Definition of chemical bond

The attractive force which holds various constituents (atoms, ions, etc.) together in different chemical species is called a chemical bond.

Oxygen molecule

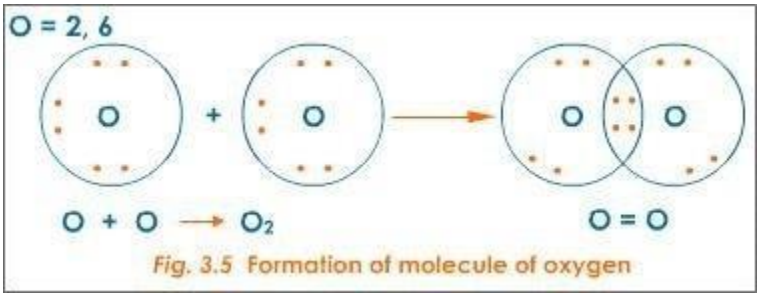


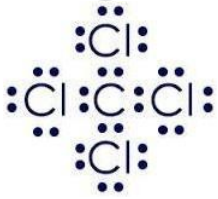
Fig. 3.5 Formation of molecule of oxygen

Each oxygen atom has six valence electrons, and is two electrons short of nearest noble gas configuration of neon. Two oxygen atoms can both achieve stable structures by sharing it's electron pair to achieve the nearest noble gas configuration. It forms a covalent bond, as their electro-negativities are equal. Oxygen molecule has double covalent bond.

Nitrogen molecule

The electronic configuration of nitrogen is 2,5. It needs 3 more electrons to attain the octet of electrons. It shares these 3 valence electrons with another nitrogen atom forming a triple covalent bond.

Carbon-tetrachloride

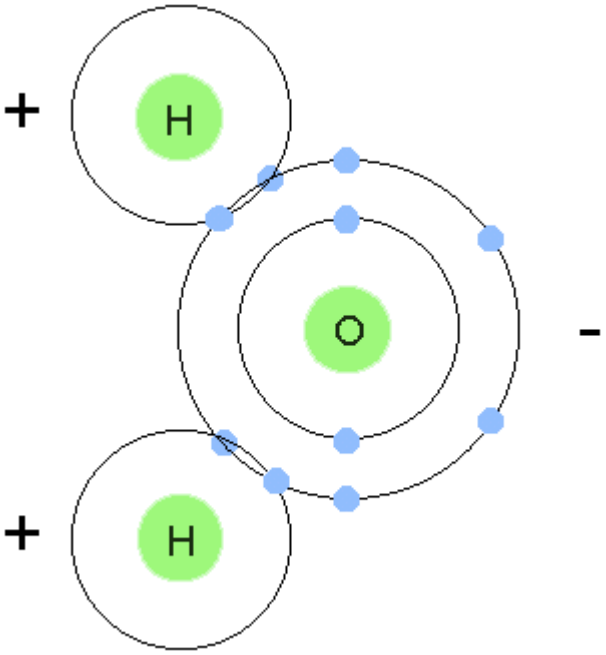


Carbon has 4 valence electrons and each chlorine atom has 1 valence electron. Hence, four chlorine atoms will share their electron with carbon's valence electrons to form four single bonds, and thus, form CCl_4.

Methane

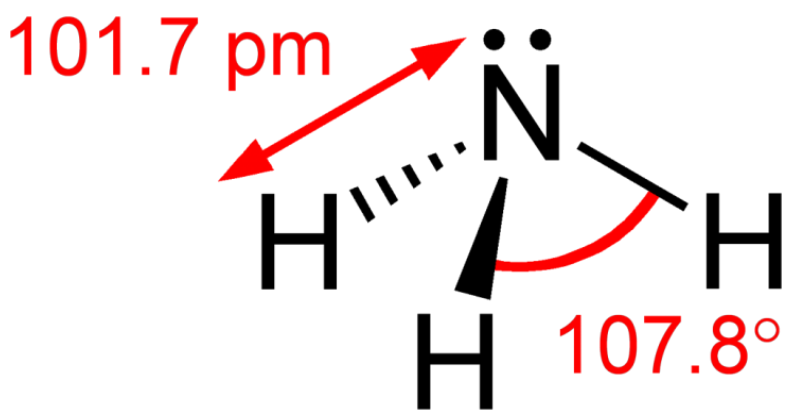
In methane (CH_4) molecule, each of the 4 electrons in the outermost ("valence") shell of carbon is shared with one hydrogen. In turn, each of the hydrogen also shares one electron with carbon. Overall, carbon "owns" 8 valence electrons, satisfying the octet rule, and each hydrogen has 2, satisfying the duplet rule.

Water



Water molecules contain two hydrogen atoms bonded to one oxygen atom. Oxygen, with six valence electrons, needs two additional electrons to complete its valence shell. Each hydrogen contains one electron. Thus, oxygen shares the electrons with two hydrogen atoms to complete its own valence shell, and in return, shares two of its own electrons with each hydrogen, completing the valence shell of hydrogen atoms.

Ammonia



The single nitrogen atom in an ammonia molecule is bonded to three atoms of hydrogen through the sharing of three electron pairs, one with each atom of hydrogen. In each of these, three covalent bonds are formed between nitrogen and hydrogen, one electron is provided by nitrogen and one electron is provided by the hydrogen atom. This forms one pair of shared electrons.

VSEPR theory explaination

VSEPR theory explain the shape of a molecule by number of valence electron present in valence shell of central atom. Charged electrons in valence shell repel each other, electrons occupy such position in space so that repulsion should be minimum.

VSEPR approach to find molecular structure

VSEPR theory is used to find out the geometry of a molecule.According to the VSEPR theory, the electrons repel one another and will, therefore, adopt an arrangement that minimises this repulsion. Repulsions are minimum when the electron pairs or groups of electron pairs are as far apart as possible. This will then be the most stable form or shape of a molecule known as the molecule's geometry.

VSEPR theory limitation

VSEPR fails to explain shapes of transition Metal compound. Valence bond theory introduces the new concept of resonance and molecular stability, where as molecular orbital theory explains the shapes of polyatomic molecules.

Valence bond theory

The valence bond theory explains the structure and magnetic properties of a large number of coordination compounds. Valence bond theory was used to explain the structure of coordination compounds and the bond linkages. According to valence bond theory, the metal atom or ion under the influence of ligands can use its (n-1)d, ns, np, nd orbitals for hybridization to yield a set of equivalent orbitals of definite geometry such as octahedral, tetrahedral, square planar etc. The hybridized orbitals can overlap with the ligand orbitals that can donate electron pairs for bonding.

VBT in terms of energy consideration

Valence bond theory of covalent bond explains that covalent bond forms when attractive forces balances repulsive forces and the system acquires minimum energy. Covalent bond is formed by sharing of electrons.

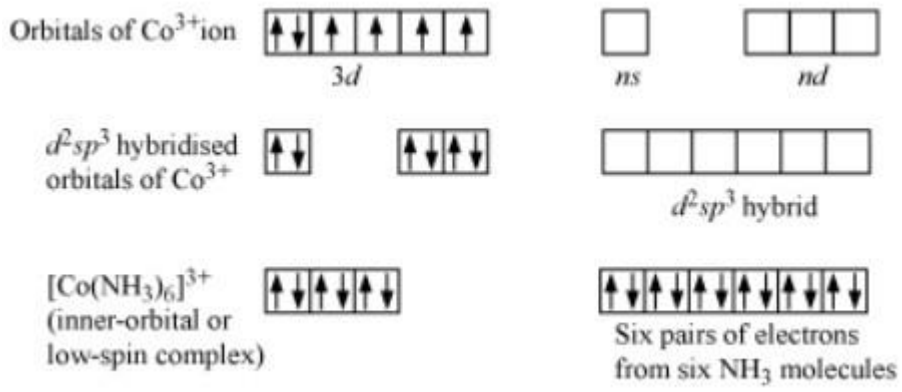
VBT in terms of orbital overlap

According to VBT a covalent bond is formed only when half filled orbitals of two atoms partially overlap with each other.

Bond dissociation energy

The amount of energy required to break one mole of bond in gaseous state is called as bond enthalpy. For example, C-C bond require 348.4 kJ mol^{-1} of energy for bond dissociation.

Outer orbital complexes



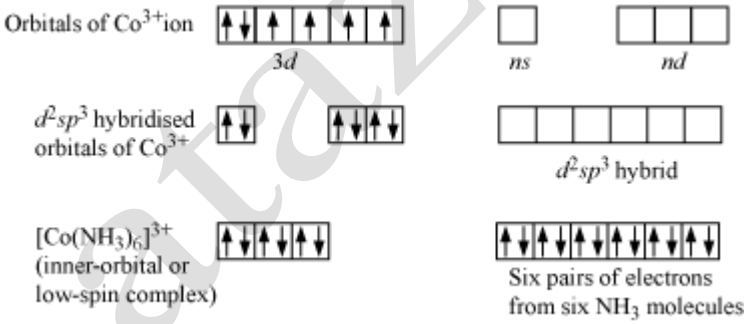
Characteristics of outer orbital complexes

The d-orbitals involved in the hybridization may be inner d-orbitals, (n-1) d-orbitals, or the outer d-orbitals, nd-orbitals. The complexes formed in these two ways are referred to as low spin and high spin complexes or, inner and outer orbital complexes respectively. Hybridisation is sp3sp3 and the shape is tetrahedral.

Types of covalent bonding

There are two types of covalent bonds,
1. Sigma (σ) bond
2. Pi (π) bond

Inner-orbital complexes



A complex, typically of a transition element, in which the hybridization of the central metal atom utilizes d-orbitals from the shell inside that of the outermost occupied shell.

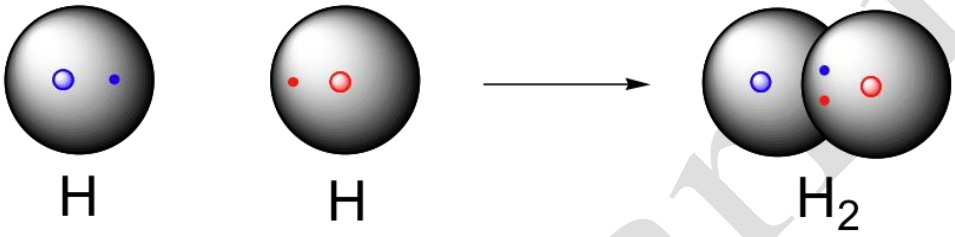
Define , identify and give example of sigma bond

The covalent bond formed by the coaxial overlap of atomic orbitals is called as sigma bonding.for example methane molecule contain 4 C-H sigma bonding.

Definition and examples of pi bond

The covalent bond formed by lateral overlap of atomic orbitals is called as pi bond. For example, ethylene molecule contain 5 sigma bonding and 1 pi bonding in it.

s-s overlapping and give its examples



When two half filled s - orbitals of two different atoms containing unpaired electrons with opposite spin overlap with each other it is called as s-s overlap.example, formation of Hydrogen molecule .

Hybridisation of complex compounds on the basis of magnetic behavior

Complex Compound or Ion	Magnetic Behaviour	Hybridisation	Shape
$[Fe(CN)_6]^{3-}$	Paramagnetic	d^2sp^3	Octahedral
$[Fe(CN)_6]^{4-}$	Diamagnetic	d^2sp^3	Octahedral
$[Ni(CN)_4]^{2-}$	Diamagnetic	dsp^2	Square Planar
$[Cu(NH_3)_4]SO_4$	Paramagnetic	dsp^2	Square Planar
$[Ni(NH_3)_4]SO_4$	Paramagnetic	sp^3	Tetrahedral
$[Cu(CN)_4]^{2-}$	Paramagnetic	dsp^2	Square Planar
$[Fe(H_2O)_6]^{3+}$	Paramagnetic	d^2sp^3	Octahedral
$[Cr(CN)_6]^{3-}$	Paramagnetic	d^2sp^3	Octahedral
$[Co(CN)_6]^{3-}$	Diamagnetic	d^2sp^3	Octahedral
$[Co(NH_3)_6]^{3+}$	Diamagnetic	d^2sp^3	Octahedral

s-p overlapping and give its examples

The overlap between one half filled s orbital of one atom and one half filed p orbital of another atom containing electrons with opposite spins is called as s-p overlapping.example, formation of HF molecule.

p-p overlapping and give its examples

The overlap between two half filled p orbitals of two different atoms containing electrons with opposite spins is called as p-p . example, formation ofF_2.

Comparision between sigma bond and pi bond

Sigma bonds are formed by coaxial overlap where as pi bond is formed by lateral overlapping .sigma being strong bond where as pi being weak due to electron density is high along the axis of molecule in sigma bonding where as its is zero in pi bonding.

Characteristics of a bond

Bond energy, Bond length, Bond angle ,Bond order this are the characteristics of chemical bond.

Drawbacks of VBT

It fails to explain the tetravalency of carbon.
This theory does not discuss about energies of electrons.
The assumptions about the electrons being localized to specific locations.

Defination and examples of bond length

The equilibrium distance between the nuclei of two bonded atoms in a molecule is called as bond length.

Factors affecting bond length

Size of the atom and multiplicity of bonds are the factors which affect the bond length.

Bond enthalpy

The amount of energy required to break one mole of bonds between two atoms in a gaseous state is called as Bond enthalpy.example c=c bond require 614.7 kJmol−1mol−1

Factors affecting bond enthalpy

Size of atom and bond multiplicity are the factors affecting the bond enthalpy.

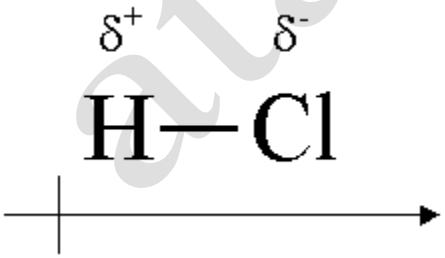
Defination and examples of bond order

The number of bonds present between the two atoms in a molecule is called as bond order of that molecule. For example, O_2 molecule have bond order 2.

Polar compounds

Charge separation between the atoms of the molecule creates polarity in compounds.There should be electronegativity difference between the atoms in polar compounds.

Polar covalent compounds



Polar covalent bonding is a type of chemical bond where a pair of electrons is unequally shared between two atoms due to difference in their electro-negativities. These compounds are called polar covalent compounds. An example is HCl, where both have different electro-negativities.

Definition and examples of polar covalent compounds

When the covalent bonds between two atoms of different electronegativity then two poles that is positive and negative generates between them such bonds are called as polar covalent bond.
For example: HCl,HF .

Polar nature of water

In water molecule the dipole moment shifts towards oxygen (because of more electronegativity).Therefore water is a polar molecule.

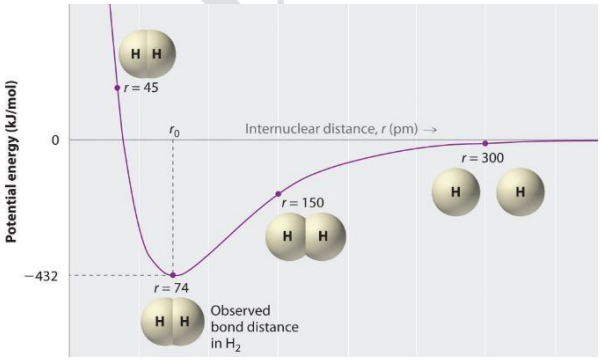
Isoelectronic molecule

Two or more molecular entities (atoms, molecules, or ions) are described as being isoelectronic with each other if they have the same number of electrons or a similar electron configuration and the same structure (number and connectivity
of atoms), regardless of the nature of the elements involved.

Partial ionic character of covalent bond

If two atoms linked together have different electro negativities , the bond formed is polar.In other words the bond is said to be posses partial ionic character. The extent of partial ionic character is determined by difference in electronegative of the combining atoms .More is the difference in electro negativity , greater will be the ionic character.

Importance of valance bond theory



Valence bond theory describes the electronic structure of molecules.

Failure of valance bond theory

Valence bond theory fails to determine the actual shapes of the polyatomic molecules, such as methane, ammonia and water which are Tetrahedral, Pyramidal and Bent respectively.

dipole moment

It is a physical quantity for measurement of polarity of covalent bond. it is a product of the magnitude of the charge and distance between the centers of positive and negative charges.

dipole moment of molecular structure

In a molecular structure dipole moment describes the polarity of the molecule.

Application of dipole moment

Dipole moment find out difference between polar and non polar molecule, it determine ionic character in molecule, it is the important tool to decide the geometry of molecule.

Ionic character of covalent bond

When atoms of large electro negativity difference combine together to form covalent bond then the atom with higher electro negativity pulls the shared pair of electron towards it shelf and acquire negative charge and the other atom acquire positive charge.this phenomenon develops ionic character in covalent bond.

partial covalent character of ionic bond

In Ionic bond formation when two oppositely charged ions approach each other ,the charged cation attracts electrons and repel positive nucleus, this develops polarization in ionic bond because of that Ionic bonds develop covalent character.

Properties of covalent compound

Properties of covalent compounds are :

Low melting points and boiling point
Low enthalpies of fusion and vaporisation
Soft or brittle solid form
Poor electrical and thermal conductivity

Difference between ionic and covalent compounds

Ionic compounds are mostly crystalline solids, have high melting and boiling points, conduct electricity when melted, and many are soluble in water but not in non-polar liquids. Covalent compounds can exist in solid, liquid or gaseous state, have low melting and boiling points, have poor electrical conductivities in all phases, and are more soluble in non-polar solvents.

hybridisation VBT Approach

It is the process of mixing and recasting of atomic orbitals of the same atom with slightly different energies to form equal number of new orbitals with equivalent energy , maximum symmetry and definite orientations in space. example, C shows sp^3sp3 hybridization in methane.

Important point of Hybridisation

Hybridization involves mixing and recasting of atomic orbitals of same element.
The orbitals involving in this process must have nearly same energy.
only the atomic orbitals not electron undergo hybridization.
Number of hybrid orbitals produced= number of hybrid orbitals involved in hybridization.

Bent rule

Bent rule describes and explains the relationship between the orbital hybridization of central atoms in molecules and the electro negativity of substituents.

Directional properties of bonds

The directional properties of molecules depend on type of orbitals involved in hybridization. s orbital is spherically symmetrical and overlap in any direction.

shape of molecule containing bond pair only

The shape of molecule containing bond pair of electron only depends on bond pair-bond pair electron repulsion.

shape of molecule containing bond pair and lone pair

The shape can be bent, trigonal planar, tetrahedral, square pyramid,square planar.

Effect of electronegativity on bond angle of central atom.

If the electro negativity of central atom increases bond angle increase and if it is decreases bond angle also decreases.

Effect of electronegativity on bond angle of central atom.

If the electro negativity of central atom increases bond angle increase and if it is decreases bond angle also decreases.

Effect of electronegativity on surrounding atom.

On surrounding atom If electro negativity increases or decreases it does not affect bond angle.

Determination of hybridisation of central atom

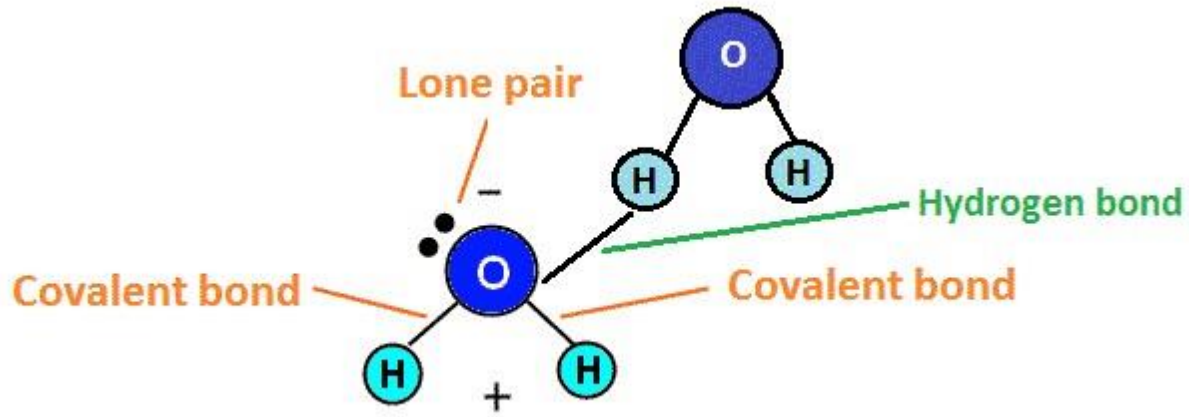
For determination of hybridization of central atom following rules can be observed.Start by drawing the Lewis structure. The least electronegative atom
that is not a hydrogen goes in the center (unless you have been given structural

arrangement)determine the number of electron domains on the central atom.Determine the electron geometry using VSEPR. Correlate the geometry with the hybridization.

shape of molecule

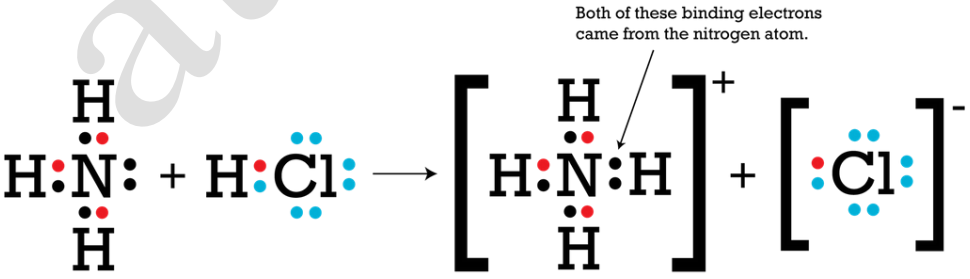
Shape of a molecule is determined by the type of hybridization and lone pairs on central atom. Example: Shape of the water molecule is bent or V-shaped with bond angle 104o5′104o5′. In water molecule, oxygen atom is sp3sp3 hybridized and has two lone pairs. Hence the shape is bent.

Identify different types of bond by drawing molecular structures



There are different types are present in molecule : Ionic, covalent , hydrogen bond. Covalent further classify as sigma and pii bond.

Different types of coordinate covalent bond



A covalent bond is formed by two atoms sharing a pair of electrons. The atoms are held together because the electron pair is attracted by both of the nuclei. In the formation of a simple covalent

bond, each atom supplies one electron to the bond - but that does not have to be the case. A coordinate bond (also called a dative covalent bond) is a covalent bond (a shared pair of electrons) in which both electrons come from the same atom.

coordinate bond.

It is a covalent bond in which both shared pair of electron comes from the same atom is called as coordinate or dative bond.coordination compounds are the example of coordinate bond.

Different cases of chemical bonding

Steric hindrance is the stopping of a chemical reaction which might be caused by a molecule's structure. An example of steric hindrance is how rotaxanes are created.

coordinate bond interms of valence bond approach

The central metal atom (or) ion has the required number of vacant orbitals for accommodating the electrons donated by the ligands. Hence, ligand forms coordinate bond with central atom in which electrons only shared by ligands not by central atom.

Define resonance

When a molecule is represented by two or more hybrid tructures and that structure are different in the position of electrons not in position of atoms, then the structure is called as resonating structure and this phenomenon is called as resonance.

Rules of writing resonating structure.

1.Leave atoms at there positions, draw hydrogen and lone pair of electron to start resonance.
2.Electrons in pi-bonding or non-bonding electron easily participate in resonance.
3.The total number of electrons does not change.
4.Do not exceed the octet rule.

resonance energy

The difference between the energy of the resonance hybrid and that of most stable contributing structure is called as resonance energy.

Characteristics of resonance

Resonating structures are not isomers, they differ in position of electrons, but not in position of nucleus. Real structure have less potential energy than contributing structure.

Salient features of molecular orbital theory

1. The electrons present in a molecule are present in various molecular orbitals.
2. The atomic orbitals of comparable energy combine to form molecular orbitals.
3. An electron in a molecular orbital is influenced by two or more nuclei depending on the number of atoms of molecule.
4. The bonding and anti-bonding molecular orbitals are present, which can be further classified as sigma bonding and anti bonding, pi bonding and anti bonding.

Difference between atomic orbital and molecular orbital.

1. Atomic orbitals contain orbitals like s,p,d,f where as atomic orbitals overlap to form molecular orbitals.
2. The energy of electron is described by atomic orbital where as energy of molecule is described by molecular orbital.
3. Atomic orbitals are more stable because their energy is less where as molecular orbitals are also stable but less than atomic orbital .

Formation of molecular orbital.

When two atoms move closer together to form a molecule, atomic orbitals overlap and combine to become molecular orbitals. The number of newly formed molecular orbitals is equal to number of combined atomic orbitals.

Characteristics of bonding MOT

Bonding molecular orbitals formed by addition of molecular orbitals and electron density is maximum.
Bonding molecular orbitals have lower energy, higher stability and they are formed by additive effect.

Characteristics of antibonding MOT

The molecular orbital formed by subtraction method in which electron density is maximum outside the nuclei. These are less stable than bonding molecular orbitals.

Difference between bonding and antibonding MOT

1. Electrons that spend most of their time between the nuclei of two atoms are placed into the bonding orbitals, and electrons that spend most of their time outside the nuclei of two atoms are placed into anti bonding orbitals.
2. This is because there is an increasing in electron density between the nuclei in bonding orbitals, and a decreasing in electron density in antibonding orbitals.
3. Placing an electron in the bonding orbital stabilizes the molecule because it is in between the two nuclei.Conversely, placing electrons into the antibonding orbitals will decrease the stability of the molecule. Electrons will fill according to the energy levels of the orbitals.
4. They will first fill the lower energy orbitals, and then they will fill the higher energy orbitals. If a bond order of zero is obtained, that means that the molecule is too unstable and so it will not exist.

Conditon for combination of atomic orbitals to form MOT

The combining atomic orbitals must have same energy.they must have same symmetry about molecular axis.the combining atomic orbitals must overlap to the maximum extent.

Types of MOT

There are two molecular orbitals can be formed that is sigma and pi molecular orbitals.

Difference between sigma and pi molecular orbital

When atomic orbitals overlap along the line joining the two nuclei they form sigma molecular orbitals whereas when atomic orbitals overlap laterally they form pi molecular orbitals.

electronic configuration and molecular behavior

electronic configuration in molecular orbitals explain stability of molecule, bond order, nature of bond , bond length and magnetic nature.

Stability of molecules

If number of electron present in bonding molecular orbitals is more than no of electron present in anti bonding molecular orbitals then molecule is stable.

Magnetic moment of a molecule

Any molecule has a well-defined magnitude of magnetic moment, which may depend on the molecule's energy state. Typically, the overall magnetic moment of a molecule is a combination of the following contributions, in the order of their typical strength:magnetic moments due to its unpaired electron spins (paramagnetic contribution), if any orbital motion of its electrons, which in the ground state is often proportional to the external magnetic field (diamagnetic contribution)the combined magnetic moment of its nuclear spins, which depends on the nuclear spin configuration.

Stability of molecules interms of bond order

If bond order is positive it indicates molecule is stable where as if it is negative or zero , molecule is unstable.

Comparision between valence bond and molecular theories

1. In valence bond theory, Bonds are present in two atoms not in molecule. In molecular orbital theory,bonds are present in molecular orbits.
2. Valence bond theory explain the bonding due to valence electrons of any element.

3. Molecular orbital theory explain bonding due to overlapping of molecular orbitals of different molecule.

Explanation of hydrogen bonding

The attractive forces which binds hydrogen atom of one molecule with the electronegative atom of another molecule is called as hydrogen bonding. Alcohols contain hydrogen bonding with water molecule there fore they are completely soluble in water.

Condition for hydrogen bonding

1. For the formation of inter molecular hydrogen bond, the H atom and electronegative atoms such as O, N, F, Cl etc should be from different molecules.
2. In case of intra molecular hydrogen bonding, both H atom and electronegative atom should be from same molecule.

Strength of hydrogen bonding

1. The hydrogen bond will be strong, if it is present in molecule which is in solid state and minimum in gaseous state.
2. Strength of hydrogen bonding increases if it is formed within the molecule.

Difference between hydrogen bond and covalent bond.

Covalent bond is stronger than hydrogen bonding.in covalent bonding electrons are shared between any two atoms of same or small difference in electro negativity. In hydrogen bonding electrons shared between hydrogen atom and electronegative atoms.

Effects or consequences of hydrogen bonding

Intermolecular hydrogen bonding increases the melting point, boiling point, solubility, viscosity and surface tension while intra molecular hydrogen bonding has opposite effects.

Types of hydrogen bonding

They are two types of hydrogen bonding is possible i.e. intermolecular hydrogen bond and intramolecular hydrogen bonds.

Intermolecular hydrogen bonding

It is formed between two different molecules of same and different compounds.example: HF molecule.

Intramolecular hydrogen bonding

In intramolecular hydrogen bonding, H atom is bonded to electronegative atom of the same molecule.

Effect of hydrogen bonding in biological systems.

Intermolecular hydrogen bonding increases the melting point ,solubility, viscosity, and surface tension.while intra molecular does its opposite.

Kossel-Lewis approach

To acquire stable noble gas electronic configuration atoms combine by either losing, sharing or gaining electrons.

Some examples of formation of chemical bond

Ionic bond is found in sodium chloride, potassium fluoride, etc., and covalent bond is found in hydrogen chloride, aluminium chloride, etc.

Lewis symbol

ww

Lewis provides simple notation for representing this valence electrons called as Lewis symbols. It contains dots surrounding the symbol of given element, indicating number of valence electron present in that element.

Significance in Lewis symbol

The main significance of lewis symbol was providing a single notation of element with dots representing valence electron by which need of complete electronic configuration to find out valence do not arise.

Reason for chemical bond formation

Lewis postulated that atoms combine and form chemical bonds, so that, they can achieve the nearest stable inert gas configuration.

Methods for achieving Chemical bond

Bond formation is achieved by one of the following methods: electron transfer method or ionic bond and electron sharing method or covalent bond.

Ionic compounds

An ionic compound is a chemical compound comprising ions held together by electrostatic forces termed ionic bonding. The compound is neutral overall, but consists of positively charged ions called cations and negatively charged ions called anions.

Ionic bonding

Ionic bonding is formed by complete transfer of electrons from metal to non metal. In periodic table alkali metals, alkali earth metals and transition metals formed ionic bonding with p block non metals.

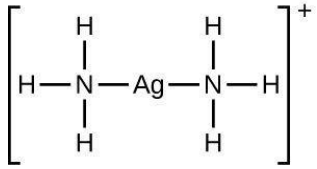
Inert pair effect

The inert pair effect is the tendency of the electrons in the outermost atomic s-orbital to remain unionized or unshared in compounds of post-transition metals.

Factors affecting formation of ionic bond

Factors affecting formation of ionic bond are ionization energy, electron affinity and lattice energy.

Coordination number



The number of ligands which are directly bonded to the central metal atom is known as coordination number. For example, in molecule $Ag(NH_3)_2$Ag(NH3)2 silver has +2 coordination number.

Lattice energy

The energy released when ions of opposite charge in the gas phase come together to form crystalline solid is called as lattice energy.

Properties of ionic bond

Properties of ionic bond are high melting and boiling points, good conductors of heat and electricity and more solubility in polar solvents.

Lewis-Langmuir concept

The electrons shared between the elements of same electronegativity or having small electronegativity difference develops attractive forces, which are nothing but covalent bond. This concept of sharing of electrons given by both scientist.

Covalent bond

Covalent bonding occurs when pairs of electrons are shared by atoms. Atoms will covalently bond with other atoms in order to attain the nearest noble gas configuration.

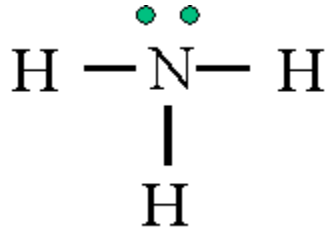
Formation of covalent bond

When two atoms share electron mutually, they are said to be joined by a covalent bond. Covalent bond is of three types: single bond, double bond and triple bond.

Factors influencing covalent bond

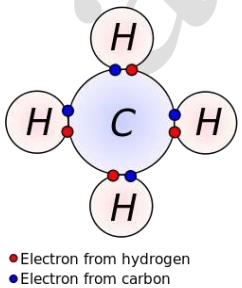
Factors favouring covalent bond are similar electronegativity and high ionisation energy.

Bond pair



The pair of electrons involved in bond formation is called as bond pair electron and the pair of electron which is not involved in bond formation but remain present on atom, in molecule is called as lone pair of electron. For example: ammonia molecule, it contain 3 bond pair of electrons and 1 lone pair of electrons.

Lewis representation



Lewis representation provides a picture of bonding in molecules and ions by shared pair of electrons which explain covalent bonding.

Formal charges

The formal charge of an atom is the difference between number of valency electrons of that atom in free state and number of electrons given to that element in Lewis structure.

Significance of formal charges

The actual shapes of the polyatomic molecule is properly given by the number of formal charge present on any atom, molecule or ion.

Octet rule

Atoms can combine either by transfer of valence electrons from one atom to another (gaining or losing) or by sharing of valence electrons in order to have an octet or 8 electrons in their valence shells. This is known as octet rule.

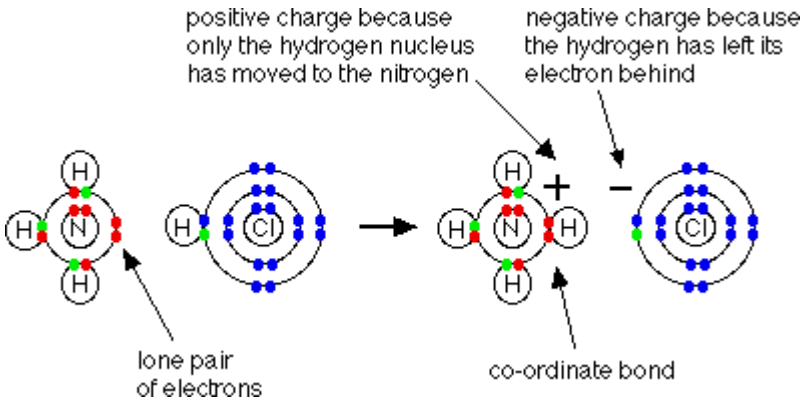
Octet rule

Octet rule fails to explain the stability of molecules with central atom containing less than eight or more than eight electrons in the valence shell.

Limitations of Lewis-Langmuir concept

This concept fails to explain the shapes of polyatomic molecule.

Properties of co-ordination bond



A coordinate covalent bond has all the characteristics of the covalent bond. They have low boiling and melting point. Since the shared pair of electrons is between two atoms, there are no electrostatic forces of attraction. They do not conduct electricity in the liquid or in the dissolved state. The compounds are much less soluble in water.

Single, double and triple bond

A covalent bond formed between atoms can be single, with two electrons shared; double, with four electrons shared; and triple, with six electrons, shared.

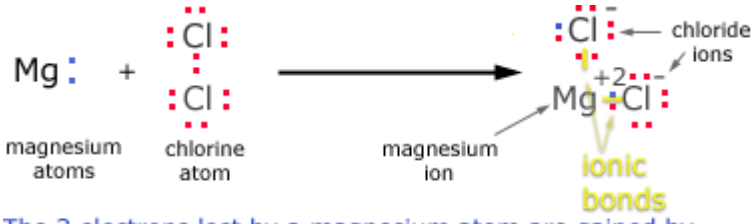
Effects of van der waal's forces on the properties of substances

Van der Waals forces include attraction and repulsions between atoms, molecules, and surfaces, as well as other intermolecular forces. They differ from covalent and ionic bonding. In that they are caused by correlations in the fluctuating polarisation of nearby particles.

Factors affecting van der Waals forces

1. Size of atoms: (strength of VWF increases as size increases e.g., He, Ne, Ar, Kr and Ra) Boiling point and melting point increases down the group because of increase in strength in these forces.
2. Electronegativity of elements.
3. Nature of elements, metals, non-metals, most of non-metals exists in liquid or gaseous states and thus, have these forces, while metals have strong cohesive forces, metallic bond, non- metals are more electronegative and metals are more electropositive.

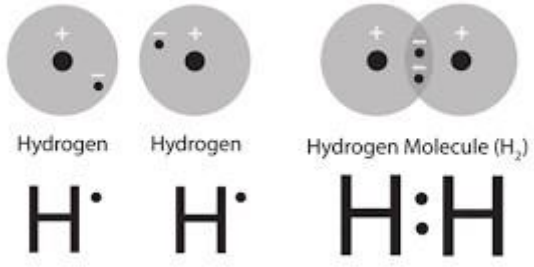
Magnesium chloride



The 2 electrons lost by a magnesium atom are gained by chlorine atoms to produce a magnesium ion and 2 chloride ions.

Magnesium forms ionic bond with chlorine by donating it's two valence electrons to two Cl atoms. Magnesium loses 2 electrons and attains the noble gas configuration of neon. Each chlorine atom gains one electron to form the noble gas configuration of argon. The opposite charges of the magnesium ions and chloride ions attract each other and ionic bond is formed.

Formation of Hydrogen molecule



Each H atom has one valence electron. When two H atoms react, they share a pair of electrons. In the sharing of a pair of electrons, a chemical bond is formed and each hydrogen atom achieves the nearest noble gas configuration of helium. Because the bond involves sharing of electrons, it is called a covalent bond.