

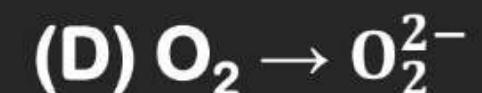
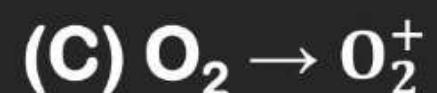
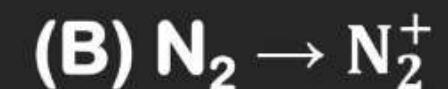
CHEMICAL BONDING

(2019)

1. According to molecular orbital theory, which of the following is true with respect to Li_2^+ and Li_2^- ?
 - (A) Li_2^+ is unstable and Li_2^- is stable
 - (B) Li_2^+ is stable and Li_2^- is unstable
 - (C) Both are stable
 - (D) Both are unstable

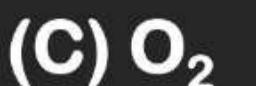
CHEMICAL BONDING

2. In which of the following processes, the bond order has increased and paramagnetic character has changed to diamagnetic?



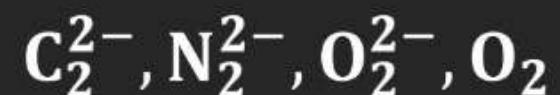
CHEMICAL BONDING

3. Two pi and half sigma bonds are present in:



CHEMICAL BONDING

4. Among the following molecules/ions,



Which one is diamagnetic and has the shortest bond length?

(A) O_2

(B) N_2^{2-}

(C) O_2^{2-}

(D) C_2^{2-}

CHEMICAL BONDING

5. Among the following, the molecule expected to be stabilized by anion formation is: $\text{C}_2, \text{O}_2, \text{NO}, \text{F}_2$

(A) C_2

(B) F_2

(C) NO

(D) O_2

CHEMICAL BONDING

6. Among the following species, the diamagnetic molecule is:

(A) NO

(B) CO

(C) B_2

(D) O_2

CHEMICAL BONDING

7. During the change of O_2 to O_2^- the incoming electron goes to the orbital:
- (A) $\pi 2p_y$ (B) $\sigma^* 2p_z$ (C) $\pi^* 2p_x$ (D) $\pi 2p_x$

CHEMICAL BONDING

8. The correct statement among the following is:

- (A) $(\text{SiH}_3)_3\text{N}$ is planar and less basic than $(\text{CH}_3)_3\text{N}$.
- (B) $(\text{SiH}_3)_3\text{N}$ is pyramidal and more basic than $(\text{CH}_3)_3\text{N}$.
- (C) $(\text{SiH}_3)_3\text{N}$ is pyramidal and less basic than $(\text{CH}_3)_3\text{N}$.
- (D) $(\text{SiH}_3)_3\text{N}$ is planar and less basic than $(\text{CH}_3)_3\text{N}$.

CHEMICAL BONDING

(2020)

1. Decreasing order of dipole moment in CHCl_3 , CCl_4 & CH_4 is-

(A) $\text{CHCl}_3 > \text{CCl}_4 = \text{CH}_4$

(B) $\text{CHCl}_3 > \text{CCl}_4 > \text{CH}_4$

(C) $\text{CCl}_4 > \text{CHCl}_3 > \text{CH}_4$

(D) $\text{CCl}_4 = \text{CH}_4 > \text{CHCl}_3$

CHEMICAL BONDING

2. Bond order and magnetic nature of CN^- are respectively
- (A) 3, diamagnetic
 - (B) 3, paramagnetic
 - (C) 2.5, paramagnetic
 - (D) 2.5, diamagnetic

CHEMICAL BONDING

3. Following vanderwaal forces are present in ethyl acetate liquid
- (A) H-bond, London forces.
 - (B) dipole-dipole interaction, H-bond
 - (C) dipole-dipole interaction, London forces
 - (D) H-bond, dipole-dipole interaction, London forces

CHEMICAL BONDING

4. Correct bond energy order of following is-

- (A) C-Cl > C-Br > C-I > C-F
- (B) C-F < C-Cl < C-Br < C-I
- (C) C-F > C-Cl > C-Br > C-I
- (D) C-I < C-Br < C-F < C-Cl

CHEMICAL BONDING

5. Complex $[ML_5]$ can exhibit trigonal bipyramidal and square pyramidal geometry. Determine total number of 108° , 90° & 120° L-M-L bond angles.

CHEMICAL BONDING

6. Which of the following species have one unpaired electron each?

- (A) O_2, O_2^-
- (B) O_2, O_2^+
- (C) O_2^+, O_2^-
- (D) O_2, O_2^{2-}

CHEMICAL BONDING

7. If AB_4 molecule is a polar molecule, a possible geometry of AB_4 is
- (A) Tetrahedral
 - (B) Rectangular planar
 - (C) Square pyramidal
 - (D) Square planar

CHEMICAL BONDING

8. Match the type of interaction in column A with distance dependence of their interaction energy in column B

A

(I)

ion-ion

(II)

dipole-dipole

(III)

London dispersion

B

$$(a) \frac{1}{r}$$

$$(b) \frac{1}{r^2} \frac{1}{r^2}$$

$$(c) \frac{1}{r^3}$$

$$(d) \frac{1}{r^6}$$

(A) (I) – (a), (II) – (b), (III) – (d)

(C) (I) – (a), (II) – (b), (III) – (c)

(B) (I) – (b), (II) – (d), (III) – (c)

(D) (I) – (a), (II) – (c), (III) – (d)

CHEMICAL BONDING

9. The molecular geometry of SF_6 is octahedral . What is the geometry of SF_4 (including lone pair(s) of electrons, if any)?
- (A) Tetrahedral
 - (B) Trigonal bipyramidal
 - (C) Square planar
 - (D) Pyramidal

CHEMICAL BONDING

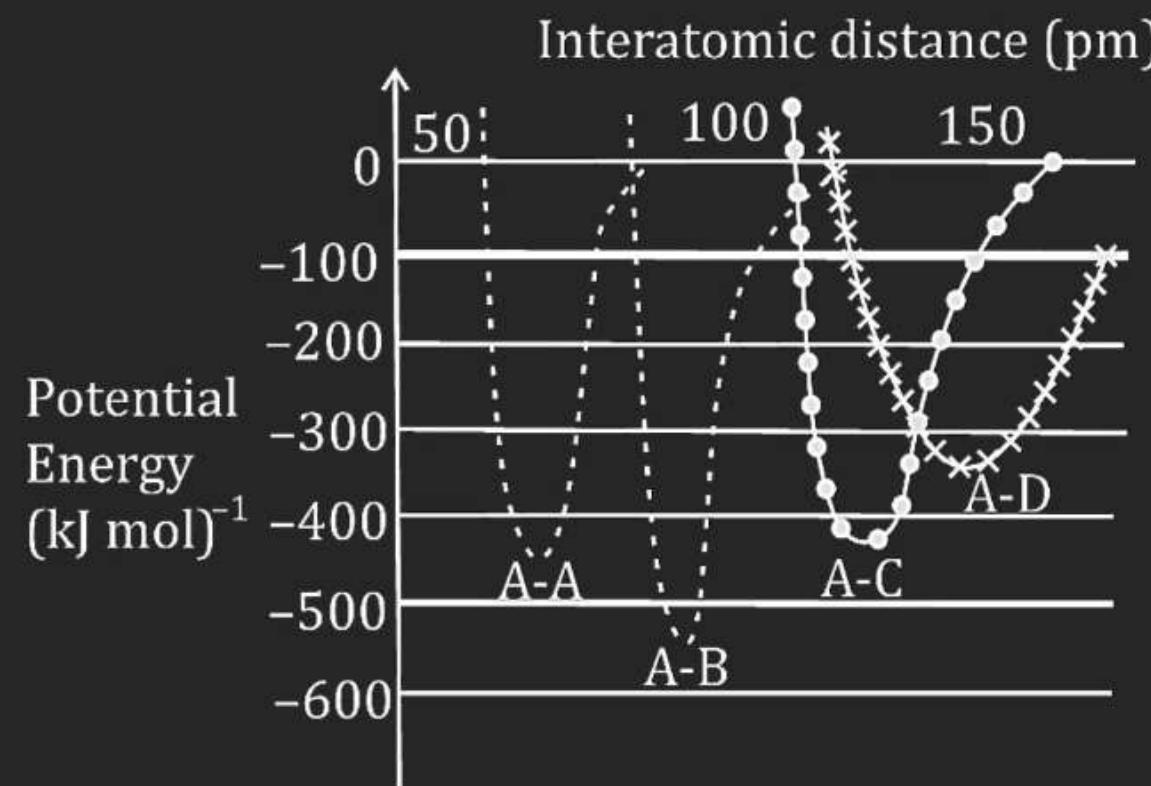
10. The shape/structure of $[\text{XeF}_5]^-$ and XeO_3F_2 , respectively, are
- (A) Pentagonal planar and trigonal bipyramidal
 - (B) Trigonal bipyramidal and pentagonal planar
 - (C) Octahedral and square pyramidal
 - (D) Trigonal bipyramidal and trigonal bipyramidal

CHEMICAL BONDING

11. Of the species, NO, NO^+ , NO^{2+} and NO^- , the one with minimum bond strength is
- (A) NO^- (B) NO^{2+} (C) NO^+ (D) NO

CHEMICAL BONDING

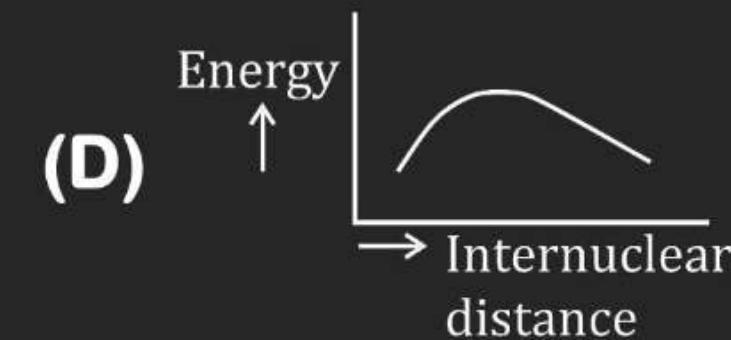
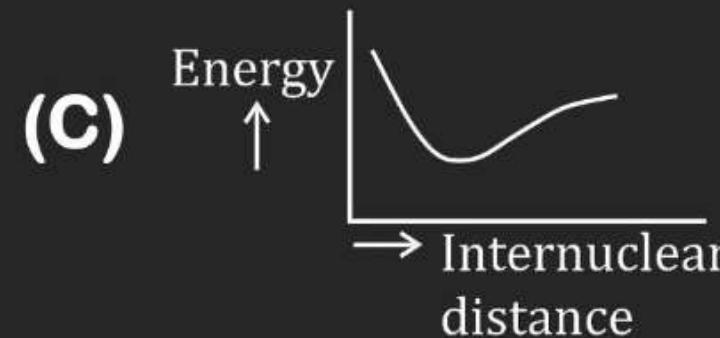
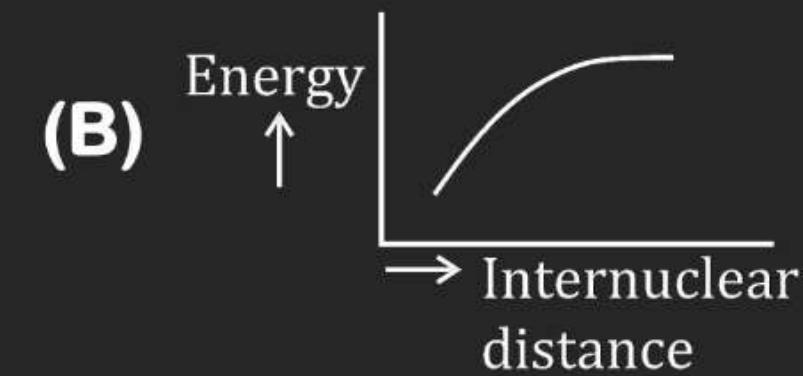
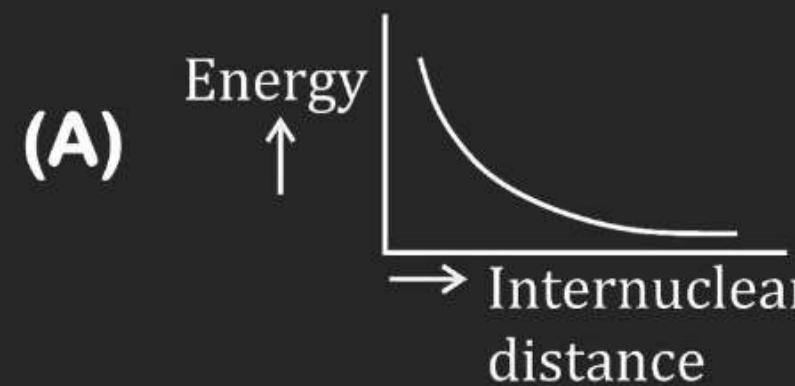
12. The intermolecular potential energy for the molecules A, B, C and D given below suggests that:



- (A) A–B has the stiffest bond
- (B) A – D has the shortest bond length
- (C) A–A has the largest bond enthalpy
- (D) D is more electronegative than other atoms

CHEMICAL BONDING

13. The potential energy curve for the H_2 molecule as a function of internuclear distance is



CHEMICAL BONDING

14. The compound that has the largest H – M – H bond angle (M = N, O, S, C) is
- (A) H_2S (B) CH_4 (C) NH_3 (D) H_2O

CHEMICAL BONDING

15. Which theory can explain bonding of $\text{Ni}(\text{CO})_4$:

- (A) MOT
- (B) CFT
- (C) VBT
- (D) Werner's theory

CHEMICAL BONDING

16. Oxidation number of potassium in K_2O , K_2O_2 & KO_2 respectively is

(A) +1, +1, +1

(B) +1 +2, +4

(C) +1, +2, +2

(D) +1, +4, +2

CHEMICAL BONDING

17. The relative strength of interionic/intermolecular forces in decreasing order is:
- (A) Dipole – Dipole > Ion – Ion > Dipole – Ion
 - (B) Ion – Ion > Dipole – Dipole > Dipole – Ion
 - (C) Dipole – Ion > Dipole – Dipole > Ion – Ion
 - (D) Ion – Ion > Dipole – Ion > Dipole – Dipole

CHEMICAL BONDING

18. Bond order and magnetic nature of CN^- are respectively
- (A) 3, diamagnetic (B) 3, paramagnetic
(C) 2.5, paramagnetic (D) 2.5, diamagnetic

CHEMICAL BONDING

19. Number of sp^2 hybrid carbon atoms in aspartame is

CHEMICAL BONDING

20. If the magnetic moment of a dioxygen species is 1.73 B.M., it may be:

- (A) O_2^- , or O_2^+ (B) O_2 , or O_2^+ (C) O_2 , or O_2^- (D) None of these

CHEMICAL BONDING

21. The number of sp^2 hybrid orbitals in a molecule of benzene is:
- (A) 24 (B) 18 (C) 12 (D) 6

CHEMICAL BONDING

22. The isomer (s) of $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]$ that has/have a Cl – Co – Cl angle of 90° , is/are:

- (A) cis and trans
- (C) meridional and trans

- (B) cis only
- (D) trans only

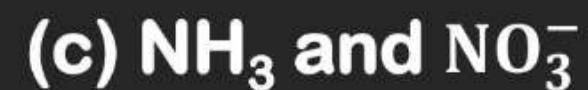
CHEMICAL BONDING

23. The predominant intermolecular forces present in ethyl acetate, a liquid are:
- (A) H-bond, London dispersion.
 - (B) dipole-dipole interaction, H-bond
 - (C) dipole-dipole interaction, London dispersion
 - (D) H-bond, dipole-dipole interaction, London dispersion

CHEMICAL BONDING

(2021)

1. Which of the following are isostructural pairs?



(A) A and C only

(B) A and B only

(B) B and C only

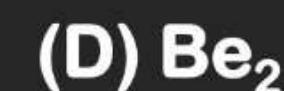
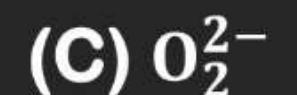
(D) C and D only

CHEMICAL BONDING

2. The correct shape and I-I-I bond angles respectively in I_3^- ion are:
- (A) Trigonal planar; 120°
 - (B) Distorted trigonal planar, 135° and 90°
 - (C) Linear; 180°
 - (D) T-shaped; 108° and 90°

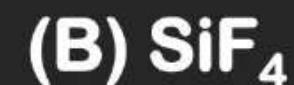
CHEMICAL BONDING

3. According to molecular orbital theory, the species among the following that does not exist is:



CHEMICAL BONDING

4. Which among the following species has unequal bond lengths?



CHEMICAL BONDING

5. Given below are two statements : one is labelled as Assertion A and the other is labelled as Reason R.

Assertion A : Dipole-dipole interactions are the only non-covalent interactions, resulting in hydrogen bond formation

Reason R : Fluorine is the most electronegative element and hydrogen bonds in HF are symmetrical In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) A is false but R is true
- (B) Both A and R are true and R is the correct explanation of A
- (C) A is true but R is false
- (D) Both A and R are true and R is not the correct explanation of A

CHEMICAL BONDING

6. Match List-I with List-II.

List-I**(Molecule)**(a) Ne_2 (b) N_2 (c) F_2 (d) O_2 **List-II****(Bond order)**

(i) 1

(ii) 2

(iii) 0

(iv) 3

Choose the correct answer from the options given below:

(A) (a) – (iii), (b) – (iv), (c) – (i), (d) – (iii) (B) (a) – (i), (b) – (ii), (c) – (iii), (d) – (iv)

(C) (a) – (ii), (b) – (i), (c) – (iv), (d) – (iii) (D) (a) – (iv), (b) – (iii), (c) – (ii), (d) – (i)

CHEMICAL BONDING

7. Given below are two statements: one is labelled as Assertion and the other is labelled as Reason : Assertion A: The H – O – H bond angle in water molecule is 104.5°

Reason R : The lone pair – lone pair repulsion of electrons is higher than the bond pair - bond pair repulsion.

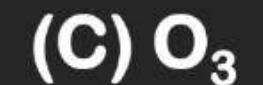
- (A) A is false but R is true
- (B) Both A and R are true, but is not the correct explanation of A
- (C) A is true but R is false
- (D) Both A and R are true, and is the correct explanation of A

CHEMICAL BONDING

8. A central atom in a molecule has two lone pairs of electrons and forms three single bonds. The shape of this molecule is:
- (A) see-saw
 - (B) planar triangular
 - (C) T-shaped
 - (D) trigonal pyramidal

CHEMICAL BONDING

9. Amongst the following, the linear species is:



CHEMICAL BONDING

10. AX is a covalent diatomic molecule where A and X are second row elements of periodic table. Based on Molecular orbital theory, the bond order of AX is 2.5 The total number of electrons in AX is _____(Round off to the Nearest Integer).

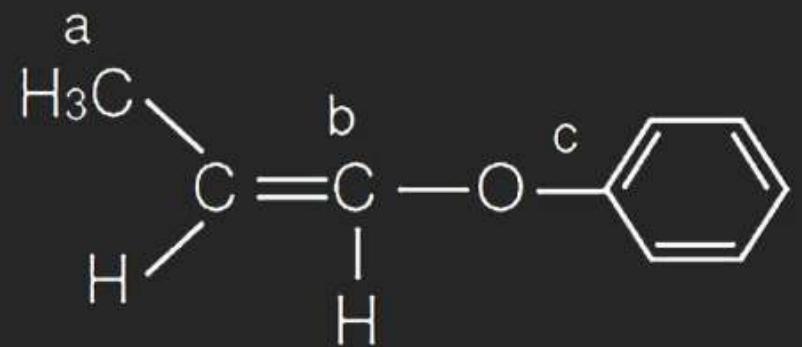
CHEMICAL BONDING

11. The oxide that shows magnetic property is :



CHEMICAL BONDING

12. In the following molecules,



Hybridisation of carbon a, b and c respectively are :

- (A) $\text{sp}^3, \text{sp}, \text{sp}$
- (B) $\text{sp}^3, \text{sp}^2, \text{sp}$
- (C) $\text{sp}^3, \text{sp}^2, \text{sp}^2$
- (D) $\text{sp}^3, \text{sp}, \text{sp}^2$

CHEMICAL BONDING

13. The number of species below that have two lone pairs of electrons in their central atom is_____ (Round off to the Nearest integer)



CHEMICAL BONDING

14. The spin-only magnetic moment value of B_2^+ species is $\times 10^{-2}$ B.M.(Nearest integer) [Given: $\sqrt{3} = 1.73$]

CHEMICAL BONDING

15. Number of paramagnetic oxides among the following given oxides is ____.



CHEMICAL BONDING

16. According to molecular orbital theory, the number of unpaired electron(s) in O_2^{2-} is :

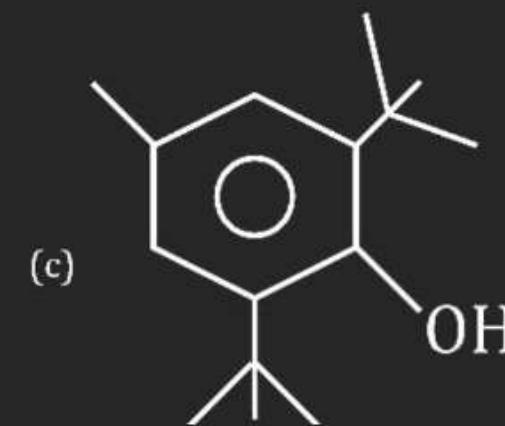
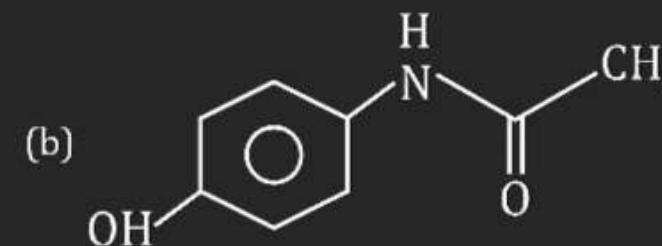
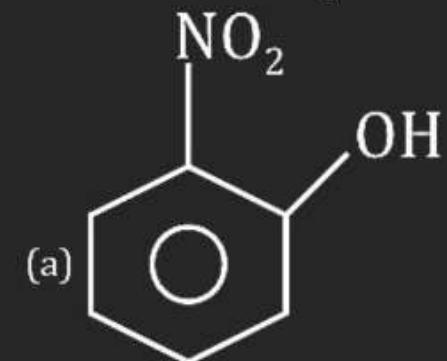
CHEMICAL BONDING

17. The number of species having non-pyramidal shape among the following is ____.



CHEMICAL BONDING

18. The compound/s which will show significant intermolecular H-bonding is/are :



(A) (b) only

(C) (a) and (b) only

(B) (c) only

(D) (a), (b) and (c)

CHEMICAL BONDING

19. The bond order and magnetic behaviour of O_2^- ion are, respectively :

(A) 1.5 and paramagnetic

(B) 1.5 and diamagnetic

(C) 2 and diamagnetic

(D) 1 and paramagnetic

CHEMICAL BONDING

20. The interaction energy of London forces between two particles is proportional to r^x , where r is the distance between the particles. The value of x is :
- (A) 3 (B) -3 (C) -6 (D) 6

CHEMICAL BONDING

21. AB_3 is an interhalogen T-shaped molecule. The number of lone pairs of electrons on A is _____. (Integer answer)

CHEMICAL BONDING

22. The number of lone pairs of electrons on the central I atom in I_3^- is __

CHEMICAL BONDING

23. The hybridizations of the atomic orbitals of nitrogen in NO_2^+ , NO_2^+ and NH_4^+ respectively are.
- (A) sp^3 , sp^2 and sp (B) sp , sp^2 and sp^3
(C) sp^3 , sp and sp^2 (D) sp^2 , sp and sp^3

CHEMICAL BONDING

24. Match List-I with List-II :

List-I

(species)

(a) SF_4

(b) IF_5

(c) NO_2^+

(d) NH_4^+

List-II

(Hybrid Orbitals)

(i) sp^3d^2

(ii) d^2sp^3

(iii) sp^3d

(iv) sp^3

(v) sp

Choose the correct answer from the options given below:

(A) (a)-(i), (b)-(ii), (c)-(v) and (d)-(iii)

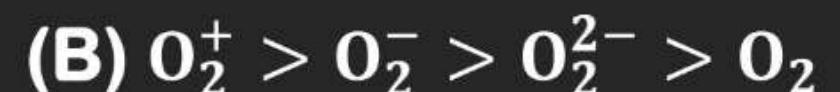
(B) (a)-(ii), (b)-(i), (c)-(iv) and (d)-(v)

(C) (a)-(iii), (b)-(i), (c)-(v) and (d)-(iv)

(D) (a)-(iv), (b)-(iii), (c)-(ii) and (d)-(v)

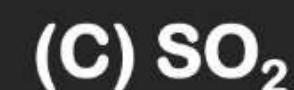
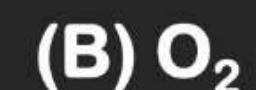
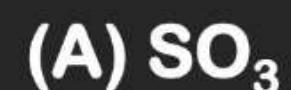
CHEMICAL BONDING

25. In the following the correct bond order sequence is:



CHEMICAL BONDING

26. Identify the species having one p-bond and maximum number of canonical forms from the following :



CHEMICAL BONDING

27. Given below are two statements: One is labelled as Assertion A and the other labelled as Reason R. Assertion A: Lithium halides are some what covalent in nature.

Reason R: Lithium possess high polarisation capability. In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) A is true but R is false
- (B) A is false but R is true
- (C) Both A and R are true but is NOT the correct explanation of A
- (D) Both A and R are true and is the correct explanation of A

CHEMICAL BONDING

28. In gaseous triethyl amine the "-C-N-C-" bond angle is _____ degree.

CHEMICAL BONDING

29. The difference between bond orders of CO and NO^{\oplus} is $\frac{x}{2}$ where $x =$ (Round off to the Nearest Integer)

CHEMICAL BONDING

30. The total number of electrons in all bonding molecular orbitals of O_2^{2-} is
(Round off to the nearest integer)

CHEMICAL BONDING

(2022)

1. Among the following species



the number of species showing diamagnetism is

CHEMICAL BONDING

2. Match List I with List II:

List-I

(molecule)



List-II

(hybridization ; shape)

I. sp^3d ; linear

II. sp^3 ; pyramidal

III. sp^3, d^3 ; distorted octahedral

IV. sp^3d^2 ; square pyramidal

Choose the correct answer from the options given below:

(A) A-II, B-I, C-IV, D-III

(C) A-IV, B-II, C-III, D-I

(B) A-II, B-IV, C-III, D-I

(D) A-IV, B-II, C-I, D-III

CHEMICAL BONDING

3. The total number of acidic oxides from the following list is: NO, N₂O, B₂O₃, N₂O₅, CO, SO₃, P₄O₁₀
- (A) 3 (B) 4 (C) 5 (D) 6

CHEMICAL BONDING

4. The sum of number of lone pairs of electrons present on the central atoms of XeO_3 , XeOF_4 , and XeF_6 is _____

CHEMICAL BONDING

5. Match List - I with List - II.

List - I

(Compound)

(A) BrF_5

(B) $[\text{CrF}_6]^{3-}$

(C) O_3

(D) PCl_5

List-II

(Shape)

(I) bent

(II) square pyramidal

(III) trigonal bipyramidal

(IV) octahedral

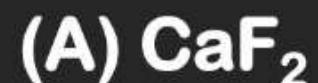
Choose the correct answer from the options given below

(A) (A) - (I), (B) - (II), (C) - (III), (D) - (IV) (B) (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

(C) (A) - (II), (B) - (IV), (C) - (I), (D) - (III) (D) (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

CHEMICAL BONDING

6. Arrange the following in increasing order of their covalent character.



Choose the correct answer from the options given



CHEMICAL BONDING

7. Given below are two statements.

Statement I: O_2 , Cu^{2+} and Fe^{3+} are weakly attracted by magnetic field and are magnetized in the same direction as magnetic field.

Statement II: $NaCl$ and H_2O are weakly magnetized in opposite direction to magnetic field.

In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) Both Statement I and Statement II are correct.
- (B) Both Statement I and Statement II are incorrect.
- (C) Statement I is correct but Statement II is incorrect.
- (D) Statement I is incorrect but Statement II is correct.

CHEMICAL BONDING

8. Amongst the following the number of oxide(s) which are paramagnetic in nature is



CHEMICAL BONDING

9. According to MO theory, number of species/ions from the following having identical bond order is _____:



CHEMICAL BONDING

10. Match List – I with List – II

List – I

(A) $\Psi_{MO} = \Psi_A - \Psi_B$

(B) $\mu = Q \times r$

(C) $\frac{N_b - N_a}{2}$

(D) $\Psi MO = \Psi_A + \Psi_B$

(A) (A) – (II), (B) – (II), (C) – (IV), (D) – (III)

(B) (A) – (III), (B) – (IV), (C) – (I), (D) – (II)

(C) (A) – (III), (B) – (I), (C) – (IV), (D) – (II)

(D) (A) – (III), (B) – (IV), (C) – (II), (D) – (I)

List – II

(I) Dipole moment

(II) Bonding molecular orbital

(III) Anti-bonding

(IV) Bond order

CHEMICAL BONDING

11. The number of molecule(s) or ion(s) from the following having non-planar structure is_____.



CHEMICAL BONDING

12. The number of paramagnetic species among the following is ____.



CHEMICAL BONDING

13. Given below are two statements: One is labelled as at

Assertion A and the other is labelled as Reason R

Assertion A: Zero orbital overlap is an out of phase overlap.

Reason R: It results due to different orientation/ direction of approach of orbitals.

In the light of the above statements. Choose the correct answer from the options given below

(A) Both A and R are true and R is the correct explanation of A

(B) Both A and R are true but R is NOT the correct explanation of A

(C) A is true but R is false

(D) A is false but R is true

CHEMICAL BONDING

14. Number of lone pairs of electrons in the central atom of SCl_2 , O_3 , ClF_3 and SF_6 , respectively, are :
- (A) 0, 1, 2 and 2 (B) 2, 1, 2 and 0
(C) 1, 2, 2 and 0 (D) 2, 1, 2 and 0

CHEMICAL BONDING

15. Consider, PF_5 , BrF_5 , PCl_3 , SF_6 , $[\text{ClI}_4]^-$, ClF_3 and IF_5 . Amongst the above molecule(s)/ion(s), the number of molecule(s)/ion(s) having sp^3d^2 is_____.

CHEMICAL BONDING

16. The correct order of bond orders C_2^{2-} , N_2^{2-} and O_2^{2-} is, respectively.

(A) $\text{C}_2^{2-} < \text{N}_2^{2-} < \text{O}_2^{2-}$

(B) $\text{O}_2^{2-} < \text{N}_2^{2-} < \text{O}_2^{2-}$

(C) $\text{C}_2^{2-} < \text{O}_2^{2-} < \text{N}_2^{2-}$

(D) $\text{N}_2^{2-} < \text{C}_2^{2-} < \text{O}_2^{2-}$

CHEMICAL BONDING

17. Bonding in which of the following diatomic molecule(s) become(s) stronger, on the basis of MO Theory, by removal of an electron?

(A) NO

(B) N₂

(C) O₂

(D) C₂

(E) B₂

CHEMICAL BONDING

18. Amongst BeF_2 , BF_3 , H_2O , NH_3 , CCl_4 and HCl , the number of molecules with non-zero net dipole moment is _____.

CHEMICAL BONDING

19. Consider the ions/molecule



For increasing bond order the correct option is:

(A) $\text{O}_2^{2-} < \text{O}_2^- < \text{O}_2 < \text{O}_2^+$

(B) $\text{O}_2^- < \text{O}_2^{2-} < \text{O}_2 < \text{O}_2^+$

(C) $\text{O}_2^- < \text{O}_2^{2-} < \text{O}_2^+ < \text{O}_2$

(D) $\text{O}_2^- < \text{O}_2^+ < \text{O}_2^{2-} < \text{O}_2$

CHEMICAL BONDING

20. The oxide which contains an odd electron at the nitrogen atom is



CHEMICAL BONDING

21. Amongst SF_4 , XeF_4 , CF_4 and H_2O , the number of species with two lone pairs of electrons ____.

CHEMICAL BONDING

22. Based upon VSEPR theory, match the shape (geometry) of the molecules in List-I with the molecules in List-II and select the most appropriate option

List-I**(Shape)****(a) T-shaped****(b) Trigonal planar****(c) Square planar****(d) See-saw****(A) (A) – I , (B) – (II), (C) – (III), (D) – (IV)****(B) (A) – (III), (B) –(IV), (C) – (I), (D) – (II)****(C) (A) – (III), (B) – (IV), (C) – (II), (D) – (I)****(D) (A) – (IV), (B) – (III), (C) – (I), (D) – (II)****List-II****(Molecules)****(i) XeF_4** **(ii) SF_4** **(iii) ClF_3** **(iv) BF_3**

CHEMICAL BONDING

23. Identify the incorrect statement for PCl_5 , from the following.
- (A) In this molecule, orbitals of phosphorous are assumed to undergo sp^3d hybridization.
 - (B) The geometry of PCl_5 , is trigonal bipyramidal.
 - (C) PCl_5 , has two axial bonds stronger than three equatorial bonds.
 - (D) The three equatorial bonds of PCl_5 , lie in a plane.

CHEMICAL BONDING

24. The correct order of increasing intermolecular hydrogen bond strength is



CHEMICAL BONDING

25. The hybridization of P exhibited in PF_5 is sp^xd^y . The value of y is ____.

CHEMICAL BONDING

26. In the structure of SF_4 , the lone pair of electrons on S is in.
- (A) equatorial position and there are two lone pair- bond pair repulsions at 90°
 - (B) equatorial position and there are three lone pair-bond pair repulsions at 90°
 - (C) axial position and there are three lone pair - bond pair repulsion at 90° .
 - (D) axial position and there are two lone pair -bond pair repulsion at 90° .

CHEMICAL BONDING

27. Arrange the following in the decreasing order of their covalent character:



Question: Choose the most appropriate answer from the options given below:

(A) (A)> (C)>(B)> (D)

(B) (B)>(A)>(C)>(D)

(C) (A)> (B)> (C)>(D)

(D) (A)> (B) > (D) > (C)

CHEMICAL BONDING

28. Consider the species CH_4 , NH_4^+ and BH_4^- . Choose the correct option with respect to the there species
- (A) They are isoelectronic and only two have tetrahedral structures
 - (B) They are isoelectronic and all have tetrahedral structures
 - (C) Only two are isoelectronic and all have tetrahedral structures
 - (D) Only two are isoelectronic and only two have tetrahedral structures

CHEMICAL BONDING

29. Number of lone pair (s) of electrons on central atom and the shape of BrF_3 , molecule respectively, are:
- (A) 0, triangular planar.
 - (B) 1, pyramidal.
 - (C) 2, bent T-shape.
 - (D) 1, bent T-shape

CHEMICAL BONDING

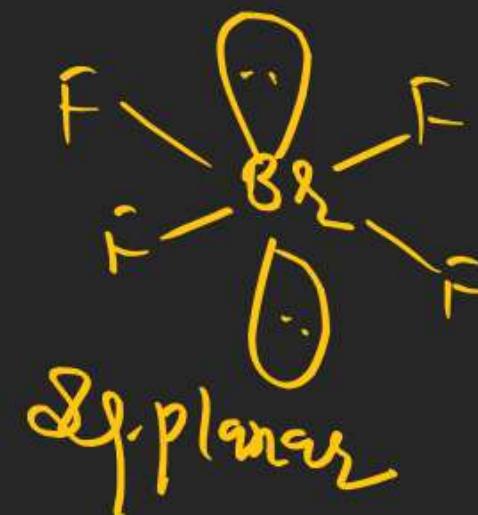
(2023)

1. The number of species from the following which have square pyramidal structure is _____

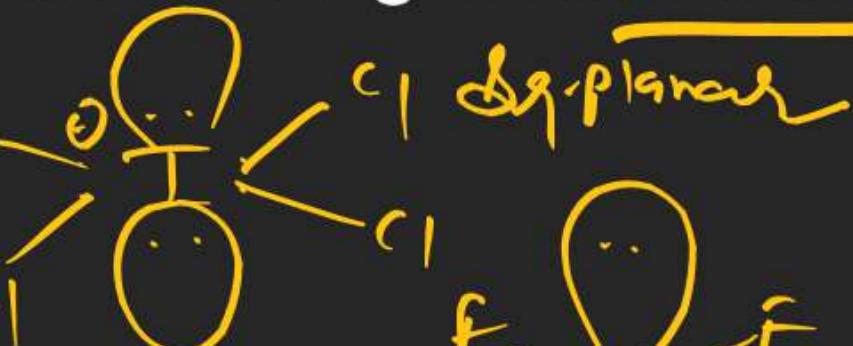
(3)

 sp^3d

T-B-P



Squ. planar

 $4+2 = \text{sp}^3\text{d}^2$ 

Squ. planar

 $5+1=6$
 sp^3d^2 

Squ. pyramidal

Squ. pyramidal

 $5+1=6$
 sp^3d^2 

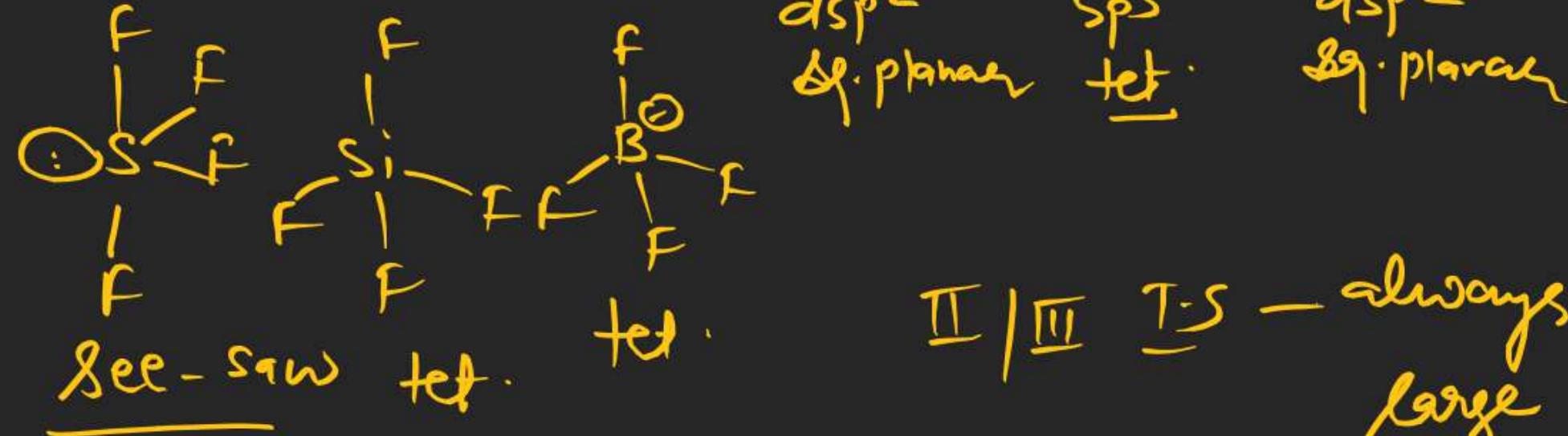
Squ. pyramidal

CHEMICAL BONDING

2. The number of species having a square planar shape from the following is



(4)



II / III T.S - always dsp^2
large splitting



CHEMICAL BONDING

3. In an ice crystal, each water molecule is hydrogen bonded to _____ neighbouring molecules.

(4)



CHEMICAL BONDING

4. Given below are two statements : One is labelled as Assertion A and the other is labelled as . Reason R.

Assertion A : Butan- 1 -ol has higher boiling point than ethoxyethane.

Reason R : Extensive hydrogen bonding leads to stronger association of molecules.

In the light of the above statements, choose the correct answer from the options given below :

(A) A is true but R is false

(B) Both A and R are true and R is the correct explanation of A

(C) Both A and R are true but R is not the correct explanation of A

(D) A is false but R is true

CHEMICAL BONDING

5. The number of following factors which affect the percent covalent character of the ionic bond is _____

(A) Polarizing power of cation

(C) **Polarizability of the anion**

(B) Extent of distortion of anion

(D) Polarizing power of anion

(3)

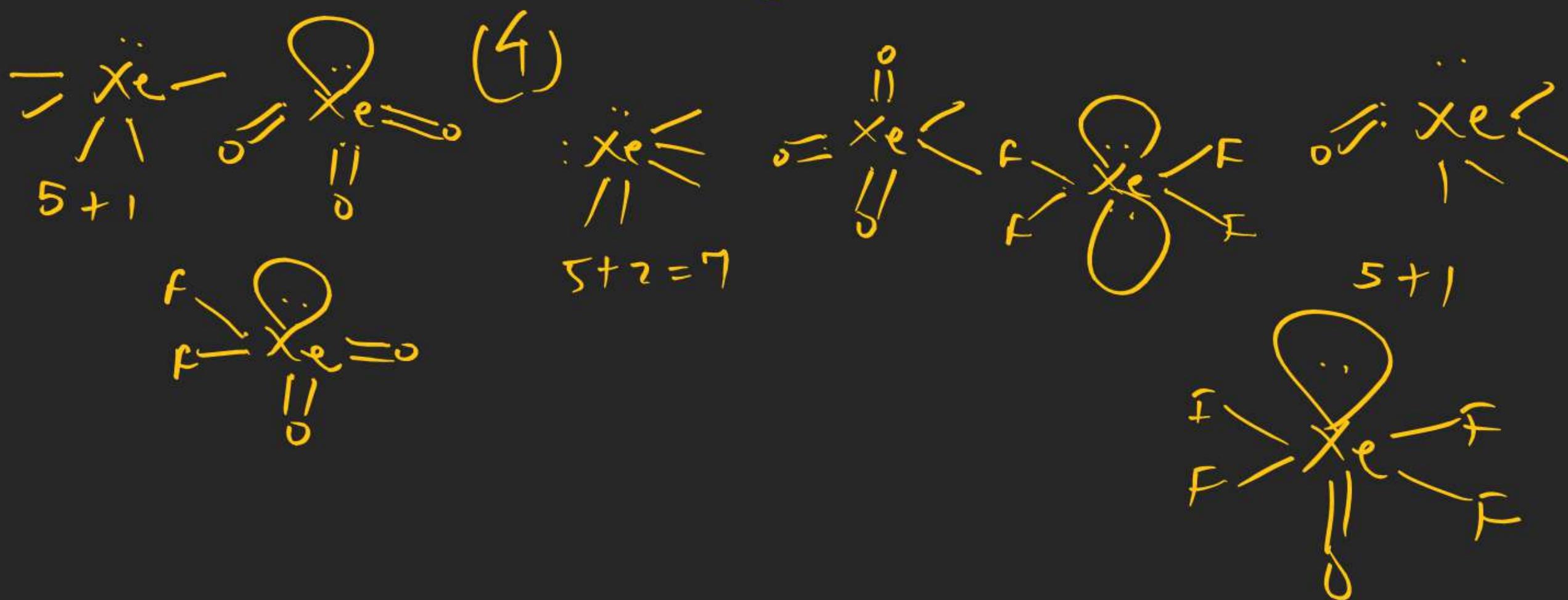


$$\text{Polarising power } (\phi) = \frac{\text{charge}}{\text{size}}$$

CHEMICAL BONDING

6. The number of species from the following carrying a single lone pair on central atom Xenon is

~~XeF₅⁺, XeO₃, XeO₂F₂, XeF₅⁻, XeO₃F₂, XeOF₄, XeF₄~~



CHEMICAL BONDING

7. The pair from the following pairs having both compounds with net non-zero dipole moment is

(A) 1, 4-Dichlorobenzene 1, 3-Dichlorobenzene

(B) cis-butene, trans-butene

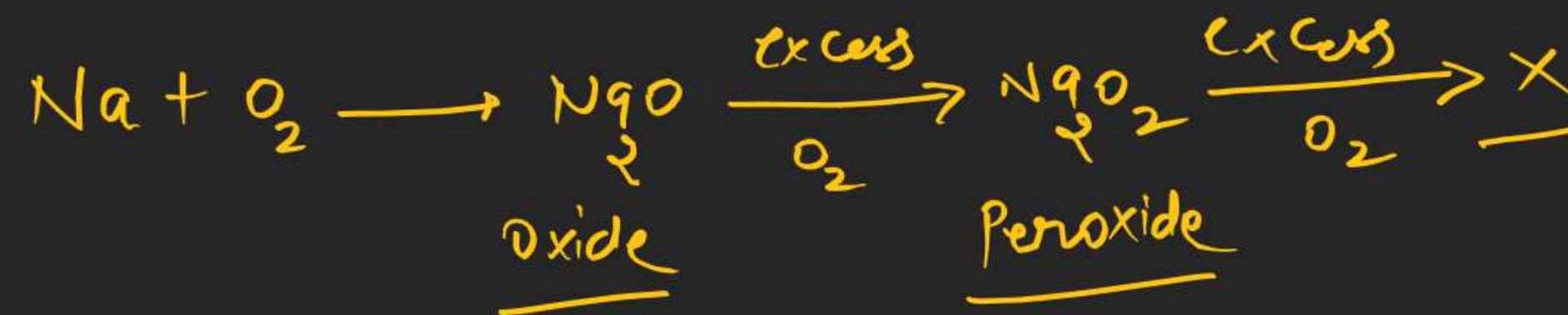
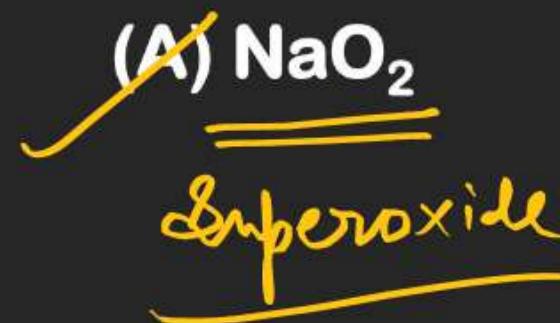
~~(C) $\text{CH}_2\text{Cl}_2, \text{CHCl}_3$~~

~~(D) Benzene, anisidine~~



CHEMICAL BONDING

8. The compound which **does not** exist is

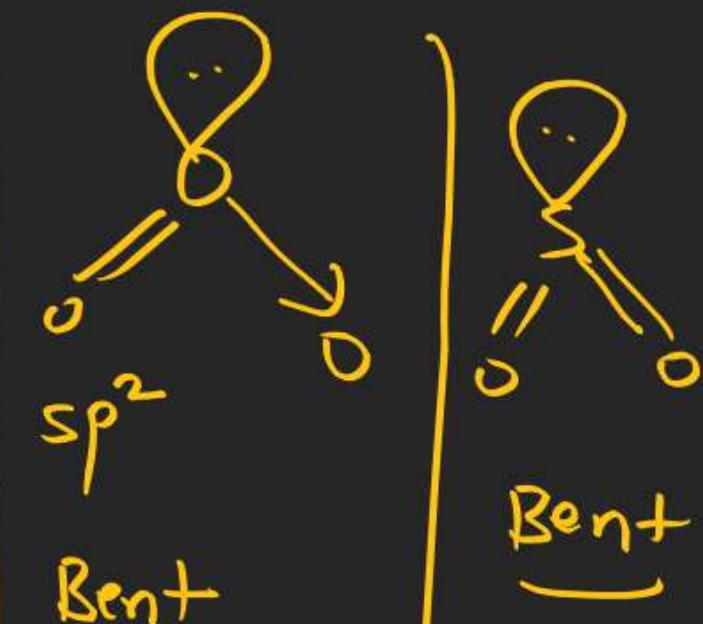
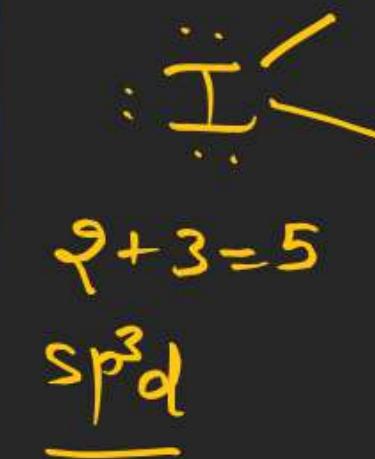
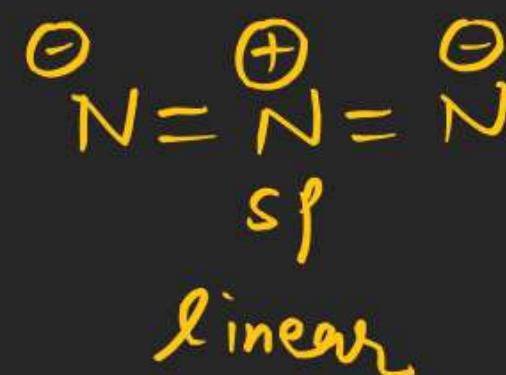


CHEMICAL BONDING

9. The number of bent-shaped molecule/s from the following is _____



(3)



CHEMICAL BONDING

10. The sum of lone pairs present on the central atom of the interhalogen IF_5 and IF_7 is (1)



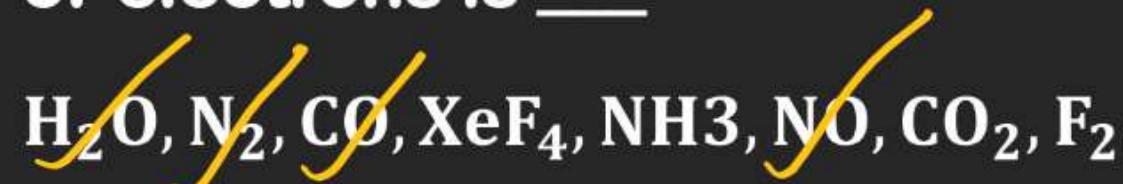
$$\lambda \cdot p = 0$$

$$5 + 1$$

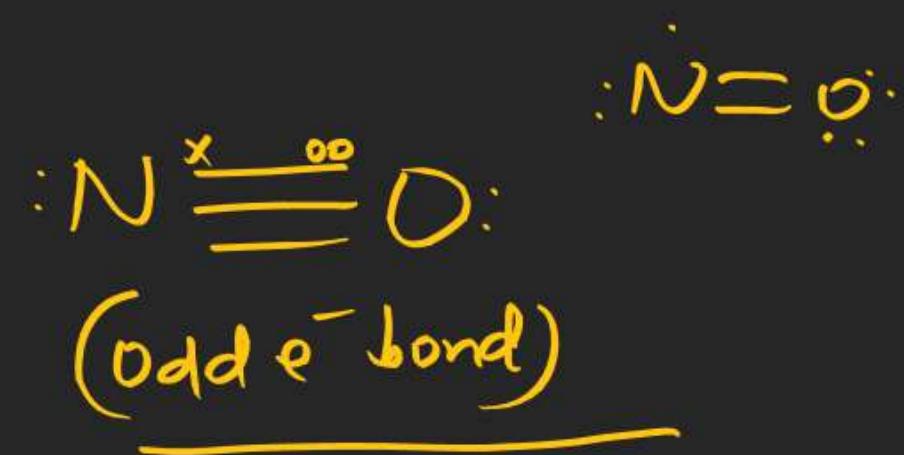
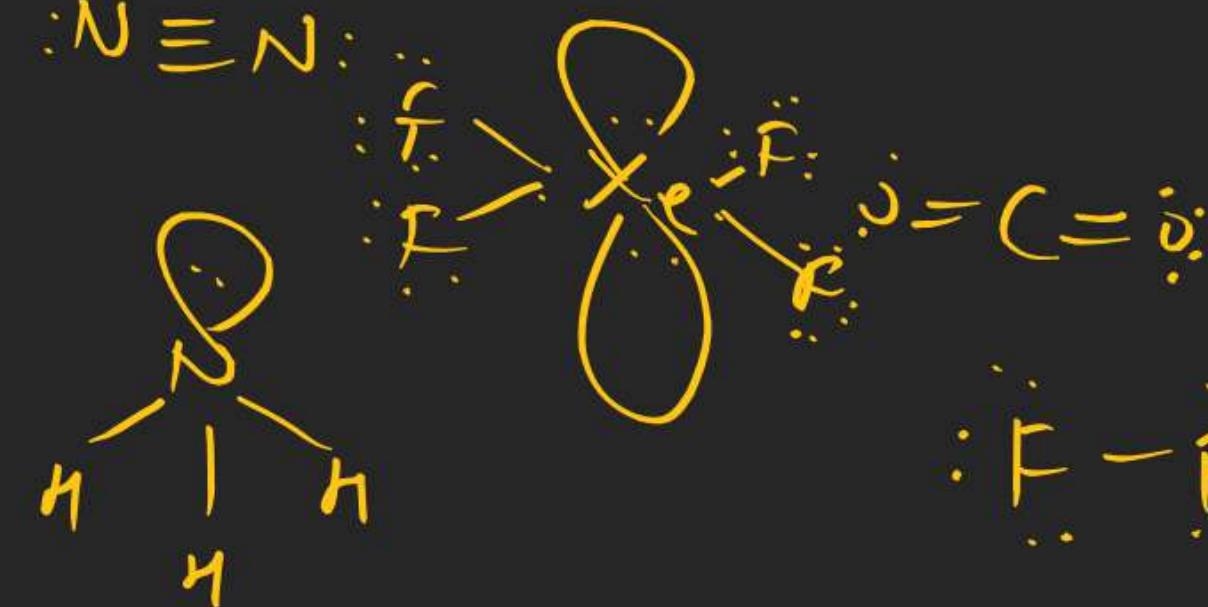
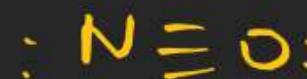
$$0 + 1 = \underline{\underline{1}}$$

CHEMICAL BONDING

11. The number of molecules from the following which contain only two lone pair of electrons is __



(4)



key point

total
val. e⁻

3	4	5	6	7	8
B	C	N	O	F	Ne



CHEMICAL BONDING

12. Match List-I with List-II:

List-I Species



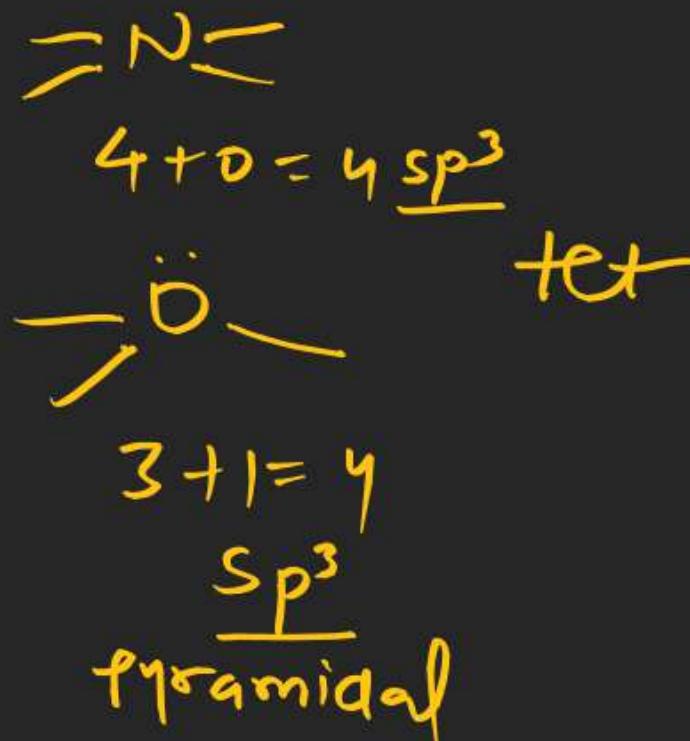
List-II Geometry/shape

I. Tetrahedral

II. Linear

III. Pyramidal

IV. Bent



Choose the correct answer from the options given below:

(A) A(III), B(IV), C(I), D(II)

(C) ~~A(III), B(II), C(I), D(IV)~~

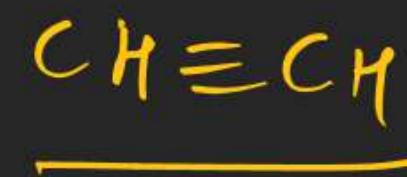
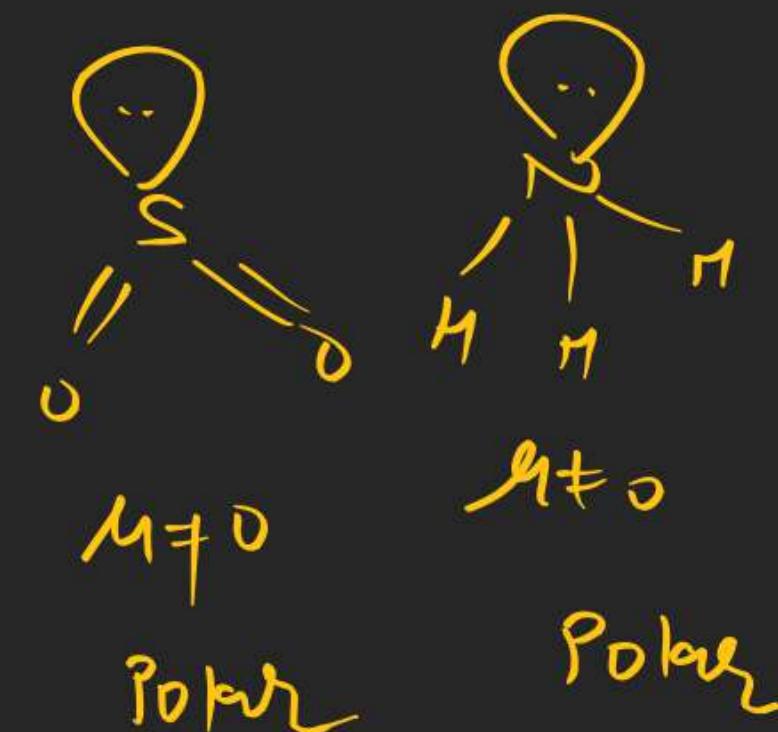
(B) A(III), B(I), C(II), D(IV)

(D) A(III), B(IV), C(II), D(I)



CHEMICAL BONDING

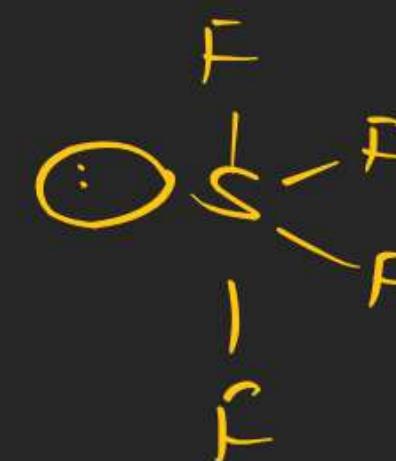
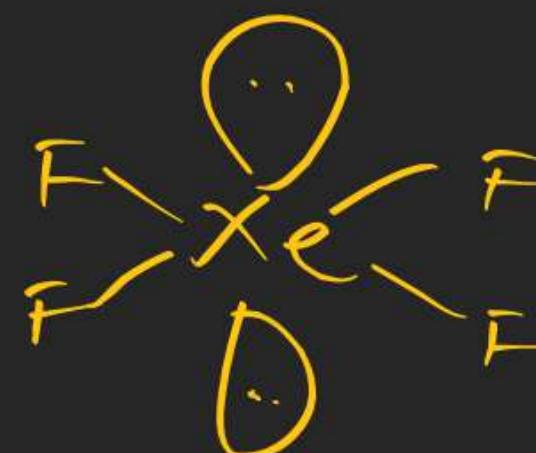
13. Which one of the following pairs is an example of polar molecular solids?



CHEMICAL BONDING

14. The maximum number of lone pairs of electron on the central atom from the following species is ClO_3^- , XeF_4 , SF_4 and I_3^-

Ans = 3



CHEMICAL BONDING

15. The bond order and magnetic property of acetylide ion are same as that of

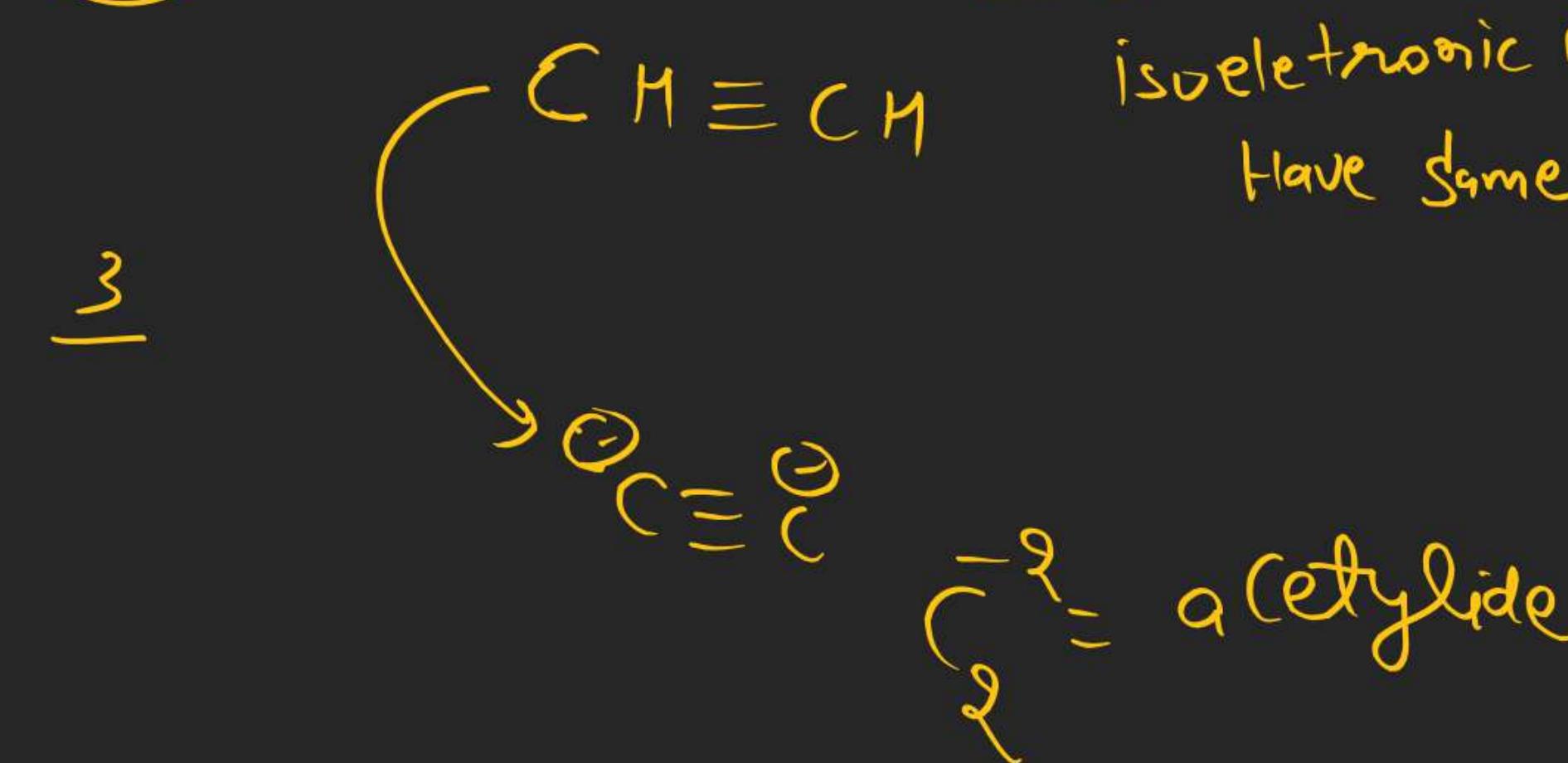
- (A) O_2^+ (B) N_2^+ ✓(C) NO^+ (D) O_2^-



Key point

isoelectronic molecule

Have same bond order

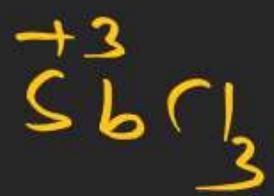


CHEMICAL BONDING

16. Given below are two statements:

Statement I: SbCl₅ is more covalent than SbCl₃

Statement II: The higher oxide of halogens also tend to be more stable than the lower ones.



$$\boxed{\phi = \frac{\text{Charge}}{\text{Size}}}$$

+ive charge ↑ Cov. ↑

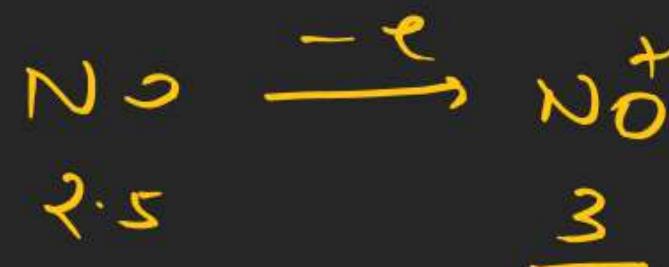
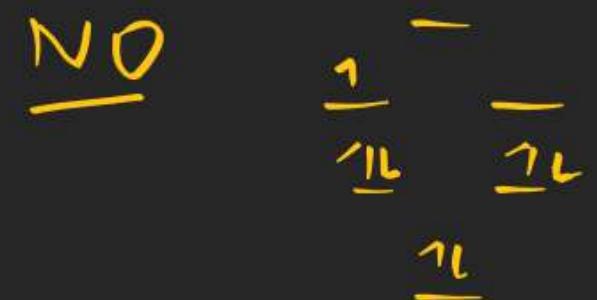
In the light of the above statements, choose the most appropriate answer from the options given below:

- (A) Statement I is incorrect but Statement II is correct
- (B) Both Statement I is incorrect but Statement II is incorrect
- (C) Both Statement I is incorrect but Statement II is correct
- (D) Statement I is incorrect but Statement II is incorrect

CHEMICAL BONDING

17.

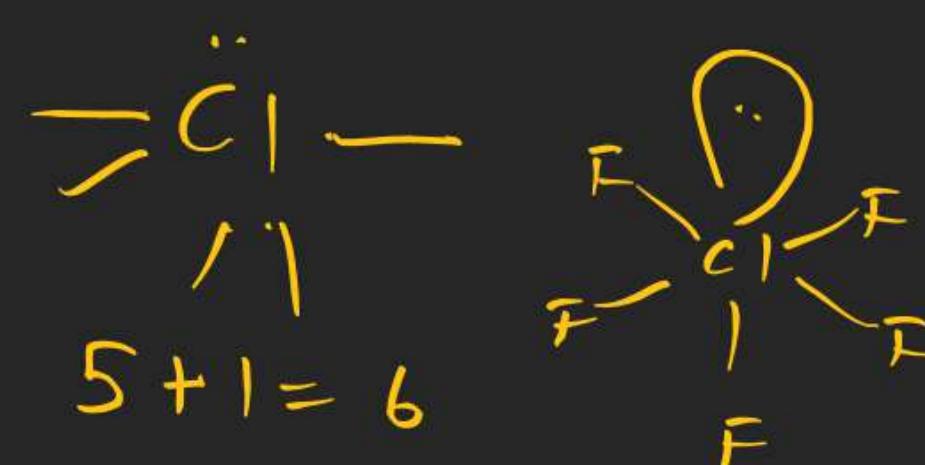
In which of the following processes, the bond order increases and paramagnetic character changes to diamagnetic one?



CHEMICAL BONDING

18. ClF_5 at room temperature is a

- (A) Colourless liquid with trigonal bipyramidal geometry
- (B) Colourless gas with square pyramidal geometry
- (C) Colourless gas with trigonal bipyramidal geometry
- (D) Colourless liquid with square pyramidal geometry



Note \Rightarrow all interhalogenes are diamag. covalent solid or liq.

except ClF which is gas

298K

CHEMICAL BONDING

19. Among the following compounds, the one which shows highest dipole moments is

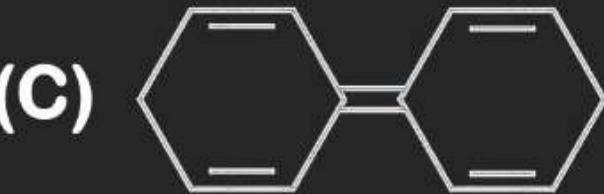
(A)



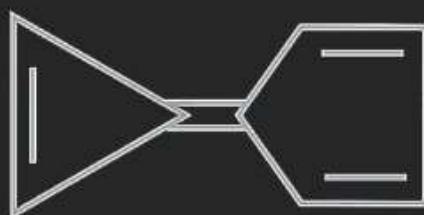
(B)



(C)



(D)



CHEMICAL BONDING

20. Match List-I with List-II.

List-I

A. Weak intermolecular forces of attraction

B. Hydrogen bonding

C. Heavily branched polymer

D. High density polymer

List-II

I. Hexamethylenediamine + adipic acid

II. $\text{AlEt}_3 + \text{TiCl}_4$

III. 2-chloro-1,3-butadiene

IV. Phenol + formaldehyde

Choose the correct answer from the options given below

(A) A-IV, B-II, C-III, D-I

(B) A-IV, B-I, C-III, D-II

(C) A-II, B-IV, C-I, D-III

(D) A-III, B-I, C-IV, D-II

CHEMICAL BONDING

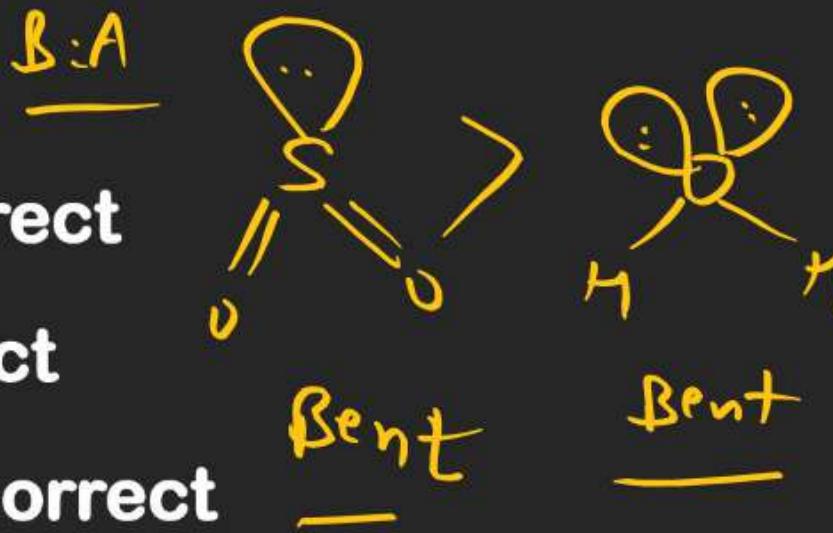
21. Given below are two statements :

Statement I : SO_2 and H_2O both possess V-shaped structure

Statement II : The bond angle of SO_2 is less than that of H_2O .

In the light of the above statements, choose the most appropriate answer from the options given below:

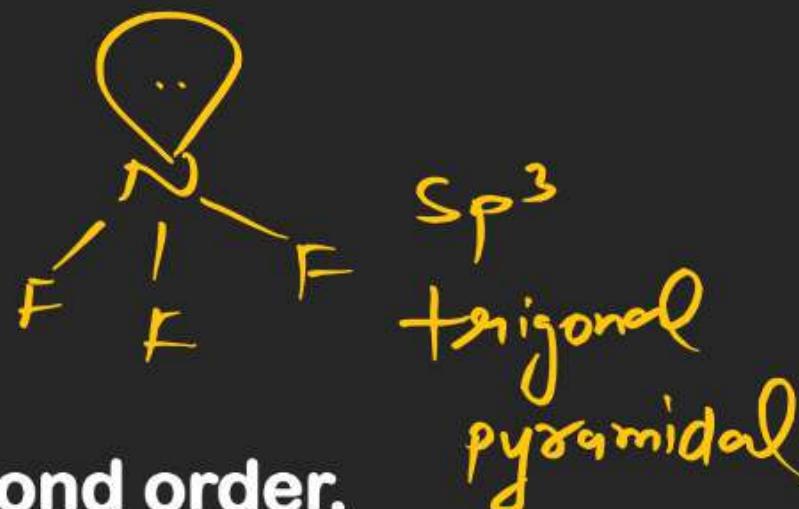
- (A) Both Statement I and Statement II are incorrect
- (B) Both Statement I and Statement II are correct
- (C) Statement I is incorrect but Statement II is correct
- (D) Statement I is correct but Statement II is incorrect



CHEMICAL BONDING

22. Consider the following statement

- ~~(a) NF_3 molecules has a trigonal planar structure.~~
- ~~(b) Bond Length of N_2 is shorter than O_2 .~~
- ~~(c) Isoelectronic molecules or ions have identical bond order.~~
- ~~(d) Dipole moment of H_2S is higher than that of water molecule.~~



Choose the correct answer from the options given below:

(A) (A) and (B) are correct

(B) (A) and (B) are correct

(C) (C) and (D) are correct

~~(D) (B) and (C) are correct~~

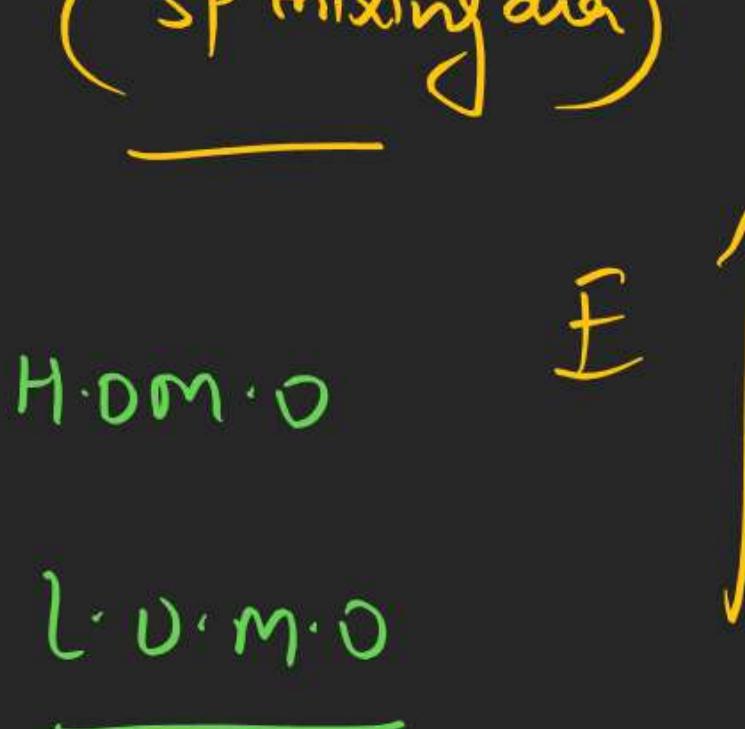


CHEMICAL BONDING

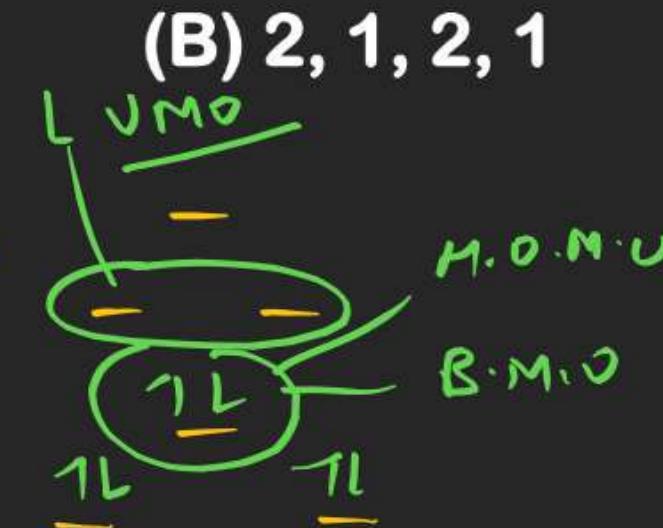
23. What is the number of unpaired electron(s) in the highest occupied molecular orbital of the following species: N_2 : N_2^+ ; O_2 ; O_2^+

(A) 0, 1, 2, 1

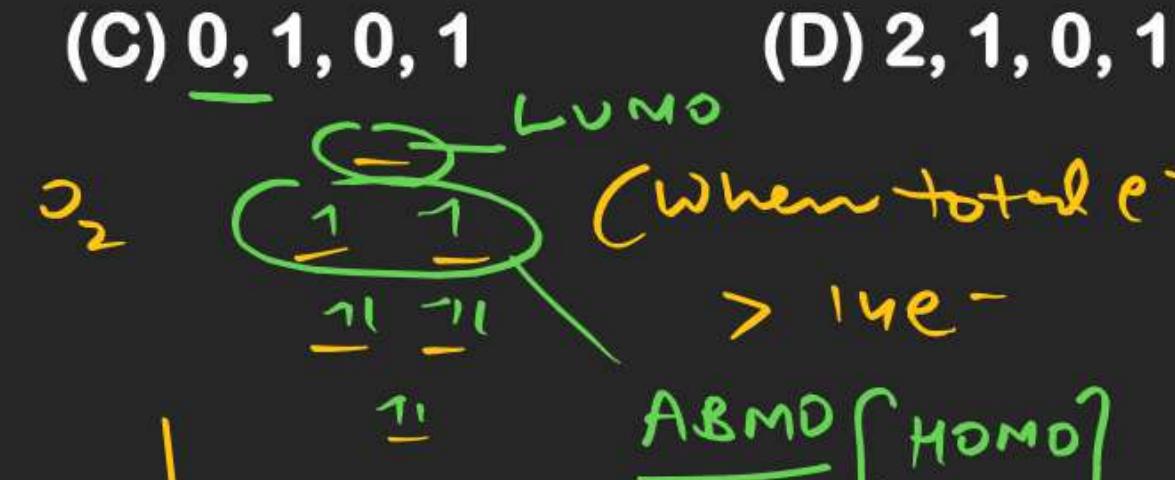
(When total no. $\sigma e^- \leq 14e^-$
SP mixing dia)



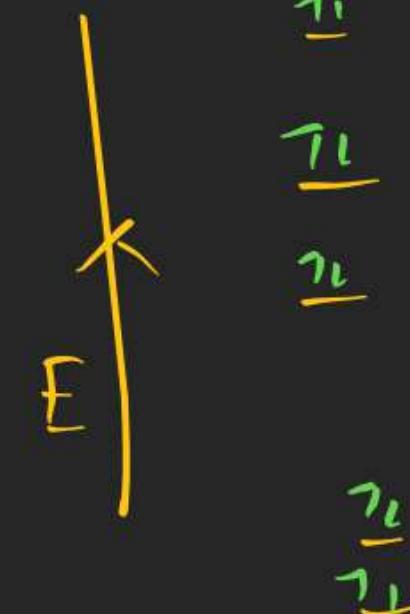
(B) 2, 1, 2, 1



(C) 0, 1, 0, 1



(D) 2, 1, 0, 1



CHEMICAL BONDING

24. The total number of lone pairs of electrons on oxygen atoms of ozone is __

(6)



CHEMICAL BONDING

25. Statement I : Dipole moment is a vector quantity and by convention it is depicted by a small arrow with tail on the negative centre and head pointing towards the positive centre.



Statement II : The crossed arrow of the dipole moment symbolize the direction of the shift of charges in the molecules.

In the light of the above statements, choose the most appropriate answer from the options given below:-

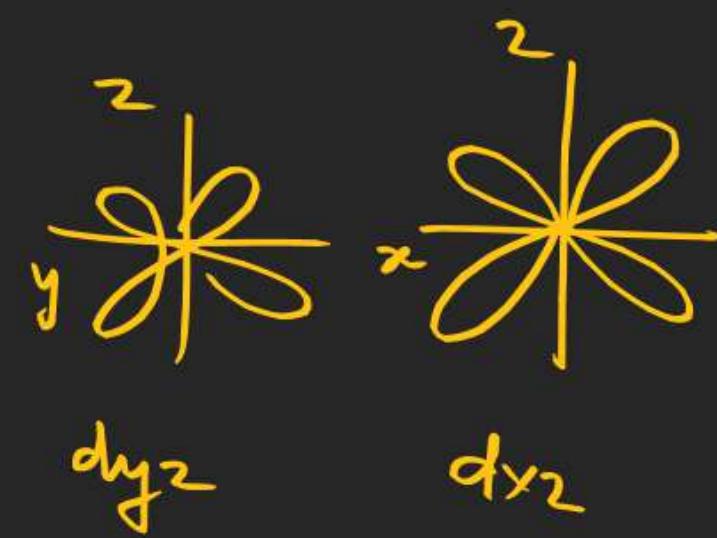
- (A) Both Statement I and Statement II are correct.
- (B) Statement I is incorrect but Statement II is correct.
- (C) Both Statement I and Statement II are incorrect
- (D) Statement I is correct but Statement II is incorrect.

CHEMICAL BONDING

26. The number of given orbitals which have electron density along the axis is __

~~P_x, p_y, p_z, d_{xy}, d_{yz}, d_{xz}, d_{z²}, d_{x²-y²}~~

(5)



CHEMICAL BONDING

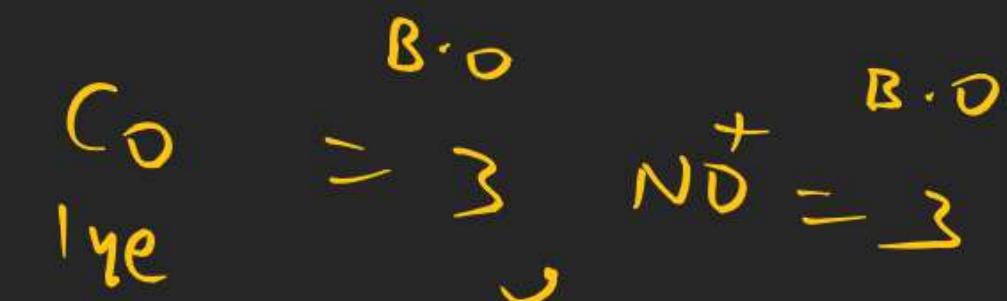
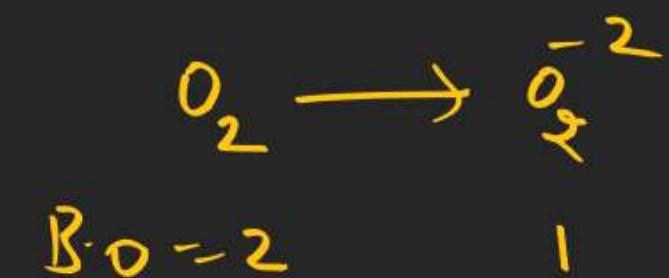
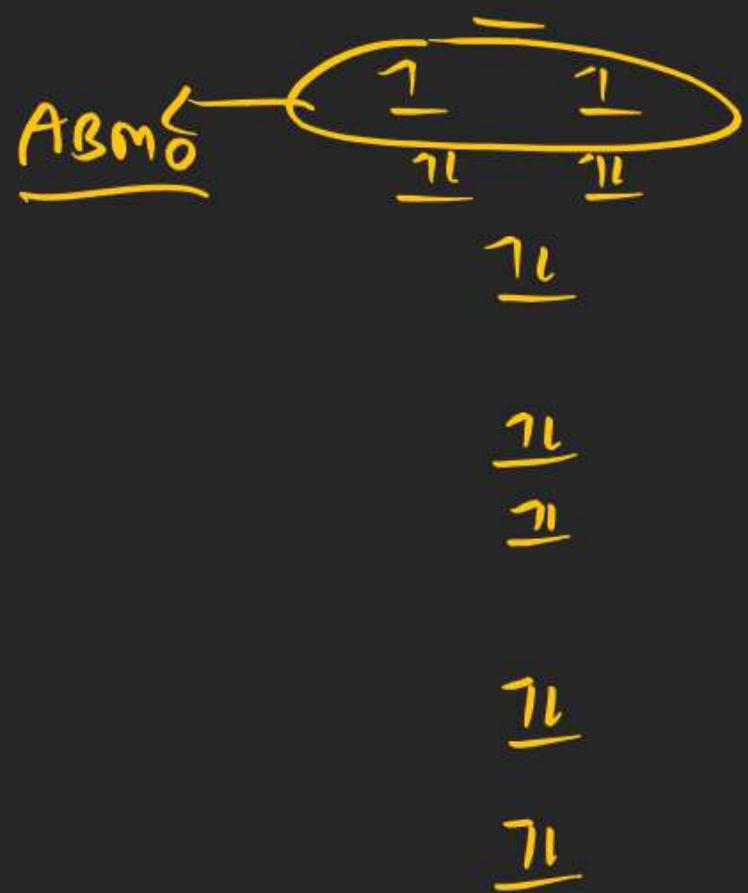
27. According to MO theory the bond orders for O_2^{2-} , CO and NO^+ respectively, are

(A) 1, 3 and 3

~~(B) 1, 3 and 3~~

(C) 1, 2 and 3

(D) 2, 3 and 3



CHEMICAL BONDING

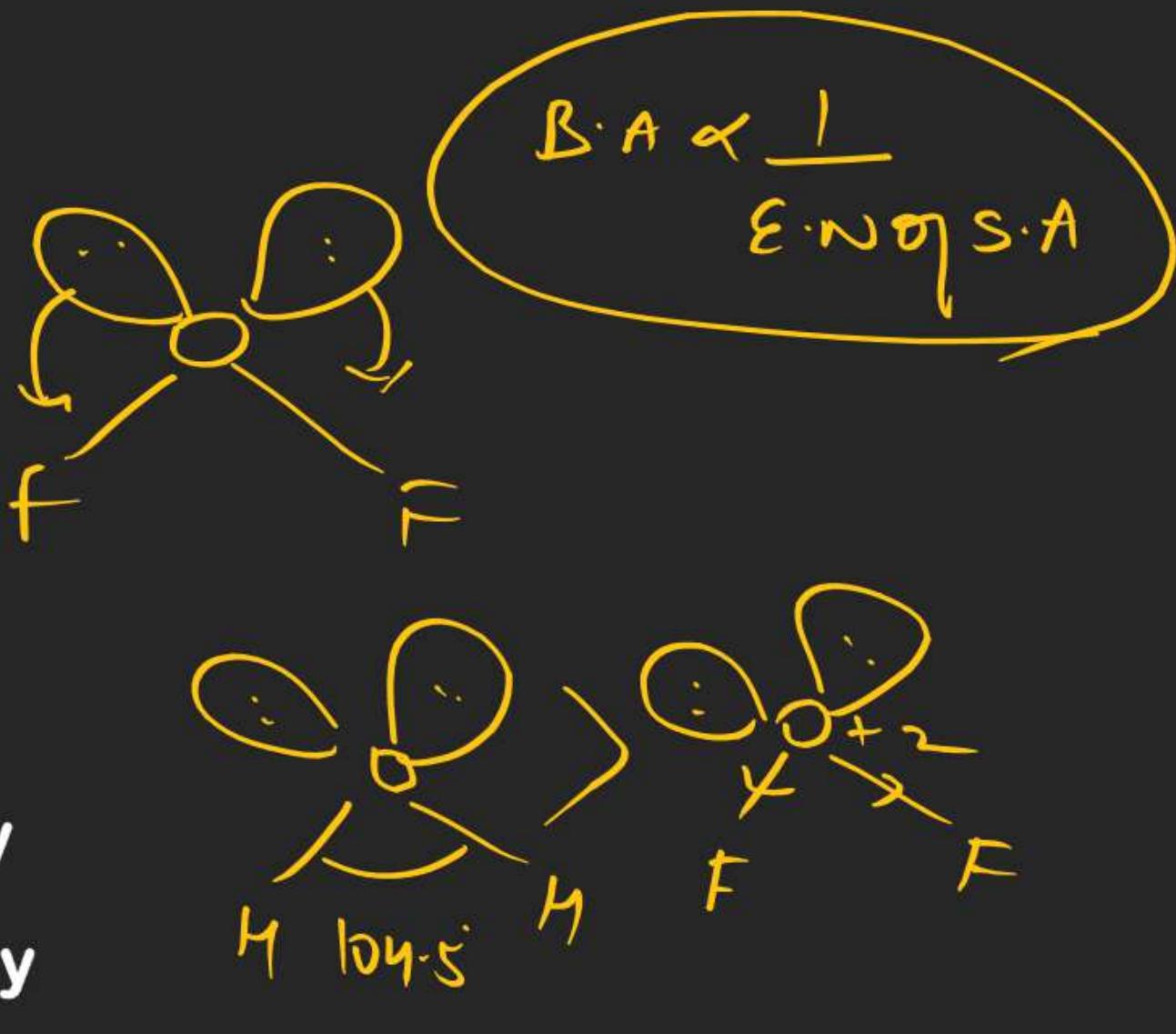
28. For OF_2 molecule consider the following

- (a) Number of lone pairs on oxygen is 2.
- (b) FOF angle is less than 104.5° .
- (c) Oxidation state of O is -2 .
- (d) Molecule is bent 'V' shaped.
- (e) Molecular geometry is linear.

Correct options are:

- (A) C, D, E only
- (C) A, C, D, only

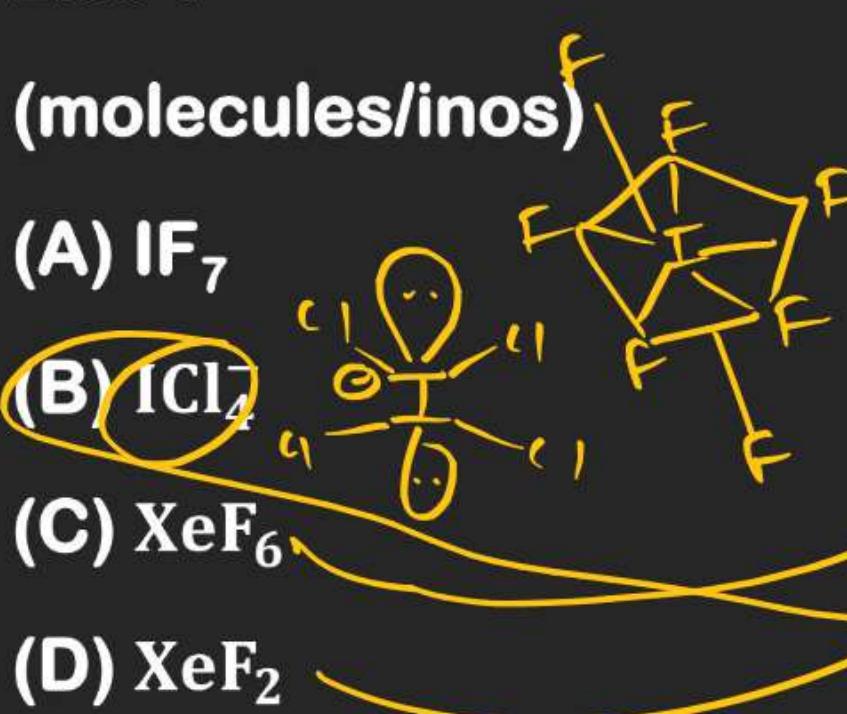
- (B) B, E, A only
- (D) A, B, D, only



CHEMICAL BONDING

29. Match List-I with List-II

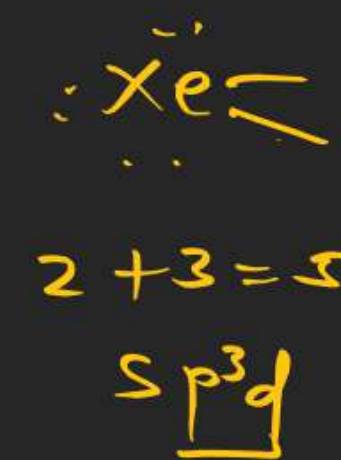
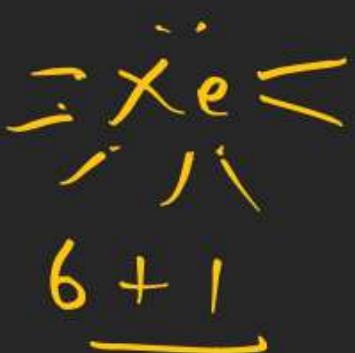
List-I



List-II

(No. of lone pairs of e^- on central atom)

- I. Three
- II. One
- III. Two
- IV. Zero



Choose the correct answer from the options given below:

(A) A - II, B - III, C - IV, D - I

(B) A - IV, B - III, C - II, D - I

(C) A - II, B - I, C - IV, D - III

(D) A - IV, B - I, C - II, D - III

CHEMICAL BONDING

30. Match List I with List II:

List – I

(Complexes)



List – II

(Hybridisation)



(A) A – II, B – I, C – III, D – IV

(C) A – II, B – I, C – IV, D – III

(B) A – I, B – II, C – III, D – IV

(D) A – I, B – II, C – IV, D – III

CHEMICAL BONDING

31. Among the following, the number of species having the linear shape is ____.



(5)



2 + 3

sp^{3d}

f

Bentlinear
 $\begin{array}{c} \text{O} = \text{C} = \text{O} \\ \text{SP} \qquad \text{SP} \end{array}$

Carbon
oxide


I

Bent
 $\begin{array}{c} \text{Cl} - \text{Be} - \text{Cl} \\ \text{SP} \qquad \text{SP} \end{array}$

Bent
linear