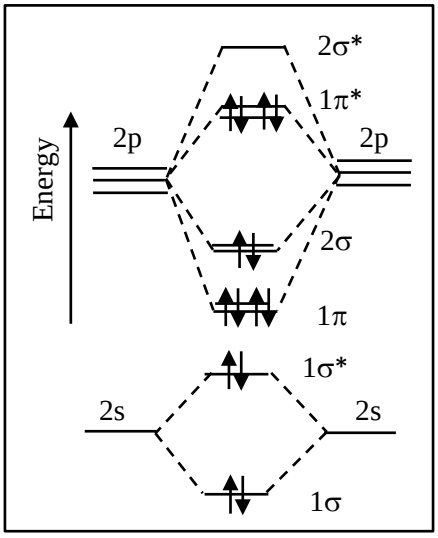
INORGANIC CHEMISTRY

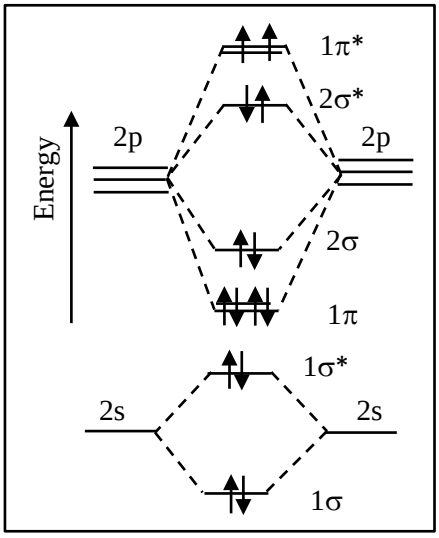
CHEMICAL BONDING

1. The correct molecular orbital diagram for F_2 molecule in the ground state is **[JEE(Advanced) 2023]**

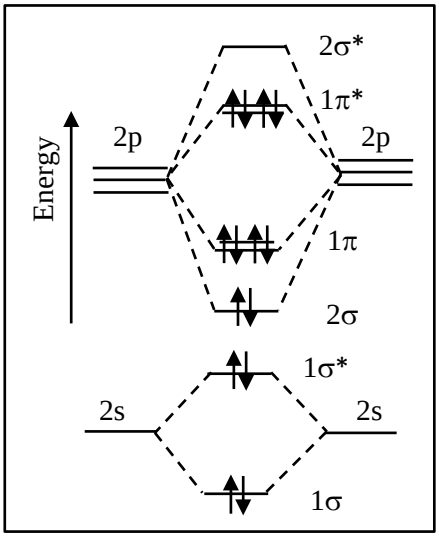
(A)



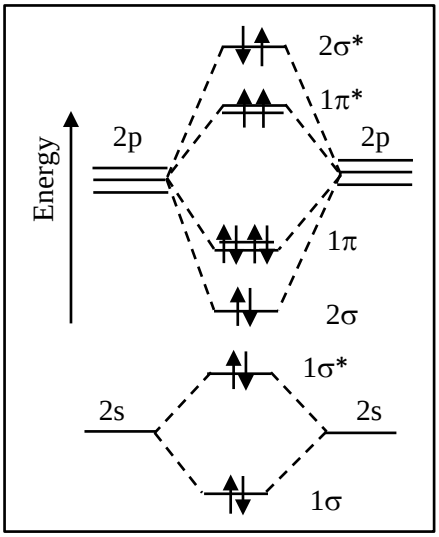
(B)



(C)



(D)



2. Among $[I_3]^+$, $[SiO_4]^{4-}$, SO_2Cl_2, XeF_2, SF_4, ClF_3, $Ni(CO)_4$, XeO_2F_2, $[PtCl_4]^{2-}$, XeF_4, and $SOCl_2$, the total number of species having sp^3 hybridised central atom is _____. **[JEE(Advanced) 2023]**

3. Consider the following molecules : Br_3O_8, F_2O, $H_2S_4O_6$, $H_2S_5O_6$, and C_3O_2.

Count the number of atoms existing in their zero oxidation state in each molecule. Their sum is_____.

[JEE(Advanced) 2023]

4. For diatomic molecules, the correct statement(s) about the molecular orbitals formed by the overlap to two $2p_z$ orbitals is(are) **[JEE(Advanced) 2022]**

(A) σ orbital has a total of two nodal planes.

(B) σ* orbital has one node in the *xz*-plane containing the molecular axis.

(C) π orbital has one node in the plane which is perpendicular to the molecular axis and goes through the center of the molecule.

(D) π* orbital has one node in the *xy*-plane containing the molecular axis.

5. Thermal decomposition of $AgNO_3$ produces two paramagnetic gases. The total number of electrons present in the antibonding molecular orbitals of the gas that has the higher number of unpaired electrons is _____. **[JEE(Advanced) 2022]**

6. The correct statement(s) related to oxoacids of phosphorous is(are) **[JEE(Advanced) 2021]**

(A) Upon heating, H_3PO_3 undergoes disproportionation reaction to produce H_3PO_4 and PH_3.

(B) While H_3PO_3 can act as reducing agent, H_3PO_4 cannot.

(C) H_3PO_3 is a monobasic acid.

(D) The H atom of P–H bond in H_3PO_3 is not ionizable in water.

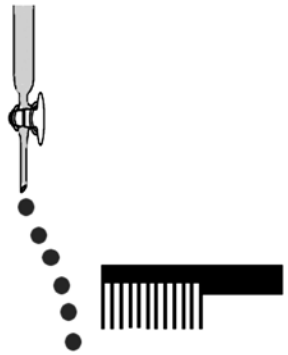
7. Which of the following liberates O_2 upon hydrolysis? **[JEE(Advanced) 2020]**

(A) Pb_3O_4 (B) KO_2 (C) Na_2O_2 (D) Li_2O_2

8. Consider the following compounds in the liquid form :

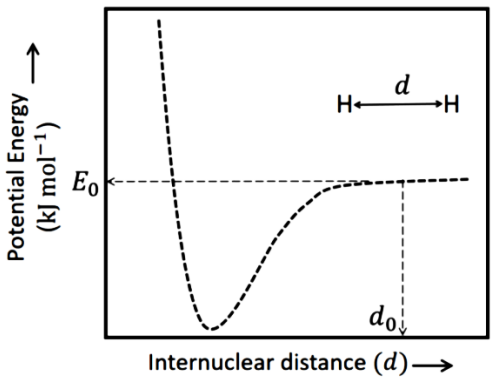
O_2, HF, H_2O, NH_3, H_2O_2, CCl_4, $CHCl_3$, C_6H_6, C_6H_5Cl.

When a charged comb is brought near their flowing stream, how many of them show deflection as per the following figure? **[JEE(Advanced) 2020]**



9. The figure below is the plot of potential energy versus internuclear distance (d) of H_2 molecule in the electronic ground state. What is the value of the net potential energy E_0 (as indicated in the figure) in kJ mol^{-1}, for d=d_0 at which the electron-electron repulsion and the nucleus-nucleus repulsion energies are absent? As reference, the potential energy of H atom is taken as zero when its electron and the nucleus are infinitely far apart.

[Use Avogadro constant as 6.023×10^{23} mol^{-1}.] **[JEE(Advanced) 2020]**



10. A tin chloride **Q** undergoes the following reactions (not balanced) **[JEE(Advanced) 2019]**

Q + $Cl^- \rightarrow$ **X**

Q + $Me_3N \rightarrow$ **Y**

Q + $CuCl_2 \rightarrow$ **Z** + CuCl

X is a monoanion having pyramidal geometry. Both **Y** and **Z** are neutral compounds. Choose the correct option(s).

(A) The central atoms in **X** is sp^3 hybridized

(B) The oxidation state of the central atom in **Z** is +2

(C) The central atom in **Z** has one lone pair of electrons

(D) There is a coordinate bond in **Y**

11. Each of the following options contains a set of four molecules. Identify the option(s) where all four molecules possess permanent dipole moment at room temperature. **[JEE(Advanced) 2019]**

(A) $BeCl_2$, CO_2, BCl_3, $CHCl_3$

(B) SO_2, C_6H_5Cl, H_2Se, BrF_5

(C) BF_3, O_3, SF_6, XeF_6

(D) NO_2, NH_3, $POCl_3$, CH_3Cl

12. Among B_2H_6, $B_3N_3H_6$, N_2O, N_2O_4, $H_2S_2O_3$ and $H_2S_2O_8$, the total number of molecules containing covalent bond between two atoms of the same kind is _____. **[JEE(Advanced) 2019]**

13. The total number of compounds having at least one bridging oxo group among the molecules given below is_____.

N_2O_3, N_2O_5, P_4O_6, P_4O_7, $H_4P_2O_5$, $H_5P_3O_{10}$, $H_2S_2O_3$, $H_2S_2O_5$ **[JEE(Advanced) 2018]**

14. The correct statements(s) about the oxoacids, $HClO_4$ and HClO, is (are) - **[JEE(Advanced) 2017]**

(A) $HClO_4$ is more acidic than HClO because of the resonance stabilization of its anion

(B) $HClO_4$ is formed in the reaction between Cl_2 and H_2O

(C) The central atom in Both $HClO_4$ and HClO is sp^3 hybridized

(D) The conjugate base of $HClO_4$ is weaker base than H_2O

15. Among H_2, He_2^+, Li_2, Be_2, B_2 ,C_2, N_2, O_2^{--}, and F_2 , the number of diamagnetic species is -

(Atomic number) : H = 1, He = 2, Li = 3, Be = 4, B = 5, C = 6, N = 7, O = 8 , f = 9)

[JEE(Advanced) 2017]

16. The sum of the number of lone pairs of electrons on each central atom in the following species is.

$[TeBr_6]^{2-}$, $[BrF_2]^+$, SNF_3 and $[XeF_3]^-$

[Atomic number : N = 7, F = 9, S = 16, Br = 35, Te = 52, Xe = 54] **[JEE(Advanced) 2017]**

17. The order of the oxidation state of the phosphorus atom in H_3PO_2, H_3PO_4 , H_3PO_3 and $H_4P_2O_6$ is

[JEE(Advanced) 2017]

(A) $H_3PO_4 > H_4P_2O_6 > H_3PO_3 > H_3PO_2$

(B) $H_3PO_3 > H_3PO_2 > H_3PO_4 > H_4P_2O_6$

(C) $H_3PO_2 > H_3PO_3 > H_4P_2O_6 > H_3PO_4$

(D) $H_3PO_4 > H_3PO_2 > H_3PO_3 > H_4P_2O_6$

18. Among the following, the correct statement(s) is are **[JEE(Advanced) 2017]**

(A) $Al(CH_3)_3$ has the three-centre two-electron bonds in its dimeric structure

(B) $AlCl_3$ has the three-centre two-electron bonds in its dimeric structure

(C) BH_3 has the three-centre two-electron bonds in its dimeric structure

(D) The Lewis acidity of BCl_3 is greater than that of $AlCl_3$

19. The compound(s) with TWO lone pairs of electrons on the central atom is(are)

[JEE(Advanced) 2016]

(A) BrF_5 (B) ClF_3 (C) XeF_4 (D) SF_4

20. According to Molecular Orbital Theory, **[JEE(Advanced) 2016]**

(A) C_2^{2-} is expected to be diamagnetic

(B) O_2^{2+} is expected to have a longer bond length than O_2

(C) N_2^+ and N_2^- have the same bond order

(D) He_2^+ has the same energy as two isolated He atoms

21. Among the triatomic molecules / ions, $BeCl_2$, N_3^-, N_2O, NO_2^+, O_3, SCl_2, ICl_2^-, I_3^- and XeF_2 the total number of linear molecules(s) / ion(s) where the hybridization of the central atoms does not have contribution from the d-orbital(s) is :

(Atomic number : S = 16, Cl = 17, I = 53 and Xe = 54) **[JEE(Advanced) 2015]**

22. The total number of lone pairs of electrons in N_2O_3 is : **[JEE(Advanced) 2015]**

23. The correct statement(s) regarding, (i) HClO, (ii) $HClO_2$, (iii) $HClO_3$ and (iv) $HClO_4$, is(are)

[JEE(Advanced) 2015]

(A) The number of Cl=O bonds in (ii) and (iii) together is two

(B) The number of lone pairs of electrons on Cl in (ii) and (iii) together is three

(C) The hybridization of Cl in (iv) is sp^3

(D) Amongst (i) to (iv), the strongest acid is (i)

24. Hydrogen bonding plays a central role in the following phenomena **[JEE(Advanced) 2014]**

(A) Ice floats in water

(B) Higher Lewis basicity of primary amines than tertiary amines in aqueous solutions

(C) Formic acid is more acidic than acetic acid

(D) Dimerisation of acetic acid in benzene

25. The correct statements(s) for orthoboric acid is/are- **[JEE(Advanced) 2014]**

(A) It behaves as a weak acid in water due to self ionization

(B) Acidity of its aqueous solution increses upon addition of ethylene glycol

(C) It has a three dimensional structure due to hydrogen bonding.

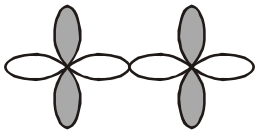
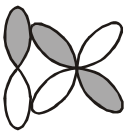
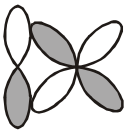
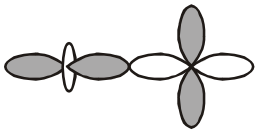
(D) It is a weak electrolyte in water

26. Assuming 2s-2p mixing is NOT operative, the paramagnetic species among the following is :

[JEE(Advanced) 2014]

(A) Be_2 (B) B_2 (C) C_2 (D) N_2

27. Match the orbital overlap figures shown in **List-I** with the description given in **List-II** and select the correct answer using the code given below the lists. **[JEE(Advanced) 2014]**

List-I		**List-II**
(P)		(1) p – d π antibonding
(Q)		(2) d – d σ bonding
(R)		(3) p – d π bonding
(S)		(4) d – d σ antibonding

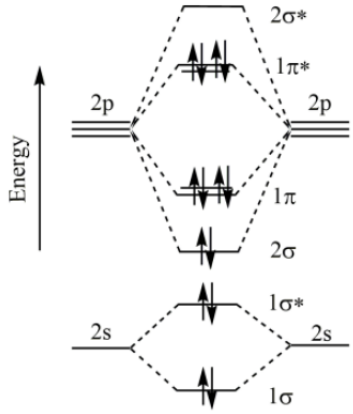
Code :

	P	Q	R	S
(A)	2	1	3	4
(B)	4	3	1	2
(C)	2	3	1	4
(D)	4	1	3	2

SOLUTIONS

1. Ans. (C)

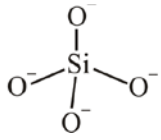
Sol. F_2 (18 e^-)

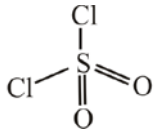


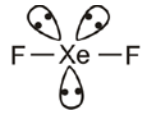
Naming of molecular orbitals are as per preference of formation of σ & π bonds respectively.

2. Ans. (5)

Sol. I_3^+ :  : sp^3

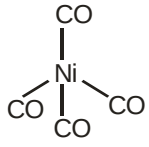
SiO_4^{4-} :  : sp^3

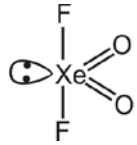
SO_2Cl_2 :  : sp^3

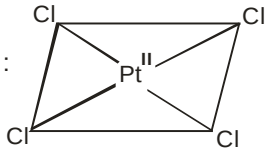
XeF_2 :  : sp^3d

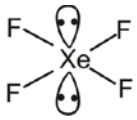
SF_4 :  : sp^3d

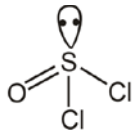
ClF_3 :  : sp^3d

$[Ni(CO)_4]$:  : sp^3

XeO_2F_2 :  : sp^3d

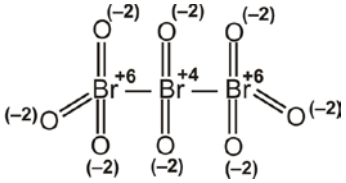
$[PtCl_4]^{2-}$:  : dsp^2

XeF_4 :  : sp^3d^2

$SOCl_2$:  : sp^3

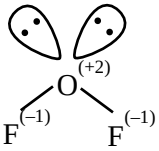
3. Ans. (6)

Sol. Br_3O_8



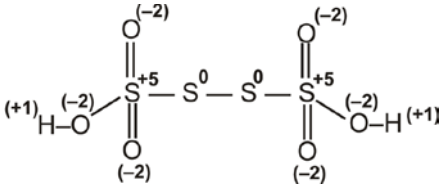
Number of atoms with zero oxidation state = 0

F_2O



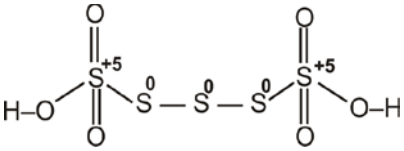
Number of atom with zero oxidation state = 0

$H_2S_4O_6$



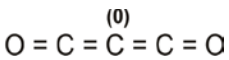
Number of atoms with zero oxidation state = 2

$H_2S_5O_6$



Number of atoms where zero oxidation state = 3

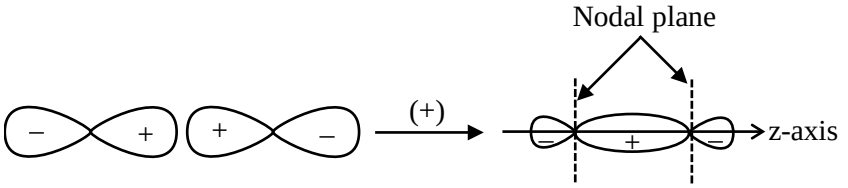
C_3O_2



Number of atoms with zero oxidation state = 1

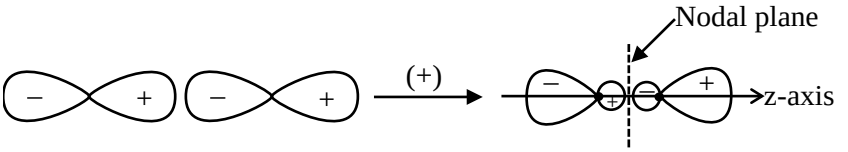
4. Ans. (A, D or D)

Sol. (A)



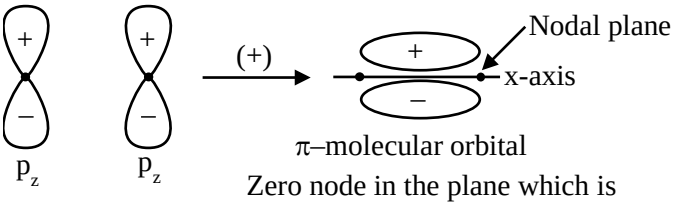
σ molecular orbital $\Rightarrow$ Total 2 nodal plane

(B)



σ^* molecular orbital $\Rightarrow$ zero node in the xz plane

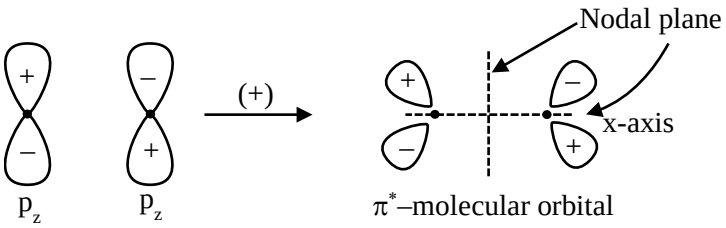
(C)



π–molecular orbital

Zero node in the plane which is perpendicular to the molecular axis and goes through the center of the molecule

(D)



π^*–molecular orbital

One node in xy plane containing the molecular axis

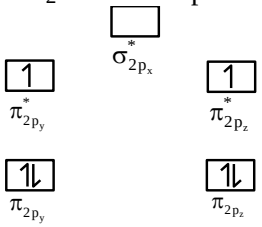
5. Ans. (6)

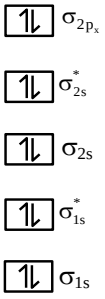
Sol. $AgNO_3 \rightarrow 2Ag + 2NO_2 + ½O_2$

– Both NO_2 & O_2 are paramagnetic

– NO_2 is odd electron molecule with one unpaired electron

– O_2 has two unpaired electrons



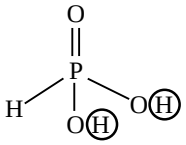


Total number of antibonding electrons = 6

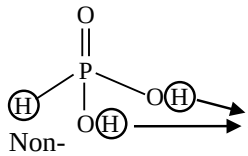
6. Ans. (A, B, D)

Sol. (A) $4H_3PO_3 \xrightarrow{\Delta} 3H_3PO_4 + PH_3$ (correct)

(B) H_3PO_4 has "P" in its highest oxidation state, hence cannot act as a reducing agent (correct)

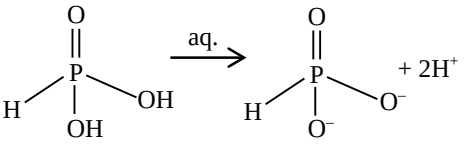
(C)  Dibasic acid (incorrect)

Two OH group present in H_3PO_3

(D)  Ionizable (Correct)

Non-ionizable

The hydrogen which is directly attached to phosphorous does not ionized in water.



7. Ans. (B)

Sol. (A) Pb_3O_4 is insoluble in water or do not react with water.

(B) $2KO_2 + 2H_2O \rightarrow 2KOH + H_2O_2 + O_{2(g)}$

(C) $Na_2O_2 + 2H_2O \rightarrow 2NaOH + H_2O_2$

(D) $Li_2O_2 + 2H_2O \rightarrow 2LiOH + H_2O_2$

8. Ans. (6)

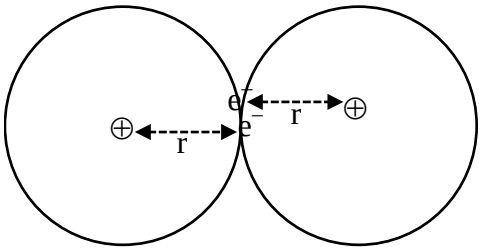
Sol. Here polar molecules in the liquid form will be attracted/deflected near charged comb.

Polar molecules : HF, H_2O, NH_3, H_2O_2, $CHCl_3$, C_6H_5Cl (6-polar molecules)

Nonpolar molecules : O_2, CCl_4, C_6H_6

9. Ans. (–2640.00 TO –2620.00 OR –5280.00 TO –5240.00)

Sol. At $d = d_0$, nucleus-nucleus & electron-electron repulsion is absent.



Hence potential energy will be calculated for 2 H atoms. (P.E. due to attraction of proton & electron)

$$\text{P.E.} = \frac{-Kq_1q_2}{\underset{\text{(Bohr radius)}}{r}} = \frac{(9\times10^9)(1.6\times10^{-19})^2}{0.529\times10^{-10}} = -4.355\times10^{-21}\text{kJ}$$

For 1 mol = $-4.355 \times 10^{-21} \times 6.023 \times 10^{23} = -2623.249$ kJ/mol

For 2 H atoms = –5246.49 kJ/mol

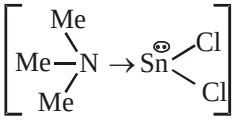
10. Ans. (A, D)

Sol. $SnCl_2 + Cl^- \longrightarrow SnCl_3^-$

(Q) (X)

$SnCl_2 + Me_3N \longrightarrow SnCl_2.NMe_3$

(Q) (Y)



$SnCl_2 + 2CuCl_2 \longrightarrow SnCl_4 + 2CuCl$

(Q) (Z)

11. Ans. (B, D)

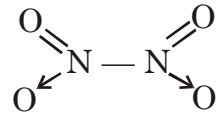
Sol.

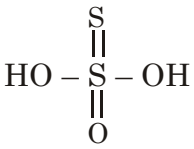
Polar molecule	**Non-polar molecule**
$CHCl_3$, SO_2, C_6H_5Cl, H_2Se, BrF_5, O_3, XeF_6, NO_2, NH_3, $POCl_3$, CH_3Cl	$BeCl_2$, CO_2, BCl_3, SF_6

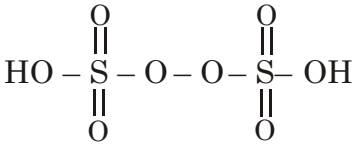
So, correct answer is option (B) and (D)

12. Ans. (4.00)

Sol. $N \equiv N \rightarrow O$

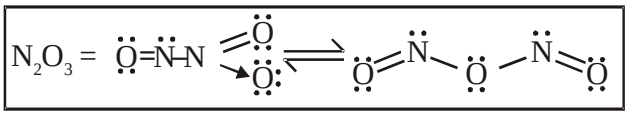




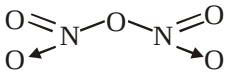


13. Ans. (5 or 6)

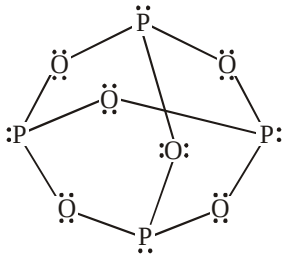
Sol.



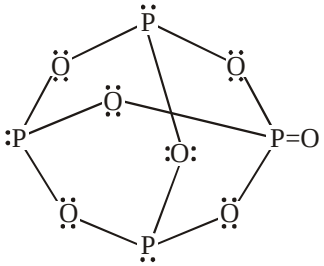
$N_2O_5 =$



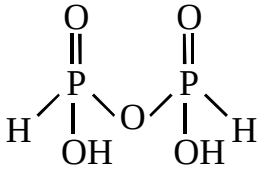
$P_4O_6 =$



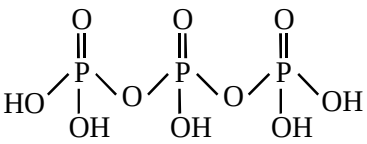
$P_4O_7 =$



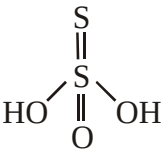
$H_4P_2O_5 =$



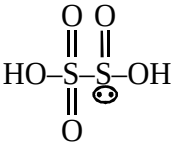
$H_5P_3O_{10} =$



$H_2S_2O_3 =$



$H_2S_2O_5 =$



14. Ans. (A, C, D)

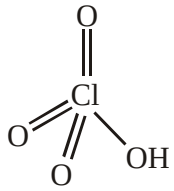
Sol. Hint :

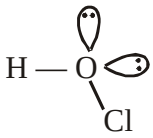
(A) $HClO_4 \rightleftharpoons H^+ + ClO_4^-$ ClO_4^- is resonance stablized anion

$HClO \rightleftharpoons H^+ + ClO^-$

$\therefore$ $HClO_4$ is more acidic then HClO.

(B) $Cl_2 + H_2O \longrightarrow HClO + HCl$

(C) $HClO_4$  Central atom is sp^3 hybridised

HClO  Central atom is sp^3 hybridised

(D) $HClO_4 + H_2O \rightarrow H_3O^{\oplus} + ClO_4^-$ since H_2O is accepting H^+ from $HClO_4$ so H_2O is stronger base compare to ClO_4^-.

15. Ans. (5 or 6)

Sol. $H_2 \Rightarrow \sigma1s^2$ (Diamagnetic)

$He_2^{\oplus} \Rightarrow \sigma1s^2\ \sigma^*1s^1$ (Paramagnetic)

$Li_2 \Rightarrow \sigma1s^2\ \sigma^*1s^2\ \sigma2s^2$ (Diamagnetic)

$Be_2 \Rightarrow \sigma1s^2\ \sigma^*1s^2\ \sigma2s^2\ \sigma^*2s^2$ (Diamagnetic)

$B_2 \Rightarrow \sigma1s^2\ \sigma^*1s^2\ \sigma2s^2\ \sigma^*2s^2\ \pi2p_x^1 = \pi2p_y^1$ (Paramagnetic)

$C_2 \Rightarrow \sigma1s^2\ \sigma^*1s^2\ \sigma2s^2\ \sigma^*2s^2\ \pi2p_x^2 = \pi2p_y^2$ (Diamagnetic)

$N_2 \Rightarrow \sigma1s^2\ \sigma^*1s^2\ \sigma2s^2\ \sigma^*2s^2\ \pi2p_x^2 = \pi2p_y^2\ \sigma2p_z^2$ (Diamagnetic)

$O_2^{\ominus} \Rightarrow \sigma1s^2\ \sigma^*1s^2\ \sigma2s^2\ \sigma^*2s^2\ \sigma2p_z^2\ \pi2p_x^2 = \pi2p_y^2\ \pi^*2p_x^2 = \pi^*2p_y^1$ (Paramagnetic)

$F_2 \Rightarrow \sigma1s^2\ \sigma^*1s^2\ \sigma2s^2\ \sigma^*2s^2\ \sigma2p_z^2\ \pi2p_x^2 = \pi2p_y^2\ \pi^*2p_x^2 = \pi^*2p_y^2$ (Diamagnetic)

If existence of Be_2 is considered in atomic form or very weak bonded higher energetic species having zero bond order then it is diamagnetic , then answer will be 6. But if existence of molecular form of Be_2 is not considered then magnetic property can't be predicted then answer will be 5.

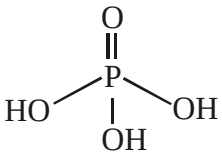
16. Ans. (6)

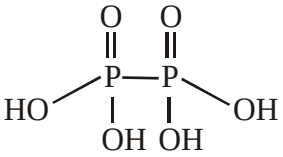
Sol. Number of σ-bonds

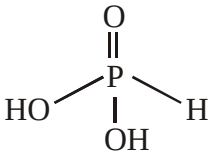
	Number of lone pairs formed by central atom	on central atom
(i) In $[TeBr_6]^{2-}$	6	1
(ii) In $[BrF_2]^+$	2	2
(iii) In SNF_3	4	0
(iv) In $[XeF_3]^-$	3	3

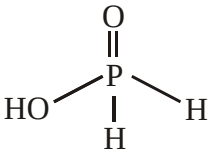
$\Rightarrow$ Total number of lone pairs of electrons = 1 + 2 + 0 + 3 = 6

17. Ans. (A)

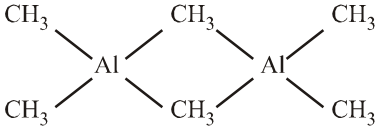
Sol. $H_3PO_4 \rightarrow$  ; oxidation state of P = +5

$H_4P_2O_6 \rightarrow$  ; oxidation state of P = +4

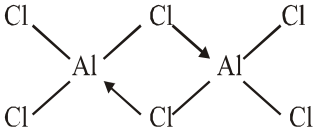
$H_3PO_4 \rightarrow$  ; oxidation state of P = +3

$H_3PO_2 \rightarrow$  ; oxidation state of P = +1

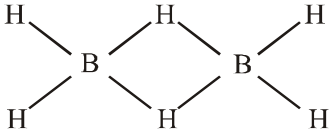
18. Ans. (A, C, D)

Sol. (A) 

Two 3c - $2e^-$ bond
(three-centre-two-electron)

(B) 

Two 3c - $4e^-$ bond
(three-centre-four-electron)

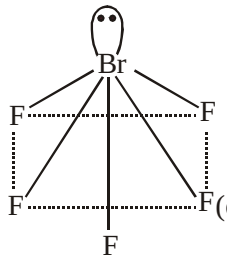
(C) 

Two 3c - $2e^-$ bond
(three-centre-two-electron)

(D) Lewis acidic strength decreases down the group. The decrease in acid strength occurs because as size increases, the attraction between the incoming electron pair and the nucleus weakens.

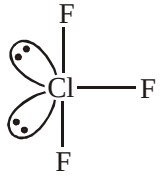
Hence Lewis acidic strength of BCl_3 is more than $AlCl_3$.

19. Ans. (B, C)

Sol. (A) 

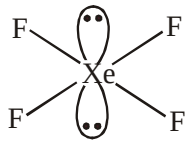
sp^3d^2 hybridisation
square pyramidal
(distorted octadehdral)

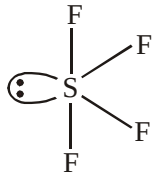
Number of lone pair on centre atom = 1

(B) 

sp^3d hybridisation
T-shape

Number of lone pair on centre atom = 2

(C)  sp^3d^2 hybridisation square planar — Number of lone pair on centre atom = 2

(D)  sp^3d hybridisation see-saw — Number of lone pair on centre atom = 1

20. Ans. (A, C)

Sol (A) The molecular orbital energy configuration of C_2^{2-} is

$$\sigma_{1s}^2, \sigma_{1s}^{*2}, \sigma_{2s}^2, \sigma_{2s}^{*2}, \pi_{2p_x}^2 = \pi_{2p_y}^2, \sigma_{2p_z}^2$$

In the MO of C_2^{2-} there is no unpaired electron hence it is diamagnatic

(B) Bond order of O_2^{2+} is 3 and O_2 is 2 therefore bond length of O_2 is greater than O_2^{2+}

(C) The molecular orbital energy configuration of N_2^+ is

$$\sigma_{1s}^2, \sigma_{1s}^{*2}, \sigma_{2s}^2, \sigma_{2s}^{*2}, \pi_{2p_x}^2 = \pi_{2p_y}^2, \sigma_{2p_z}^1$$

Bond order of $N_2^+ = \frac{1}{2}(9-4) = 2.5$

The molecular orbital energy configuration of N_2^- is

$$\sigma_{1s}^2, \sigma_{1s}^{*2}, \sigma_{2s}^2, \sigma_{2s}^{*2}, \pi_{2p_x}^2 = \pi_{2p_y}^2, \sigma_{2p_z}^2, \pi_{2p_x}^{*1} = \pi_{2p_y}^*$$

Bond order of $N_2^- = \frac{1}{2}(10-5) = 2.5$

(D) He_2^+ has less energy as compare to two isolated He atoms

21. Ans. (4)

Sol. Cl—Be—Cl $\rightarrow$ sp(linear)

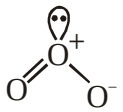
$:\ddot{N}=\overset{\oplus}{N}=\ddot{N}:^{\ominus}$ $\rightarrow$ sp(linear)

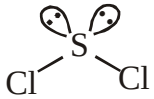
$O=\overset{\oplus}{N}=\overset{\ominus}{N}$ $\rightarrow$ sp (linear)

linear molecule / ions without involving d-orbital

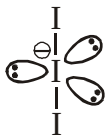
$O=\overset{\oplus}{N}=O$ $\rightarrow$ sp(linear)

in their hybridisation of central atom

 $\rightarrow$ sp^2 (bent)

 $\rightarrow$ sp^3 (bent)

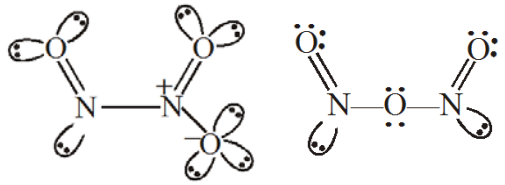
→ sp^3d (linear)



→ sp^3d (linear)

→ sp^3d (linear)

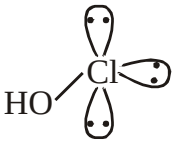
22. Ans. (8)

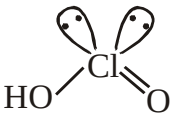
Sol. 

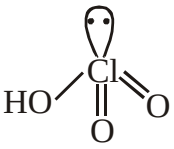
(unsymmetrical) (symmetrical)

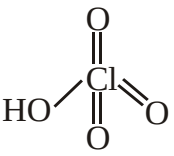
Total number of lone pairs in N_2O_3 is eight

23. Ans. (B,C)

Sol. Structure of (i) HClO = 

(ii) $HClO_2$ = 

(iii) $HClO_3$ = 

(iv) $HClO_4$ = 

(A) The number of Cl = O bonds in (ii) and (iii) together is three

(B) The number of lone pairs of electrons on Cl in (ii) and (iii) together is three

(C) The hybridisation of Cl in (iv) is sp^3

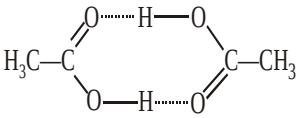
(D) Amongst (i) to (iv) the strongest acid is (iv) $HClO_4$

24. Ans. (A, B, D)

Sol. Hint

⇒ Ice floats in water due to the low density of ice as compare to water which is due to open cage like structure (formed by intermolecular H-bonding)

⇒ Dimerisation of acetic acid in benzene is due to intermolecular hydrogen bonding



⇒ Basic strength of $RNH_2 > R_3N$ it also explained by hydrogen bonding.

25. Ans. (D)

Sol. (A) It does not self ionized in water and ionized in water as follows

$$H_3BO_3 + H_2O \rightleftharpoons B(OH)_4^- + H^+$$

(B) Acidity of the aq.solution of boric acid not affected by ethylene glycol

(C) In boric acid due to hydrogen bonding two dimensional sheet structure is formed.

(D) In water the pKa value of H_3BO_3 is 9.25

$$H_3BO_3 + H_2O \rightleftharpoons B(OH)_4^- + H^+$$

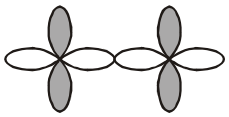
26. Ans. (C)

Sol. If 2s–2p mixing is not operative, then the energy sequence of molecular orbitals is

$\sigma_{1s} < \sigma^*_{1s} < \sigma_{2s} < \sigma^*_{2s} < \sigma_{2px} < \pi_{2py} = \pi_{2pz} < \pi^*_{2py} = \pi^*_{2pz} < \sigma^*_{2px}$

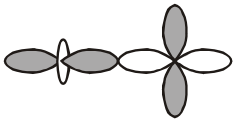
$Be_2(8e^-)$	:	2	2	2	2				$\Rightarrow$	Diamagnetic
$B_2(10e^-)$	:	2	2	2	2	2			$\Rightarrow$	Diamagnetic
$C_2(12e^-)$	:	2	2	2	2	2	1	1	$\Rightarrow$	Paramagnetic
$N_2(14e^-)$	:	2	2	2	2	2	2	2	$\Rightarrow$	Diamagnetic

27. Ans. (C)

Sol. (P)  (1) d – d interaction produce bonding molecular orbital (due to addition of wave function)

(Q)  (2) Lateral overlapping produce π bonding molecular orbital (addition of wave function)

(R)  (3) p-d interaction produce π antibonding molecular. Orbital (Substitution of wave function)

(S)  (4) d-d interaction produce antibonding molecular. Orbital (Substitution of wave function)