

# CHEMISTRY

## BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

### NATURE OF CHEMICAL BOND

#### Exercise 1

1. What is the necessary condition for an ionic compound to be soluble in water ?

A.  $\Delta H_{\text{hyd}} > \Delta H_{\text{lattice}}$

B.  $\Delta H_{\text{lattice}} > \Delta H_{\text{hyd}}$

C.  $\Delta H_{\text{hyd}} > \Delta H_{\text{lattice}}$

D. None of these

**Answer: B**



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**2. Arrange the following ionic compounds in order of increasing ionic character :**

*KF*   *KCl*   *KBr*   *KI*  
*A*   *B*   *C*   *D*

A.  $A < B < C < D$

B.  $D < C < B < A$

C.  $B < A < C < D$

D.  $C < A < B < D$

**Answer: A**



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3. Which of the following is the weakest bond?

A. Hydrogen bond

B. Covalent bond

C. Ionic acid

D. Metallic bond

**Answer: C**



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4. The high following points and insolubility in organic solvents of sulphamic acid are due to its .....structure

A. simple ionic structure

B. cubic structure

C. bipolar ionic structure

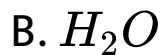
D. hexagonal structure

**Answer: A**



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**5. The molecule which contains ionic as well as covalent bond, is**

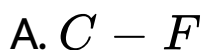


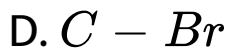
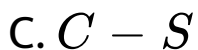
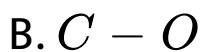
**Answer: C**



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**6. Which is the most covalent?**





**Answer: B**



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7. The molecule having zero dipole moment is



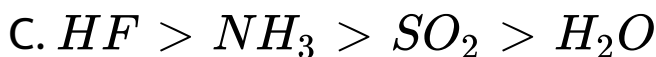
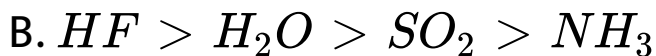
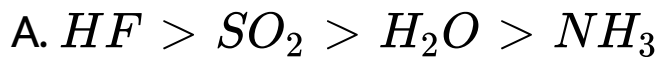


**Answer: B**

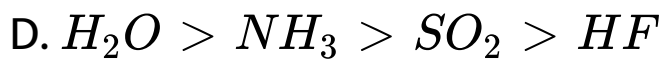


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8. The correct order of decreasing polarity is







**Answer: B**



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9. What is the bond angle of  $H - O - H$  in ice (answer approx. value) ?

A.  $120^\circ '28$

B.  $109^\circ$

C.  $90^\circ$

D.  $60^\circ$

**Answer: B**



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10. The bond angles of  $NH_3$ ,  $NH_4^+$  and  $NH_2^-$  are in the order .





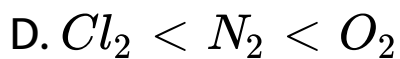
**Answer: B**



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**11.** Arrange the following in the correct order of bond length  $N_2$ ,  $O_2$  and  $Cl_2$





**Answer: C**



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**12.** The compound having maximum dipole moment is



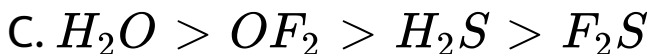
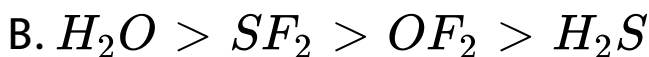
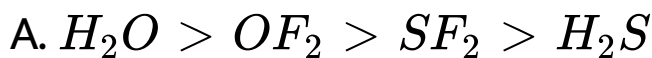
D.  $NI_3$

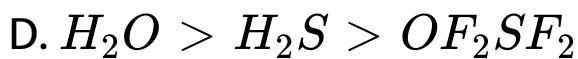
**Answer: A**



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**13.** Which of the following is correct order of bond angle ?





**Answer: A**



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**14.** Which of the following is correct regarding bond energies of  $NO$ ,  $NO^+$  and  $NO^-$  ?



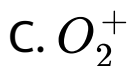


**Answer: D**



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15. Which of following requires maximum energy to undergo decomposition ?



D.  $N_2$

**Answer: D**



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**16.** What is the structure of  $XeF_6$ ?

A. Tetrahedral

B. Distorted octahedral

C. Octahedral

D. None of these



**Answer: B**



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**17.** Among the three molecules  $XeF_4$ ,  $SF_4$ ,  $SiF_4$ , which has/have tetrahedral structure?

A. All the three

B.  $SiF_4$  and  $SF_4$

C. Only  $SiF_4$

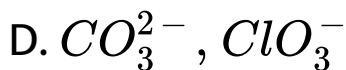
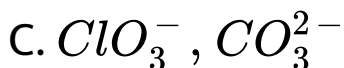
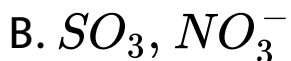
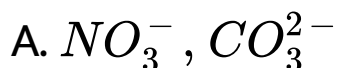
D. Only  $SF_4$

**Answer: C**



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**18.** Among the following, chose the correct pair, which is isostructural and isoelectronic ?



**Answer: A**



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**19.** Isostructural species are those which have the same shape and hybridisation. Among the given identify the isostructural pairs.

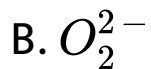


**Answer: B**



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**20. Which of the following is paramagnetic ?**



**Answer: A**



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21. Which of the following statements is correct regarding  $BeCl_2$ ?

A. It violates octet rule and has  $sp^2$

hybridisation

B. It has  $sp$  hybridisation and follows octet

rule

C. It violates octet rule and has linear

structure

D. All of the above are true

**Answer: C**



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22. In  $NO_3^-$  ion, the number of bond pairs and lone pairs of electrons on nitrogen atom are :

A. 2,2

B. 3,1

C. 1,3

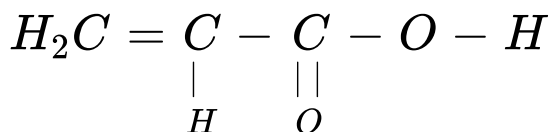
D. 4,0

**Answer: D**



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**23.** What is the type of hybridisation of carbon atoms marked with star ?



A.  $sp^2$ ,  $sp$

B.  $sp^2$ ,  $sp^2$

C.  $sp$ ,  $sp^2$

D. None of these

**Answer: B**



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24. Which of the following show correct structure of  $ICl_2$ ?

A. 

B. 



C. 

D. None of these

**Answer: B**



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**25.** Among the following, molecules, which one have trigonal planar structure ?

$XeO_3$ ,  $SO_3$ ,  $BF_3$ ,  $NH_3$

A.  $XeO_3$  and  $BF_3$

B.  $BF_2$  and  $SO_3$

C.  $NH_3$  and  $SO_3$

D. All of the above

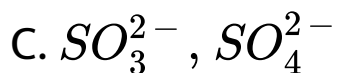
**Answer: B**



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26. Which of the following set posses  $sp^3$  hybridsatio ?

A.  $IO_4^-$ ,  $ICl_4^-$ ,  $IF_4^+$



**Answer: C**



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27. Hybridisation of the nitrogen atom and electronic geometry around nitrogen atom in pyridine is



A.  $sp^3$ , pyramidal

B.  $sp^2$  trigonal planar

C.  $sp^2$ , linear

D.  $sp^3$  tetrahedral

**Answer: B**



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**28.** Match the type of bond (given in Column I) with method of formation (given in Column II) and choose the correct option from the codes

given below.



A. 

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
6	2	3	1

B. 

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
3	2	6	1

C. 

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
1	2	3	4

D. 

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
2	4	5	6

**Answer: A**



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29. Which set of molecules are paramagnetic ?

A.  $B_2C_2$  and  $O_2$

B.  $C_2$ ,  $O_2$  and  $B_2$

C.  $O_2$ ,  $N_2$  and  $B_2$

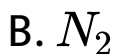
D.  $B_2$ ,  $O_2$  and  $NO$

**Answer: D**



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30. Which of the following molecule will be stabilised by losing one electron from its HOMO ?



**Answer: C**



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31. Hydrogen bonding is maximum in

A. ethyl chloride

B. triethyl amine

C. ethanol

D. diethyl ether

**Answer: C**



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32. Which one among the following does not have the hydrogen bond?

A. Phenol

B. Water

C. Liquid  $NH_3$

D. Liquid HCl

**Answer: D**



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33. Which of the following explanations accounts for o-nitro-phenol to be more volatile than p-nitrophenol?

A. Resonance

B. Steric hinderance

C. Hydrogen bond

D. Hyperconjugation

**Answer: C**



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34. In which of the following molecules the van der Waals forces are likely to be the most important in determining the mpt. and b.pt.?

A. CO

B.  $H_2S$

C.  $Br_2$

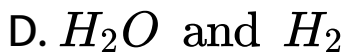
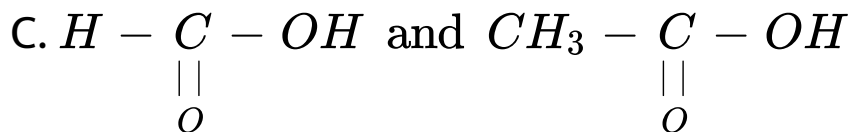
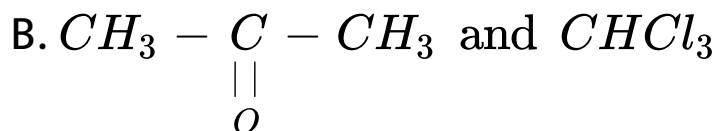
D.  $HCl$

**Answer: C**



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35. The pair of molecules forming strongest hydrogen bonds are



Answer: C



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## Exercise 2 Miscellaneous Problems

1. The percentage ionic character in  $Cs - Cl$  bond present in  $CsCl$  molecule will, be, if the electronegativities for  $Cs$  and  $Cl$  are 0.8 and 3.0, respectively

A. 62.9 %

B. 60 %

C. 75 %

D. 52.14 %

**Answer: D**



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2. If molecule  $MX_3$  has zero dipole moment, the sigma bonding orbitals used by M (atomic number  $< 21$ ) are

A.  $sp$  hybridised

B.  $sp^2$  hybridised

C.  $sp^3$  hybridised

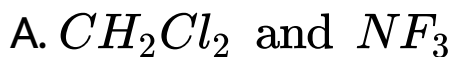
D. None of these

**Answer: B**



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**3. Which of the following pairs has zero dipole moment ?**



**Answer: B**



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4. Given : Dipole moment of  $HCl = 1.03 D$

Bond length of  $HI = 0.38D$

Bond length = 161pm

The ratio of partial positive charge on H-atom  
in HCl to that in HI will be

A. 2:1

B. 3.42:1



C. 2.39: 1

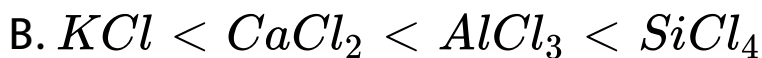
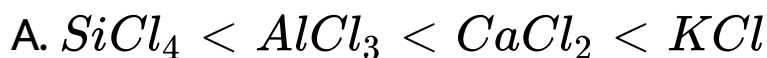
D. 4: 1

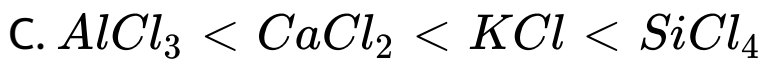
**Answer: B**



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5. The correct order of increasing covalent character of the following is





D. None of the above

**Answer: B**



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6. Bond energy  $H - H$ ,  $F - F$  and  $H - F$  bonds are 104, 38 and 135  $\text{Kcal mol}^{-1}$ , respectively. The resonance energy in the  $H - F$  molecule will be

A. 142 Kcal mol<sup>-1</sup>

B. 66 kcal mol<sup>-1</sup>

C. 72.14 kcal mol<sup>-1</sup>

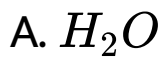
D. 79.26 kcal mol<sup>-1</sup>

**Answer: C**



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7. Which of the following compounds has the smallest bond angle in its molecule ?



**Answer: B**



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8. The bond order of  $H_2^-$  ion is  $\frac{1}{2}$ . If it has 2 bonding electrons, how many antibonding electrons it will have ?

A. 3

B. 1

C. 2

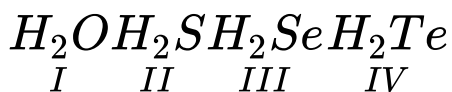
D. 4

**Answer: B**



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9. Arrange the following molecules in the increasing order of bond angle.



A.  $I < II < III < IV$

B.  $IV < III < II < I$

C.  $I < III < II < IV$

D.  $IV < II < III < I$

**Answer: B**



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**10.** The compound  $MX_4$  is tetrahedral. The number of  $\angle XMX$  angles formed in the compound is

A. three

B. four

C. five

D. six

**Answer: D**



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**11. Match the following and chose the correct option.**



- A.  $A$   $B$   $C$   $D$   
4 1 3 2
- B.  $A$   $B$   $C$   $D$   
1 3 2 4
- C.  $A$   $B$   $C$   $D$   
3 2 4 1
- D.  $A$   $B$   $C$   $D$   
3 1 2 4

**Answer: A**



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**12.** In  $XeF_2$ ,  $XeF_4$  and  $XeF_6(g)$  the number of lone pairs on Xe respectively are :



A. 2,3,1

B. 1,2,3

C. 4,1,2

D. 3,2,1

**Answer: D**



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**13.** Molecular shapes of

$SF_4$ . And  $CF_4$  and  $XeF_4$  are:

A. different with 1,0 and 2 lone pairs of electrons on the central atoms, respectively

B. different with 0,1 and 2 lone pairs of electrons on the central atoms, respectively

C. the same with 1,1 and 1 lone pairs of electrons on the central atoms, respectively

D. the same with 2,0 and 1 lone pairs of electrons on the central atoms, respectively

**Answer: A**



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**14.** The d-orbitals involved in  $sp^3d$  hybridisation is:

A.  $d_{xy}$

B.  $d_{zx}$

C.  $d_{z^2}$

D.  $d_{x^2 - y^2}$

**Answer: B**



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**15.** In accordance to molecular theory,

A.  $O_2^+$  is diamagnetic and bond order is more than  $O_2$

B.  $O_2^+$  is diamagnetic and bond order is less than  $O_2$

C.  $O_2^+$  is diamagnetic and bond order is more than  $O_2$

D.  $O_2^+$  is diamagnetic and bond order is less than  $O_2$

**Answer: C**



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**16.** The bond dissociation energy of  $B - F$  in  $BF_3$  is  $646 \text{ kJ mol}^{-1}$  whereas that of  $C - F$  in  $CF_4$  is  $515 \text{ kJ mol}^{-1}$ . The correct reason for higher  $B - F$  bond dissociation energy as compared to that of  $C - F$  in  $CF_4$  is

A. smaller size B-atom as compared to that of C-atom

B. stronger  $\sigma$  bond between B and F in  $BF_3$  as compared to that between C and F in  $CF_4$

- C. significant  $p\pi - p\pi$  interaction between B and F in  $BF_3$  whereas there is no possibility of such interaction between C and F in  $CF_4$
- D. lower degree of  $p\pi - p\pi$  interaction between B and F in  $BF_3$  than that of between C and F in  $CF_4$

**Answer: C**



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17. Which of the following statements (s) is/are true ?

A. HF is less polar than HBr

B. Absolutely pure water does not contain any ions

C. Chemical bond formation takes place when forces of attraction overcome the forces of repulsion

D. In covalency, transference of electrons take place

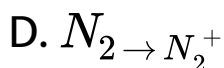
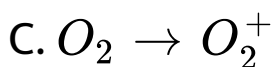
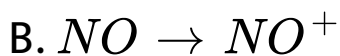
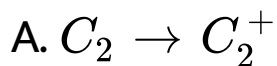


**Answer: C**



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**18.** In which of the following ionisation processes, the bond order has increased and the magnetic behaviour has changed ?



**Answer: B**



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**19.** Consider the following compounds,

I, 1,2-hydroxybenzene

II 1,3-dihydroxybenzene

III 1,4-dihydroxybenzene

IV. Hydroxybenzene

A.  $I < II < III < IV$

B.  $IV < I < II < III$

C.  $IV < II < I < III$

D.  $I < II < IV < III$

**Answer: B**



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20. Ortho -nitrophenol is less soluble in water than *p*- and *m* - nitrophenols because

A. o-nitrophenol is more steam volatile than those of m- and p-isomers

B. o-nitrophenol shows intermolecular H-bonding

C. o-nitrophenol shows intermolecular H-bonding

D. melting point of o-nitrophenol is lower than those of m-and p-isomers

**Answer: B**



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