దేశంలో అతిపెద్ద ఉప్పునీటి సరస్సు ఏది?
సాంబార్ సరస్సు

భారతదేశంలో అతిపెద్ద మానవ నిర్మిత సరస్సు ఏది?
డేబర్ సరస్సు

సాంబార్ సరస్సు లవణీయత ఎంత?
1 లీటర్‌లో 230 గ్రాముల ఉప్పు ఉంటుంది

'ది జ్యువెల్ ఇన్ ది క్రౌన్ ఆఫ్ ది కాశ్మీర్' అని దేనిని అంటారు?
దాల్ సరస్సు

The strength of a bond depends upon?

Chemical Bonding

❖ **Chemical Bond:**

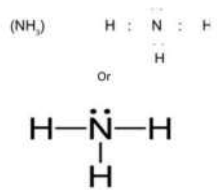
- Chemical bond is the attractive force which holds various constituents in a molecule. There are three types of chemical bonds: Ionic Bond, Covalent Bond, Co-ordinate Bond.

❖ **Octet Rule:**

- Atoms form chemical bonds in order to complete their octet i.e., eight electrons in their valence shell.

❖ **Lewis Structure:**

- Pair of bonded electrons is by means of a 'dash' (-) usually called a bond.
- Lone pairs or 'non – bonded' electrons are represented by 'dots'.
- Electrons present in the last shell of atoms are called valence electrons.



❖ **Exceptions to the Octet Rule:**

- Species with odd number of electrons : NO, NO_2
- Incomplete octet for the central atom : LiCl, BeH_2 and BCl_3
- Expanded octet for the central atom: PF_5, SF_6 and H_2SO_4

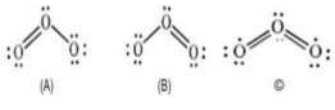
❖ **Formula Charge:**

- Formula charge is the diffe - rence between the number of valence electrons in an isolated atom and number of electrons assigned to that atoms in Lewis structure.
- Formal Charge = [(Total number of valence electrons in the free atom] – (Total number of lone pairs of electrons) – ½ (Total number of shared electrons i.e., bonding electrons)]

❖ **Resonance:**

- For molecules and ions showing resonance it is not possible to draw a single Lewis Structure.
- All the properties of such species can only be explained by two or more Lewis Structures.

Example: Resonance of O_3



A and B are resonating or canonical structures and C is the resonance hybrid Some other examples.

❖ **Ionic Bonding**

❖ **Formation of Ionic Bond**

- Formation of ionic bond takes place between a metal and non- metal by transfer of electron.
- Steps involved in formation of ionic bond:

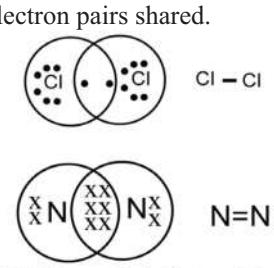
Steps	Equation	Energy involved
Formation of gaseous cations	A(g) + I.E → A⁺ (g) +e	Ionization energy
Formation of gaseous anions	X(g) + e → X (g) + E.A	Electron Affinity
Packing of ions of opposite charges to form ionic solids	A+(g) + X-(g) → AX(s) + Energy	Lattice Energy

❖ **Conditions required of formation of ionic bonds:**

- Low I.E of cation.
- High E.A of anion.
- High lattice energy.

❖ **Covalent Bonding:**

- Covalent bond is formed between two non – metals by sharing of electrons.
- Electron pairs which participate in bonding are called bond pairs.
- Electron pairs which do not participate in bonding are called lone pairs.
- There could be single, double or triple covalent bonds between two elements depending on the number of electron pairs shared.



❖ **VSEPR (Valence Shell Electron Pair Repulsion) Theory:**

X	Shape	Example
2	Linear	$HgCl_2$/$BeCl_2$
3	Triangular Planer	BF_3
3	Angular	$SnCl_2$, NO_2
4	Tetrahedral	CH_4, BF_4^-
4	Trigonal Pyramidal	NH_3, PCl_3
4	Angular	H_2O
5	Trigonal bipyramidal	PCl_5, PF_5
5	Irregular Tetrahedral	SF_4, IF_4^+
5	T – shaped	ClF_3, BrF_3
5	Linear	XeF_2, I_3^-
6	Octahedral	SF_6, PF_6^-
6	Square Pyramidal	IF_5
6	Square planar	XeF_4, ICl_4

- The shape of the molecule is determined by repulsion between all of the electron pairs present in the valence shell.
- Order of the repulsion :
- Lone Pair↔ Lone pair> Lone pair ↔ Bond Pair > Bond pair ↔ Bond pair.

- Repulsion among the bond pairs is directly proportional to the bond order and electro negativity difference between the central atom and the other atoms.

❖ **Determination of shape of molecule using VSEPR theory :**

- Calculate X using following method.
  X= (No. of valence electrons of central atom)+(No. of other atoms)+(Negative cha - rge on the molecule) – (Pos itive charge on the molecule)
- Use the following chart to find the shape.

❖ **Rule**

- It accounts for the covalent character in ionic compounds.
- Covalent is favoured by
- Smaller cation.
- Larger anion and
- Large charge on either ion.

❖ **Dipole Moment:**

- Dipole moment of any bond is the product of the net positive or negative charge and distance between the two charged ends, i.e., the bond length. i.e., Dipole Moment (m) = electron charge (e) x Distance (d) dipole moment is measured in debye unit (D);
- Dipole moment of a molecule is vector addition of all the individual bond moments.

❖ **Percentage Ionic Character:**

$$= \frac{\text{(Observed dipole moment)}}{\text{(Expected dipole moment)}} \times 100$$

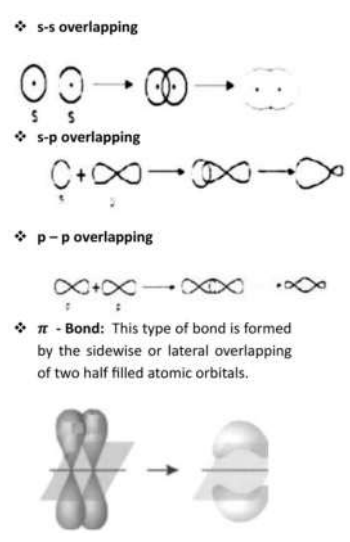
- The percent ionic character

❖ **Hydrogen Bonding:**

- Hydrogen bond is an electrostatic attractive force between covalently bonded hydrogen atom of one mole - cule or a part of a molecule and an electronegative atom (such as F,O,N) of another molecule (Inter – Molecular hydrogen bonding) or another part of the same molecule (intramolecular hydrogen bonding).
- Intermolecular hydrogen bon ding increase boiling point of the compound and also its water solubility
- Intramolecular hydrogen bonding decrease the boiling point of the compound and also its water solubility.

❖ **σ – Bond:**When covalent bond is formed by overla - pping of atomic orbitals along the same axis it is calledσ – bond. Such type of bond is symmetrical about the line joining the two nuclei e.g.

❖ **s-s overlapping**



- The strength of a bond depends upon the extent of overlapping of half – filled atomic orbitals. The extent of overlapping is between two atoms is always greater when there is end to end overlapping of orbitals than, when there is sidewise overlapping of orbitals. Hence s – bond is always stronger than p – bond.
- The average distance between the nuclei of the two bonded atoms in a molecule is called bond length and the energy required to break one mole of bonds of particular type in gaseous state is called bond energy or Bond strength. The same amount of energy is released in formation of one mole of particular bond.

❖ **Hybridization:**

- The mixing of dissimilar orbital of similar energies to form new set of hybrid orbital.
- Number of hybrid orbital formed is equal to the no. of orbital taking part in hybridi -zation.
- Depending upon the different combination of s and p orbitals, these types of hybridization are known.
- **sp^3 hybridization:** In this case, one s and three p orbi - tals hybridize to form four sp^3 hybrid orbitals. These four sp^3 hybrid orbitals are oriented in a tetrahedral arrangement.
- **Sp^2 hybridization:** In this case, one s and two p orbitals mix together to form three sp^2 hybrid orbitals and are oriented in a trigonal planar geometry.The remaining p orbital if required from sideways overlapping with the other unhybridized p orbital of other C atom and leads to formation of $H_2C = CH_2$ bond as in H.
- **sp hybridization:** In this case, one s and one p orbital mix together to form two sp hybrid orbitals and are oriented in a linear shape.
- The remaining two unhy - bridized p orbitals overlap with another unhybridized p orbital leading to the formation of triple bond as in HC ≡ CH.

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