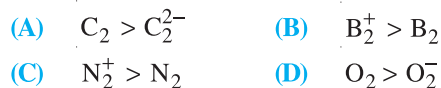


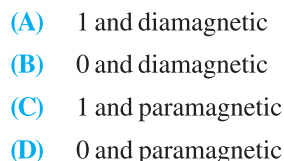
## MISCELLANEOUS EXERCISE

Choose the correct options for each of the following questions. Questions marked with \* may have more than one correct options.

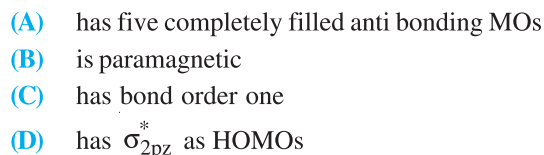
1. Which of the following is not correct with respect to bond length?



2. Assuming that Hund's rule is violated, the bond order and magnetic nature of the diatomic molecule  $B_2$  is :



3. Peroxide ion.



4. Two nodal planes are present in :



- \*5. In which of the following there is possibility of back bonding?



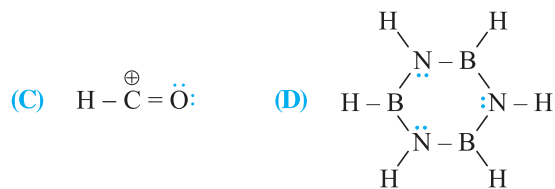
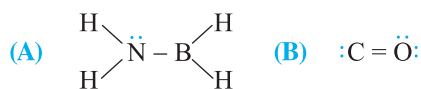
- \*6. Which of the following can exist as dimer ?



- \*7. In which of the following hybridization state is not same in vapour phase structure and in solid phase structure ?



- \*8. In which of the following there is possibility of  $p\pi - p\pi$  bond :



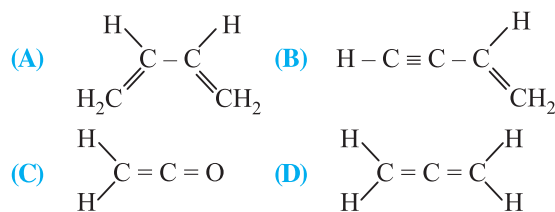
- \*9. In which of the following all atoms do not lie in same plane in all conformers (if any) [conformer  $\Rightarrow$  structure obtained by rotation about single bond]



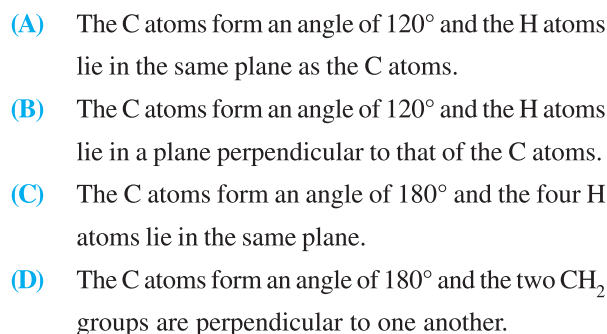
10. Number of lone pair electrons in  $I_3^-$  is :



- \*11. Which of the following is planar ?



12. Which statement best describes the structure of allene molecule,  $H_2C=C=CH_2$  ?



13. The bond angle and % of d-character in  $SF_6$  are :



14. The compound in which the number of  $d\pi - p\pi$  bonds are equal to those present in  $ClO_4^-$  is :



15. Which species has the maximum number of lone pair of electrons on the central atom ?  
 (A)  $\text{ClO}_3^-$  (B)  $\text{XeF}_4$   
 (C)  $\text{SF}_4$  (D)  $\text{I}_3^-$
16. Phosphoric acid ( $\text{H}_3\text{PO}_4$ ) is syrupy in nature due to :  
 (A) strong covalent bonding  
 (B) hydrogen bonding  
 (C) van der Waal's forces  
 (D) None of these
- \*17. Which of the following statement (s) is(are) correct with respect to  $\text{BF}_3$ ?  
 (A) It is triangular planar molecule  
 (B) It has two type of B – F bond length  
 (C) It has  $p\pi$ -  $p\pi$  back bonding  
 (D) Its B – F bond length is shorter than B – F bond length of  $\text{BF}_4^-$
- \*18. Which of the following are arranged in correct order of bond angle around central atom?  
 (A)  $\text{PF}_3 > \text{PH}_3$  (B)  $\text{Cl}_2\text{O} > \text{F}_2\text{O}$   
 (C)  $(\text{SiH}_3)_2\text{O} > (\text{CH}_3)_2\text{O}$  (D)  $\text{NCl}_3 > \text{NF}_3$
19. What is the value of bond angle X in the molecule given below?  
 (A)  $120^\circ$  (B)  $109.5^\circ$   
 (C)  $180^\circ$  (D)  $103^\circ$
- 
- \*20. What is the hybridization state of phosphorous in solid form of  $\text{PCl}_5$ ?  
 (A)  $sp^3$  (B)  $sp^3d$   
 (C)  $sp^3d^2$  (D)  $dsp^2$
- \*21. In which of the following mixtures of solvents will there be intermolecular hydrogen bonding between the different solvent molecules?  
 (A)  $\text{Et}_2\text{O}$  and THF (B)  $\text{EtOH}$  and  $\text{H}_2\text{O}$   
 (C)  $\text{EtNH}_2$  and  $\text{Et}_2\text{O}$  (D)  $\text{Et}_2\text{O}$  and HF
- \*22. Which of the following statements is(are) correct?  
 (A) The viscosity decreases along the series of liquids  
 $\text{H}_3\text{PO}_4 > \text{H}_2\text{SO}_4 > \text{HClO}_4$   
 (B) The boiling point decreases along the series of liquids: p-dihydroxybenzene  
 $> \text{m-dihydroxybenzene} > \text{o-dihydroxybenzene}$

- (C) The solubility in water decreases along the series of liquids  
 $\text{HOCH}_2\text{CH}_2\text{OH} > \text{HOCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH} > \text{HOCH}_2(\text{CHOH})_4\text{CH}_2\text{OH}$
- (D) The vapors pressure decreases along the series of liquids  
 $\text{H}-\text{O}-\text{H} > \text{CH}_3-\text{CH}_2\text{OH} > \text{CH}_3-\text{O}-\text{CH}_3$
23. The percentage of p-character in the orbital forming P – P bond in  $\text{P}_4$  molecule is :  
 (A) 25 (B) 33  
 (C) 50 (D) 75
- \*24. Which of the following molecular species has/have nonzero dipole moment?  
 (A)  $\text{PCl}_3\text{F}_2$  (B)  $\text{PCl}_2\text{F}_3$   
 (C)  $\text{XeO}_3\text{F}_2$  (D)  $\text{SOF}_4$
25. In which of the following there is two different bond length?  
 (A)  $\text{BF}_3$  (B)  $\text{PF}_5$   
 (C)  $\text{NO}_3^-$  (D)  $\text{N}_2\text{O}_5$
26. Which of the following resonance structures of thiocyanate ion is most important?  

$$\begin{array}{ccc} \text{:}\ddot{\text{S}}=\text{C}=\ddot{\text{N}}\text{:} & \text{:}\ddot{\text{S}}-\text{C}\equiv\text{N}\text{:} & \text{S}\equiv\text{C}-\ddot{\text{N}}\text{:}^{2-} \\ \text{[I]} & \text{[II]} & \text{[III]} \end{array}$$
  
 (A) Only I (B) I and II  
 (C) Only III (D) All are equally important

## LINK-COMPREHENSION TYPE :

## Paragraph for Questions 27 - 29

Bond length is the average distance between the nuclei of the two bonded atoms. This represents the internuclear distance corresponding to minimum potential energy for the system.

Order of bond length :  $\text{C}-\text{C} > \text{C}=\text{C} > \text{C}\equiv\text{C}$

This implies that presence of  $\pi$  – bond decrease the bond length. The  $\pi$  – bond can be formed by the  $p_\pi$  –  $p_\pi$  bonding or by  $p_\pi$  –  $d_\pi$  bonding.

Bond strength also depends on difference in electronegativity of bonded atoms.

27. Which of the molecule has the shortest non-metal-F bond?  
 (A)  $\text{NF}_3$  (B)  $\text{CF}_4$   
 (C)  $\text{OF}_2$  (D)  $\text{PF}_3$

28. Which of the following is true about C–Cl bond length in ethyl chloride (I) and vinyl chloride (II) ?
- (A) C–Cl bond length of I and II are equal  
 (B) C–Cl bond length of I is greater than II  
 (C) C–Cl bond length of I is less than II  
 (D) C–Cl bond length of I is twice that of II
29. Which of the molecule does not have  $p_\pi - d_\pi$  bonding?
- (A)  $\text{SO}_2$  (B)  $\text{PF}_3$   
 (C)  $\text{CO}_2$  (D)  $\text{SO}_3$

### Paragraph for Questions 30 - 31

Back bonding is observed when two adjacent atoms have orbitals, of which one is filled and other is empty, then the  $e^-$  pair from the filled orbital is given into the vacant orbital forming a dative- $\pi$  bond.

The atom having filled orbital is mostly of the second period while the atom with empty orbital belongs to either II<sup>nd</sup> or III<sup>rd</sup> period forming either  $p_\pi - p_\pi$  bond or  $p_\pi - d_\pi$  bond.

30. As a result of back bonding.
- (A) Bond length increases  
 (B) Bond strength decreases  
 (C) Bond angle decreases  
 (D) Bond angle either increases or remain same.
31. Which of the following is an incorrect statement?
- (A)  $\text{CHF}_3$  is a stronger acid than  $\text{CHCl}_3$ .  
 (B)  $\text{CH}_3\text{NCS}$  is bent while  $\text{SiH}_3\text{NCS}$  is linear in shape.  
 (C)  $(\text{SiH}_3)_3\text{N}$  is less basic than  $(\text{CH}_3)_3\text{N}$ .  
 (D) The complex of  $(\text{SiH}_3)_2\text{O}$  with  $\text{BF}_3$  is less stable than that of  $(\text{CH}_3)_2\text{O}$  with  $\text{BF}_3$ .

### MATCH MATRIX TYPE :

32. MATCH THE FOLLOWING :

List 1	List 2
(A) $\text{C}_2\text{H}_4$	(p) Molecular plane is nodal plane for non-directional covalent bond.
(B) $\text{B}_2\text{H}_6$	(q) A H-bond in the molecule
(C) $\text{N}_2\text{H}_4$	(r) It has basic properties in relation to water
(D) $\text{H}_2\text{F}_2$	(s) A Hydrogen bridge bond in the molecule

33. MATCH THE FOLLOWING :

List 1 [Molecular species]	List 2 [O - O bond distance in pm]
(A) $\text{O}_2^-$	(p) 121
(B) $\text{O}_2$	(q) 112
(C) $\text{O}_2^+$	(r) 132
(D) $\text{O}_2^{2-}$	(s) 149

34. MATCH THE FOLLOWING :

List 1	List 2
(A) $\text{B}_2$	(p) Paramagnetic
(B) $\text{N}_2$	(q) Undergoes oxidation
(C) $\text{O}_2^-$	(r) Undergoes reduction
(D) $\text{O}_2$	(s) Bond order $\geq 2$
(E) $\text{C}_2$	(t) Mixing of orbitals

35. MATCH THE FOLLOWING :

List 1	List 2
(A) HF	(p) Hydrogen bonding
(B) $\text{H}_2\text{O}$	(q) Maximum boiling point
(C) HCl	(r) Longest bond
(D) HI	(s) Most volatile
(E) $\text{NH}_3$	(t) Polar covalent

36. MATCH THE FOLLOWING :

List 1 [Molecule]	List 2 [Molecular shape]
(A) $\text{XeO}_3$	(p) Triangular planar
(B) $\text{XeOF}_4$	(q) T-shape
(C) $\text{BO}_3^{3-}$	(r) Trigonal pyramid
(D) $\text{ClF}_3$	(s) Square pyramid
(E) $\text{I}_3^-$	(t) Linear

37. MATCH THE FOLLOWING :

List 1 [Molecule]	List 2 [Molecular shape]
(A) $\text{PCl}_5$	(p) Linear
(B) $\text{IF}_7$	(q) Pyramidal
(C) $\text{H}_3\text{O}^+$	(r) Trigonal bipyramidal
(D) $\text{ClO}_2^-$	(s) Pentagonal bipyramidal
(E) $\text{NH}_4^+$	(t) Angular

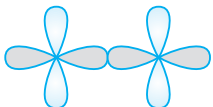


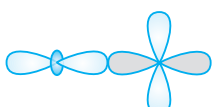
## 38. MATCH THE FOLLOWING :

List 1		List 2	
[Molecules]		[Bond angle]	
(A)	$\text{XeF}_2$	(p)	$90^\circ$
(B)	$\text{CF}_4$	(q)	$120^\circ$
(C)	$\text{XeF}_4$	(r)	$180^\circ$
(D)	$\text{BF}_3$	(s)	$109.5^\circ$

## 39. MATCH THE FOLLOWING :

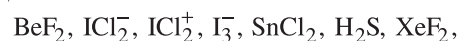
List 1		List 2	
(A)	$\text{B}_2$	(p)	Two $\pi$ bonds
(B)	$\text{C}_2$	(q)	One sigma bond.
(C)	$\text{N}_2$	(r)	One $\pi$ bonds.
(D)	$\text{Li}_2$	(s)	One sigma and two $\pi$ -bonds

## 40. MATCH THE FOLLOWING :

List 1		List 2	
[Orbital overlap]		[Orbital formed]	
(A)		(p)	p-d $\pi$ antibonding
(B)		(q)	d-d $\sigma$ bonding
(C)		(r)	p-d $\pi$ bonding
(D)		(s)	d-d $\sigma$ antibonding

## INTEGER TYPE :

41. The number of bent species among the following are :



42. The number of transformation in which the bond length decreases:



43. The number of non-polar species among the following are:

