weak.
 vk; kMu dk vldkj c<usdsdkj .k H o l dh fo | q 1/2 krk es de vlrj gkrk gA bl fy, cu/k yeckbz vf/kd , oa clek l keF; l nqy gkrh gA



- 5. sp , hybridisation
 $\text{BeCl}_2(\text{s})$, hybridisation is sp^3

 $\text{BeCl}_2 \rightarrow \text{BeCl}_2(\text{s})$
 sp hybridisation $\quad \quad \quad \text{sp}^3$ hybridisation
- 6. Due to the properly oriented tetrahedral structure of ice, H^+ ions are free and hence move more rapidly in ice than in water where molecular associations are not so well organized.

cQZ dh prlQydh; l j puk o vkf .od l xqku vf/kd gksusdsdkj .k H^+ vk; u vf/kd epr jgrk gA bl fy, H^+ vk; u dh xfr'khyrk cQZ es ty dh vi s k vf/kd gkrk gA

- 7. BCl_3 exist in monomer form
 (i)
 sp^2 , trigonal planar
 AlCl_3 exist in dimer form - Al_2Cl_6

 Dimer form sp^3 , tetrahedral
 (ii) BaSO_4 (Barium sulphate) $\quad \quad \quad \text{BeSO}_4$

H.E > L.E.

H.E < L.E.

(iii) In O₂ (O=O) due to small size of oxygen strong pπ-pπ bonding is possible but in S₂ due to larger size of sulphur there is not strong pπ-pπ bonding. So bond is weak and break down.

O₂ (O=O) ea vkkdI htu dk vkkdj Nks/k gks ds dkj.k icy pπ-pπ cl/ku ltko gkrk gsyfdu S₂ ea lYQj dk cMk vkkdj gks ij icy pπ-pπ cl/ku ughagkrk bl fy, cl/k ncy gkrk gsvkj VW tkrk gA

8. (i) σ1s (ii) π*2p_y (iii) σ2p_z
(iv) σ2s (v) π2p_x

9. According to M.O.T. O₂ is paramagnetic in nature. M.O.T. ds vu l j O₂ idfr evupicdh; gkrk gA

10.(a) In graphite sp² hybridisation and due to presence of free electron they are good conductor of electricity in a layer but not so good in between two layers.

xQkbv ea sp² l dj.k gkrk gsvkj ea byDVk dh mi fLFkr ds dkj.k ; s jr ea vPNk pyd gkrk gsyfdu ij rka ds e/ ; ; g vPNk fo l r dk pyd ugha gkrkA

(b) In solid states position of ions are fixed. Bkd voLFkk ea vk; uk dh fLFkrh fuf'pr gkrh gA

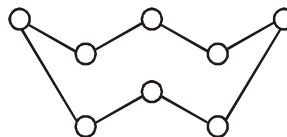
12. Due to H-bonding in NH₃ molecule. It is liquid but there is presence of vanderwaal force in between HCl molecules instead of H-bonding so it is gas.

NH₃ v. l ea H d/ku ds dkj.k ; g no gkrk gsyfdu HCl v. l ea ok.Mjok cy gks ds dkj.k ; g xB gkrk gA

14. 1.4 Å

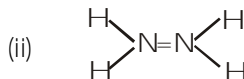
15. 84.35 %

16. 2 1/2, 3

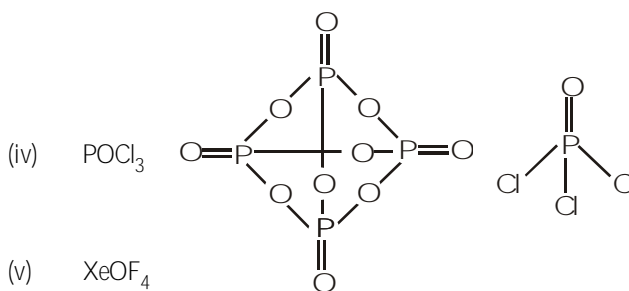


17.(i)

S₈, Crown structure

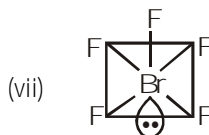


(iii) P₄O₁₀



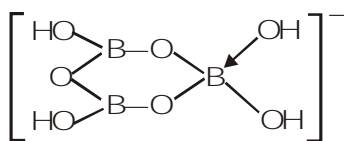
(v) XeOF₄

(vi) C₃O₂ O=C=C=C=O



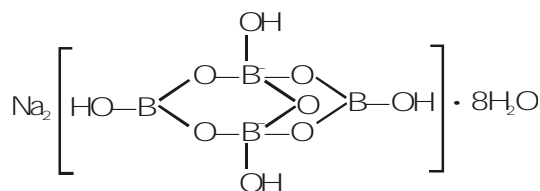
Exercise-4(B)

1.(i) Na[B₃O₃(OH)₄]⁻ [B₃O₃(OH)₄]⁻

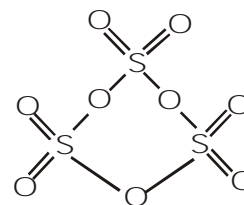


Trimeric metaborate ion

(ii) Na₂[B₄O₅(OH)₄] · 8H₂O (Borax)



(v) S₃O₉



cyclic trimer of SO₃

(vi) (CN)₂ ⇒ N≡C-C≡N

3. H₂S_nO₆

