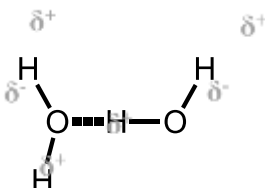


Chemical Bonding

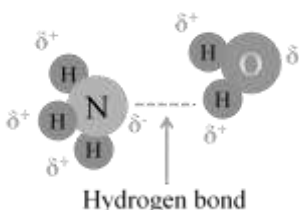
Day - 3

HYDROGEN BOND

This is special case of dipole-dipole interaction.. This is found in the molecules in which highly polar N-H, O-H or H-F bonds are present. Although hydrogen bonding is regarded as being limited to N, O and F; but species such as Chlorine may also participate in hydrogen bonding. Energy of hydrogen bond varies between 10 to 100 kJ mol. Inter molecular H bond. Same molecule

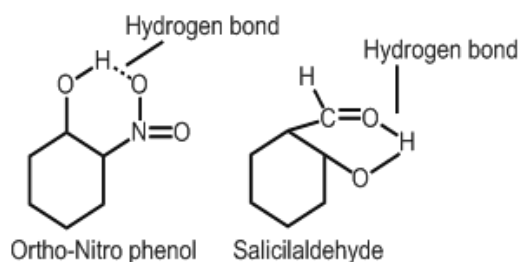


Inter molecular H bond. Different molecule



Hydrogen Bonding between Ammonia and Water

INTRA MOLECULAR HYDROGEN BOND



HYDROGEN BOND STRENGTH

Hydrogen bonds can vary in strength from weak ($1-2 \text{ kJ mol}^{-1}$) to strong ($161.5 \text{ kJ mol}^{-1}$ in the ion Typical enthalpies in vapor include:

F – H \cdots : F (161.5 kJ/mol or 38.6 kcal/mol), illustrated uniquely by HF_2^- ,

O – H \cdots : N (29 kJ/mol or 6.9 kcal/mol), illustrated water-ammonia

O – H \cdots : O (21 kJ/mol or 5.0 kcal/mol), illustrated water-water, alcohol-alcohol

N – H \cdots : N (13 kJ/mol or 3.1 kcal/mol), illustrated by ammonia-ammonia

N – H \cdots : O (8 kJ/mol or 1.9 kcal/mol), illustrated water-amide

Ex.3: What is the dominant intermolecular force on bond that must be overcome in converting liquid CH_3OH to a gas? [NEET 2009]

Chemical Bonding

- (a) Hydrogen bonding
- (b) Dipole-dipole interaction
- (c) Covalent bonds
- (d) London or dispersion force

Answer (a)

Ex.4: Which of the following statement is not correct for sigma and pi-bonds formed between two carbon atoms? [NEET 2003]

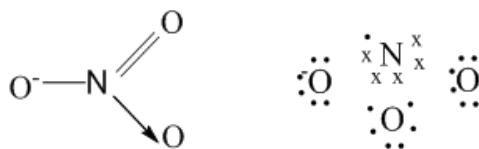
- a) Free rotation of atoms about a sigma bond is allowed but not in case of a pi-bond
- b) Sigma bond determines the direction between carbon atoms but a pi-bond has no primary effect in this regard
- c) Sigma bond is stronger than a pi-bond
- d) Bond energies of sigma and pi-bonds are of the order of 264 kJ/mol and 347 kJ/mol,

Bond energy of sigma and pi bonds are not of the order of 264 kJ/mol and 347 kJ/mol respectively. The bond energy of C – C is 347 kJ/mol and C = C is 619 kJ/mol. Answer (d)

Ex.5: In NO_3^- ion number of bond pair and lone pair of electron on nitrogen atom are [NEET 2002]

- (a) 2,2
- (b) 3,1
- (c) 1,3
- (d) 4,0

In NO_3^- ion



Nitrogen has four bond pair and zero lone pair of electrons, due to the presence of one Coordination bond. Answer (d)

Ex.6: Which of the following has $p\pi-d\pi$ bonding? [NEET 2002]

- (a) NO_3^-
- (b) SO_3^{2-}
- (c) BO_3^{3-}
- (d) CO_3^{2-}

Answer (b)

Ex.7: Which of the following is isoelectronic? [NEET 2002]

- (a) CO_2 , NO_2
- (b) NO_3^- , CO_2
- (c) CN^- , CO
- (d) SO_2 , CO_2

CN^- and CO are isoelectronic because they have equal number of electrons.

In CN^- the number of electrons = $6 + 7 + 1 = 14$

Chemical Bonding

In CO the number of electrons = $6 + 8 = 14$

Answer (c)

BOND LENGTH

A. Ionic Compound:- bond length is sum of cationic radius and anionic radius.

B. Covalent compound:

The bond length is measured by spectroscopic, x-ray diffraction and electron diffraction. Covalent radius is then calculated from this.

Lewis structure:- unable to give bond angle

VESPR they:- much better in predicate bond angle

M. O. T:- Give bond angle much better

Question Practice Online