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Answer to question No: 1(a).

~~for~~ Formal Charge:

A formal charge is the charge that is assigned to an atom in a molecule, assuming that electrons in all chemical bonds are shared equally between ~~d~~ atoms, regardless of relative electronegativity

In ~~COCl~~ $COCl_2$,

C = 0 lone pairs + 4 electrons from bonds = 4 electrons

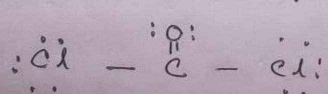
O = 4 electrons from lone pairs + 2 electrons from bonds ~~6~~= 6 electrons.

CL = 6 ~~e~~ electrons from lone pairs + 1 electron from a bond with C = 7 electrons

Again,
~~So~~, In $COCl_2$, C = 4 ~~el~~ valence electrons in unbounded atom - 4 assigned electrons in Lewis structure = 0 formal charge.

O = 6 v.e - 6 L.S = 0 formal charge.

Cl = 7 v.e. - 7 L.S = 0 formal charge.



Answer to question No: 1(b).

Polarity of molecule:

Polarity is a separation of electric charge leading to a molecule or its chemical group having an electric dipole moment.

(i) Although the bond arrangement around the C atom in CH_2Cl_2 is symmetrical, the differing polarities of the C - H & C - Cl bonds means, the effect of the polar bonds is not cancelled., ~~so~~, Therefore, the molecule is polar.

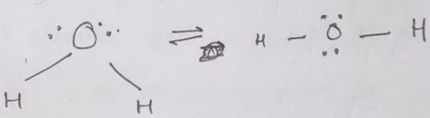
(ii) A polar molecule results from an unequal / unsymmetrical sharing of valence electrons. While there may be unequal sharing of electrons in the individual bonnds, in a non polar molecule. Like, BF_3 these bonds are evenly distributed & cancel out. There is no dipole & BF_3 is non-polar.

Answer to question NO:1(c)

Hybridization:

Hybridization is the idea of mixing two atomic orbitals with the same energy levels to create a degenerated new type of orbitals.

H_2O has a tetrahedral arrangement of the electron pairs about the O atom that requires sp^3 hybridization. Two of the four sp^3 hybrid orbitals are used to form bonds to the two hydrogen atoms, & the other two sp^3 hybrid orbitals hold the two lone pairs on Oxygen.



Here, The two O-H bonds are formed from overlap of the sp^3 hybrid orbitals from oxygen with the 1s atomic orbitals from the H atoms. Each O-H covalent bond is called (σ) sigma bond since the shared electron pair in each bond is centered in an area on a line running between two atoms.