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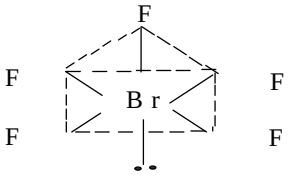
Only one option correct

1) (B) 4 B.P and Zero L.P is SiF_4.

2) (D) ICl_2^+ has 2 B.P and 2 L.P.
Sp^3 hybridization and bent shape.

3) (C) Sp^2 hybridization and trigonal planar geometry.

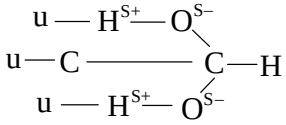
4) (D) BrF_5 : 5 B.P + 1 L.P
Sp^3d^2 hybridization and square pyramidal geometry.
8 F – Por – F angles at 90^0.



5) (C) ClO_4^- : 4 B.P + Zero L.P Sp^3 hybidiation.

6) (D)

7) (A)



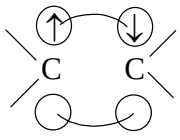
8) Bond order of $O_2^{2-} = 1$; $O_2 = 2$
$O_2^- = 1.5$; $O_2^+ = 2.5$
Hence, Stability $O_2^+ > O_2 > O_2^- > O_2^{2-}$; Ans : (B)

17) $NO_2^+ \Rightarrow Sp$; $NO_3^- \Rightarrow Sp^2$; $NH_4^+ \Rightarrow Sp^3$ (3)

18) (B) $NH_3 \Rightarrow Sp^3$; $[PHl_4]^{2-} \Rightarrow dSp^2$ (Square planar)
$PCl_5 \Rightarrow Sp^3d$; $BCl_3 \Rightarrow sp^2$.

19) (A) All are 14 e^- squares with B.O = 3.

20) (A) The e^- density lies above and below the inter-nuclear / molecular axis.



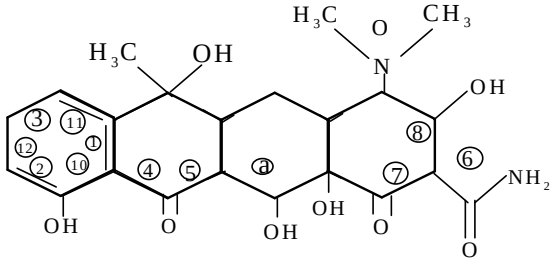
21) (B)

22) (C) $O_2^- : \sigma / s^2\sigma^* / s^2\sigma 2s^2\sigma 2p_z^2 z 2p_n^2 z^y 2p_n^2\sigma^* 2p_z\ z 2py^2 z^y 2py^1$

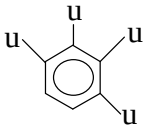
23) (B) More than number of H – atoms, more is the H – Bonding hence, Due to higher intermolecular forces of attraction, higher is the M. pt.

24) (A) Lead Oxide PbO_2.

25) (D) 12



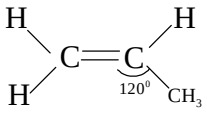
26) (C)

27) (C) Dipole Moment of 

$= \sqrt{3} \times 1.5$ D $\left(\sqrt{p_1^2 + p_2^2 + 2p_1p_2\cos 60^0}\right)$

= 2.6 D. $P_1 = P_2$.

28) (D) O – H bond is more polar than N – H bond. & SO + on H is more in O – H bond. Also N is better donor than O

29) (C) 

Comprehension Type

Passage 1:

1) (D) Both F – atoms are present in axial positions.

2) (A) uF_3 has Sp^3d hybridization ; 3 B. P + 2 L.P

3) (D) PI_5 and $\left[PBr_6\right]^e$ donot exist due to steric factors. In PH_5, Because of its low electronegative H –atom cannot effect the contraction of dz^2 orbital to form Sp^3 hybridized P = atom.

4) (B) $\left[PBr_6\right]^e$ doesnot exist since P cannot accommodate 6 Br – atoms around it due to steric hindrance.

5) (D) $^{30}P\left(^{35}Cl\right)_5 + {}^{30}P\left(^{37}Cl\right)_5 + {}^{31}P\left(^{35}Cl\right)_5 + {}^{31}P\left(^{37}Cl\right)_5 = 4$

i) $^{31}P\left(^{35}Cl\right)_1\left(^{37}Cl\right)_4$ → $^{31}P\left(^{35}Cl\right)_{ax}\left(^{37}Cl\right)_{(eq)}$ = 2 forms; $^{31}P\left(^{35}Cl^{37}Cl_3\right)_{eq}\left(^{37}Cl\right)_{ax}$

ii) $^{31}P\left(^{35}Cl\right)_2\left(^{37}Cl\right)_3$ = 3 forms → $^{31}P_{ax}\left(^{35}Cl\right)_{2\ (eq)}\left(^{37}Cl\right)_3$; $^{31}P\left(^{35}Cl^{37}Cl\right)_{ax}\left(^{35}Cl^{37}Cl_2\right)_{eq}$; $^{31}P\left(^{37}Cl\right)_{ax}\left(^{35}Cl_2^{37}Cl\right)_{eq}$

iii) $^{31}P\left(^{35}Cl\right)_3\left(^{37}Cl\right)_2 = 3$ forms ; same as (ii)

iv) $^{31}P\left(^{35}Cl\right)_4\left(^{37}Cl\right) = 2$ forms ; same as (ii)

Similarly with ^{30}P – atom as central Atom, 10 forms will be there. Total = 24.

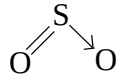
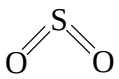
6) SF_4 has 4 G.P + 1 L. P ; Hence (C).

7) (C) $IF_2^- \left(Sp^3d\right)$ has 2B.P + 3 L.P

8) (C) In Sp^3d hybridized, dz^2 orbital is utilized.

Passage 2:

1) A) i) $I_3^+ : 2B.P + 2L.P; Sp^3$ hybridization

ii) SO_2 can be represented as  and  . It is considered that S being in 3rd period can utilized its d – orbitals to form pz – dx bonds with O atoms.

iii) XeF_2 : 3 L.P and 2 B.P $\Rightarrow Sp^3d$ hybridization.

CO_2 : Sp hybridization $\Rightarrow$ 2 B.P

iv) SF_4 : Sp^3d hybridization $\Rightarrow$ 4 B.P + 1 L.P

ICl_3 : Sp^3d hybridization $\Rightarrow$ 3 B.P + 2 L.P

2) I_3^- : L.P = 3; B.P = 2 Ratio $\Rightarrow$ 1.5

XeF_4 : L.P = 2 ; B.P = 4 Ratio $\Rightarrow$ 0.5

3) (A) $NO_2^+ \Rightarrow$ linear $\Rightarrow 180^0$

$NO_2 \left(\text{odd } e^- \text{ system}\right) \Rightarrow$ bent $\Rightarrow 134^0$

$NO_2 \left(1 \text{ L.P}\right) \Rightarrow$ bent $\Rightarrow 115^0$

4) (B) Bond angle $PF_3 > PCl_3 < PBr_3 < PI_3$.
Due to dx – px bonds in PF_3, double bond character develops increase in B.P – B.P repulsions lead to increase is Bond Angle.

5) (D) B.O of $O_2^+ = 2.5; O_2^- = 1.5; O_2 = 2, O_2^{+2} = 3; O_2^{2-} = 1$

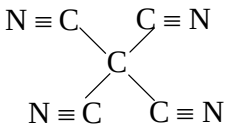
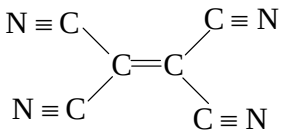
Bond length $O_2^{2-} > O_2^- > O_2 > O_2^{+2} > O_2^{+2}$

6) (D) B.O of $N_2^+ = 2.5$

B.O of $N_2^- = 2.5$; e^-s occupy non – bonding Molecular orbital's.

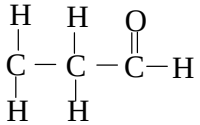
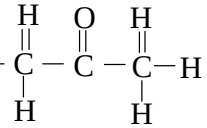
$\therefore$ bond strength of N_2^- < Bond strength of N_2^+

7) (C)

i)  

σ bonds = 8 σ bonds = 9

π bonds = 8 π bonds = 9

ii) $CH_3CH_2CHO =$  ; $CH_3COCH_3 =$ 

Propanal Propauone

ii) XeF_4 is square planar in shape.
SF_4 has See – saw Shape.

iv) Due to smaller orbital size, effective overlapping take place in u – u bond.

Passage 3:

1) (D)

2) (A) In HF_2^- H bonding exists between HF and I^-.

3) (B)

Passage 4:

1) A) $BeCl_2$ has maximum covalent character because of smallest size of cation $\left(Be^{+2}\right)$

2) D) I^- is the largest Anion.
It has maximum polar ability.

3) C) Highest positive change and smallest size of cation (Al^{+3}), hence maximum polarization and covalent character.

4) B) Liu has maximum covalent character, hence it will be most soluble in non – polar solvent ether.

5) D) CaI_2 has maximum covalent character hence least M.pt…

Passage 5:

1) A) and B) These are planar molecules. XeF_4 has square planar shape.
XeF_4 has trigonal planar shape.

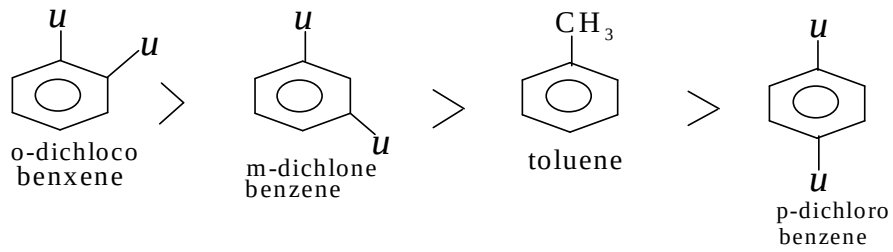
2) $p = q \times l$

$$q = \frac{p}{l} = \frac{1.2 \times 10^{-18}\,\text{esu cm}}{10^{-8}\,\text{cm}}$$

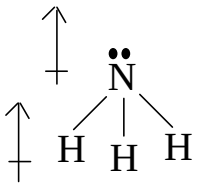
$$q = 1.2 \times 10^{-10}\,\text{esu.}$$

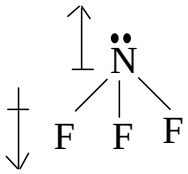
$$\text{Fraction of change} = \frac{1.2 \times 10^{-10}}{4.8 \times 10^{-10}} = \frac{1}{4} = 0.25.$$

3) (C)



4) (D)





5) % Ionic character $= \dfrac{1.5\times10^{-29}\ \text{C.m}}{1.6\times10^{-19}\text{C}\times150\times10^{-12}\text{m}}\times100 = 62.5\%$

Passage 6:

1) B

2) A

3) A.

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C. <u>Multiple Choice Questions with ONE correct answer</u> :

1) (C) Sp^2 hybridized, p = 0.

2) (A) CO and $C\overline{N} \Rightarrow 14\ e^-$ systems.

3) (A) CO_2. Sp hybridized $O{=}{=}C{=}{=}O$

4) (B) $CCl_4 \Rightarrow Sp^3$ hybridized with tetrahedral geometry.

5) (B)

6) (D)

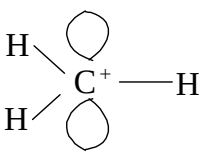
7) (A) $NO \Rightarrow 15\ e^-$ system ; has 1 unpaired e^-.
$O_2 \Rightarrow 16\ e^-$ system ; has 2 unpaired e^-s.

8) (C) More than bond forms stronger H – Bonds.

9) (C)

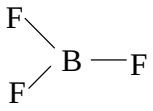
10) (A) $CH_3 - CH_2 - \overset{8-}{O} - \overset{\delta+}{H}$

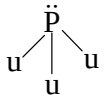
11) (C)

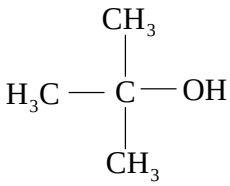


Sp^2.

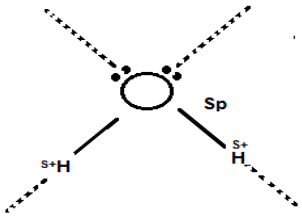
12) (A)

13) (A)  trigonal planar, Sp^2 hybridized p = 0.

14) (A) PCl_3 has 3 B.P + 1 L.P 

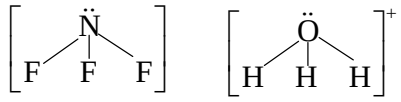
15) (C) 

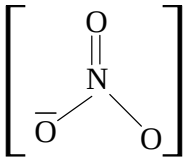
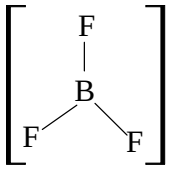
16) (A) 2 B.P + 2 L. P ; Sp^3 hybridized.

17) (B) 

18) (C) Least oxidation state, least polarization, least covalent character.

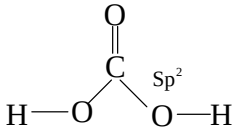
19) (D) $O_2 : \sigma / s^2 \quad \sigma^x / s^2 \quad \sigma 2s^2 \; \sigma 2s^2 \quad \sigma 2pz^2 \; \pi 2pn^2 \; {}^x\!\pi 2pn^1 \; \sigma^x 2pz \; 2\pi py^2 \; {}^x\!\pi 2py^1$

20) (C) 

21) (B) $Ca^{+2}\left[C \equiv C\right]^{2-}$ $1\sigma + 2\pi$

22) (C) $O_2^- \Rightarrow$ superoxide ion.

23) (A) 

24) (C)

25) (D)

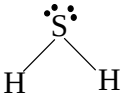
26) (B)

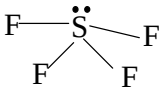
27) (A)

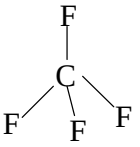
28) (C)

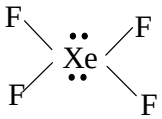
29) (D) B. O of CO = 3 ; CO_2 = 2 ; $CO_3^{2-} = 1.5$.

$\therefore$ Bond Length : $CO_3^{2-} > CO_2 > CO$.

30) (A) 

31) (D) 

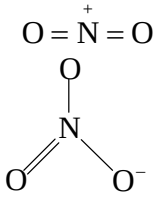
32) 
4 BP + 1 L.P


4 B.P + 0 L.P

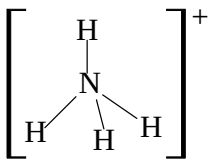
4 B.P + 2 L.P

33) (B) $NO_2^+ \Rightarrow Sp$

$NO_3^- \Rightarrow Sp^2$

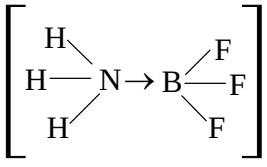


; $NH_4^+ \Rightarrow Sp^3$



34) (A)

35) (B)

36) (A) 

37) (C)

38) $O_2^+ \Rightarrow$ B.O is 25 ; (B)

39) (D) I_3^- has 3 L.P, ; XeF_4 has 2 L.P

SF_4 has 1 L.P, ; ClO_3^- has 1 L.P

D.<u>Multiple Choice Questions with ONE or MORE THAN ONE correct answer</u> :

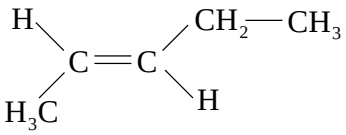
(1) (A) and (C). Cl – Hg – Cl ; H – C ≡ C – H

(2) (B), (C), (D) .

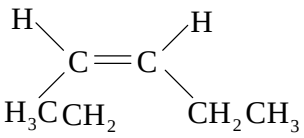
S = C = S ; $O = \overset{+}{N} = O$

(3) A, (C) CN^- and NO^+ has B.O = 3.

(4) B, C.



trans-2-pentene



cis-3-Hexene

(5) (D) H_3O^+, NH_3 and $CH_3^{\odot}$ have Sp^3 hybridization.

(6) (B)

(7) (A)

(8) (B)

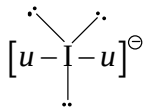
(9) (B), (D)

(10) B, C, D

(11) A, B, D

(12) A, B, C. HF and H_2O have abnormallyhigh B.pt due to H – Bonds

(13) A, C, D *Cl – Hg – Cl* ;

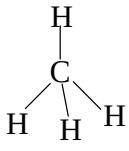


; S = C = S

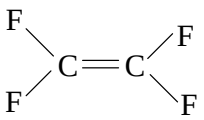
14) B, D

15) A, D

16) A, B, C



; F – C ≡ C – F ;



17) A, B, C, D.

18) B, C $SF_4 \Rightarrow$ 4 B.P + 1 L.P

$PF_5 \Rightarrow$ 5 B.P + Zero L.P .

19) A, C

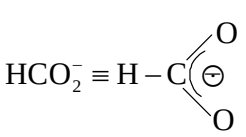
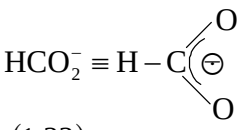
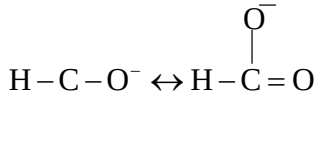
20) $Al(OH)_3 + NaOH \rightarrow [Al(OH)_4]^{\odot}$ $Pu_5 \Rightarrow [Pu_4]^{+}[Pu_6]^{-}$

Sp^3 Solid Sp^3 Sp^3d^2

$SiF_4 + 2HF \rightarrow (SiF_6)^{2-}$ Hence, A, C, D.

Sp^3 Sp^3d^2

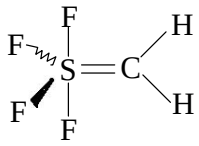
21) A, C ; Only O_2 and B_2 are paramagnetic.

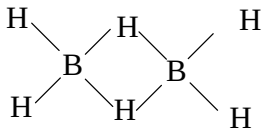
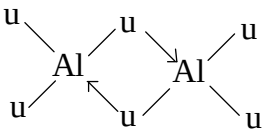
22) C, D   

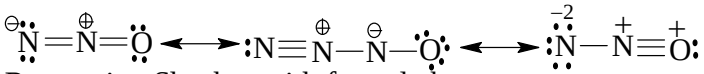
B.O of $HCl_2^-(1.5) >$ B.O of $CO_3^{2-}(1.33)$

[formate ion] [Carbonate ion]

$\therefore$ Bond length of $HCO_2^- <$ Bond length of CO_3^{2-}

23) A, C 

24) A, B  

25) A, C, D 

Resonating Shushes with formal charges.

26) A, B, C, D.

27) A, B, C, D

More electronegative element in each case, i.e. O and F occupy axial position in I & II respectively.