Ankit Gupta Classes

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UNIT—7

p-BLOCK ELEMENTS

1 MARK QUESTIONS

Q. 1. Arrange the following in Acidic strength :

HNO_3, H_3PO_4, H_3AsO_4

Ans. The order of acidity will be :

$HNO_3 > H_3PO_4 > H_3AsO_4$

$N > P > As$

$\because \leftarrow$———

Electronegativity of elements

Q. 2. Iodine is more soluble in KI, than H_2O.

Ans. Formation of soluble complex KI_3 :

$I_2 + I^- \longrightarrow KI_3$

Q. 3. $R_3P = 0$ exist but $R_3N = 0$ can not exist.

Ans. $\because$ Phosphorus can form $d\pi$-$d\pi$ bond while Nitrogen can not.

Q. 4. N-N, bond is weaker than P-P, on the contrary N_2 is very inert.

Ans. $N \equiv N$ has 941.4 KJ mol^{-1} as it is triply bonded. of small size it can form $p\pi$-$p\pi$ bonding. Single N-N bond is weaker of high interelectronic repulsion :

σ

$N \equiv N$

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Q. 5. Why the stability order is :

ClF_3 > BrF_3 > IF_3 (Stable)

Ans. ∵ Cl – F > Br – F > I – F (Bond enthalpy)

Q. 6. Both Cl and O have the same electronegativity but only O forms H-bonding ?

Ans. ∵ Their sizes are different so the electron density on oxygen atom is much more than on Cl. ∴ Cl is unable to form H-bonding.

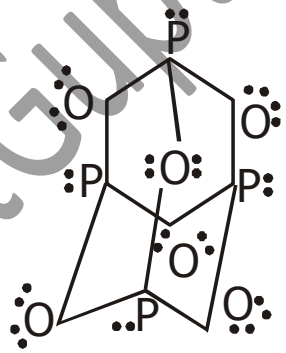
Note : Sizes : O = 66 pm, Cl = 99 pm.

Q. 7. NO is paramagnetic in the gaseous state but dimagnetic in liquid and solid state ?

Ans. NO = 5 + 6 = 11 e^-, it has odd pair of e^- and hence paramagnetic in gaseous state, but in liquid and solid state, it exists as dimer.

Q. 8. Give the No. of P – O and lone pair in P_4O_6.

Ans.



Just count P – O bonds and lone pair of e^- carefully :

P – O bonds are = 12

Lone pair of e^- are = 16

Q. 9. Why the bond angle is in the following order ?

NH_3	PH_3	AsH_3	SbH_3
106.5°	93.5°	91.5°	91.3°

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Ans. The bond angle in NH_3 is less than 109°.28' due to repulsion between lone pair on Nitrogen atom and bonded pairs of electron. As we move down the group the bond angles gradually decreases due to decrease in bond pair.

Q. 10. Why ICl bonds are weaker than Cl_2 ?

Ans. In Cl_2, overlapping has to be taken place between Cl – Cl atom, their sizes are equal, overlapping is effective, but in I – Cl sizes are different ∴ "ineffective overlapping" leads to weaker bond.

Q. 11. Among Halogens F_2 is the strongest oxidising agent ?

Ans. Bond dissociation enthalpy of F – F is lower, Hydration enthalpy of F^- is higher i. e. more negative.

OR

(i) $\frac{1}{2} F_2 \xrightarrow{\Delta \text{ B. EH}} F(g)$ is less in F of Interelectronic repulsion.

(ii) $F(g) \xrightarrow{-\Delta \text{ eg H}} F^-(g)$

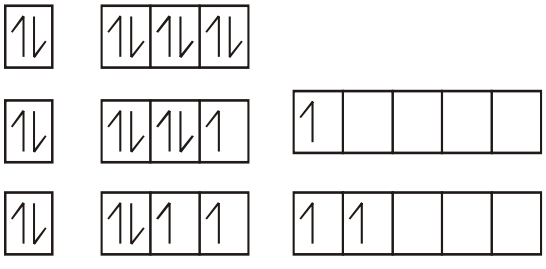
(iii) $F^-(g) + aq \xrightarrow{\Delta \text{ Hydration H}} F^-(aq)$ is most negative of small size.

2 MARKS QUESTIONS

Q. 1. Apply VSEPR throry to derive the structure of XeO_3.

Ans. Xe = $6s^2$ p^6

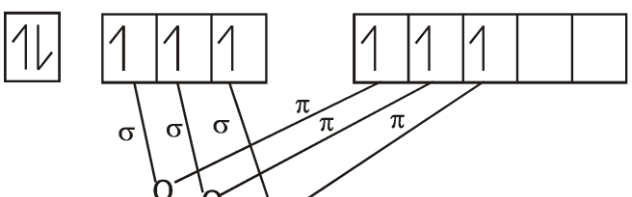
G. S 6 s 6p



I-Excited State

II-Excited State

III-Excited State



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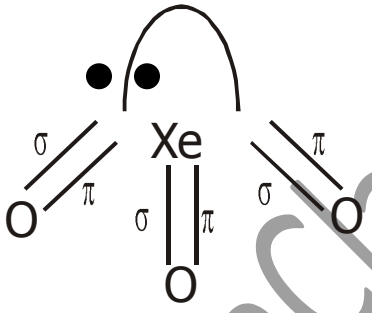
as π bonds are not included in hybridisation

∴ sp^3, hybridisation, Tetradedral :



Q. 2. (a) XeF_6 is reactive and F^- ion acceptor ?

OR

XeF_6 is F^- ion acceptor.

Ans. $MF + XeF_6 \longrightarrow M^+ [XeF_7^-]$ M = Na, K, Rb and Cs.

Octahedral Pentagonal bipyramidal

XeF_6 has unsymmetrical, distorted octahedral structure but on the acceptance of F^- it attains Pentagonal bipyramidal structure, which is symmetrical and stable.

(b) White Phosphorus is toxic, while Red Phosphorus is not.

Ans. It consists of discrete P_4 molecule, ∴ more reactive :

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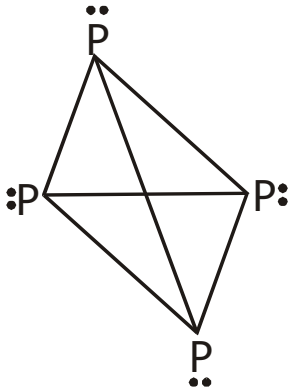
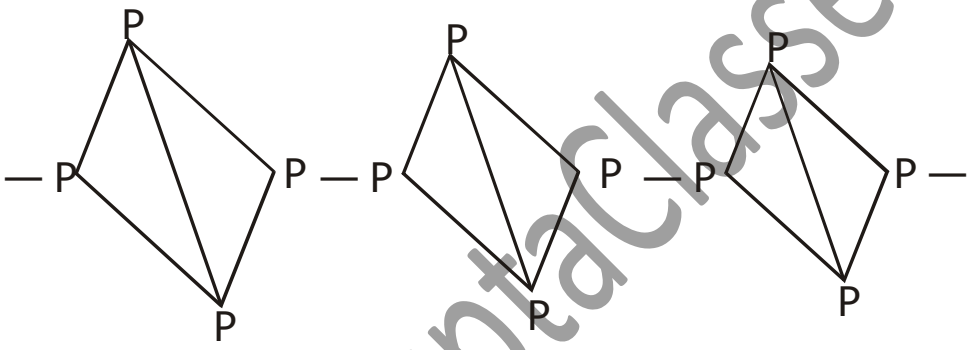


Red Phosphorus is polymeric, chain of P_4 linked together :



Q. 3. Cl^- does not give layer test, while Br^- and I^- gives layer test ?

Ans. Cl
Br
I ↓ oxidising behaviour decreases from top to bottom.

$Cl_2 + 2\ X^- \longrightarrow 2\ Cl^- + X_2$ $\quad X^- = Br^-, I^-$

$Br_2 + 2\ I^- \longrightarrow 2\ Br^- + I_2$

$\therefore$ Cl_2 water oxidises Br^- into Br_2 and I^- into I_2 which form layer with CCl_4. CCl_4 can dissolve Br_2 to form Brown layer, dissolves I_2 to form Violet layer.

Q. 4. (a) $HClO_4$ is more acidic than $HClO_3$.

OR

pK_a of $HClO_3$ is more than $HClO_4$.

Ans.

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Conjugate anion of $HClO_3$ Conjugate anion of $HClO_4$

Greater number of oxygen atom, greater is the dispersal of (–) charge, greater is stability of anion.

$HClO_4 > HClO_3$

$\therefore \leftarrow$———————

Acidity

(b) Interhalogen compounds of F are good flourinating agent ?

Ans. Bonding between XX' is weaker and are used for flourinating agent.

❑❑❑