MID Script

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Answer to question No: 1(a)

There are two types of bonds we usually observe in compound; they are ~~ionic~~ ionic bonds & covalent bonds. The distinction between them has to do with how equally the atoms participating in the bond share their electrons.

In ionic bonds, one atom essentially donates an electron to stabilize other electron. Atoms that participate in an ionic bond have different electronegativity values from each other. For example, sodium & chloride form an ionic bond, to make NaCl or table salt.

In covalent bond, the atoms are bound by shared electrons. In a true covalent bond, the electronegativity values are ~~are~~ the same (though in practice it just need to be close). For example, the atoms in water, H_2O are held together by polar covalent bonds. We can predic a covalent bond will form between two nonmetallic atoms.

Answer to question No: 1(b)

Lewis structure, also known as Lewis dot diagrams, is the diagram that show the bonding between atoms of a molecule & lone pairs of electrons that may exists in the molecule.

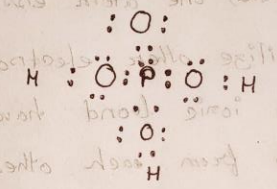


Figure: Lewis structure of H_3PO_4

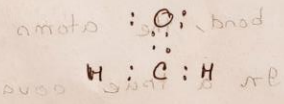


Figure: Lewis structure of CH_2O.

Answer to question NO: 1(c).

Molar mass of $C_{12}H_{22}O_{11}$ = 342 g $[12\times12 + 1\times22 + 16\times11]$
= 342 g/mol.

Number of moles in 10 g = $\frac{10}{342} = 0.0292$

Number of Hydrogen atoms in molecule of $C_{12}H_{22}O_{11} = 22$

∴ Number of H atoms —
in 10 g of $C_{12}H_{22}O_{11} = 0.0292 \times 6.023\times10^{23} \times 22$
$= 3.8692\times10^{23}$. hydrogen atoms.

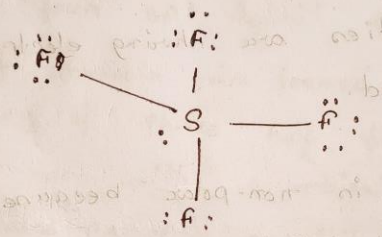
Answer to question NO: 2(a).

Water is more polar than ammonia. Though they are both polar molecules, but, with water the oxygen atom is more electronegative, causing the valence electrons to stay closer. Because of polarity H_2O has higher boiling point than NH_3. H - bonds are stronger & it contains twice as many H-bonds. In NH_3 it has two unused H atoms & those can only form one H bond with single bare electron pair.

Answer to question No: 2(b).

Formal charge:

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



In SF_4, total valence electron : $6 + 7(4) = 34$.

Formal charge of each F atom = $7 - 6 - \frac{2}{2} = 0$.

" " " Sulphur atom = $6 - 2 - \frac{8}{2} = 0$.

Answer to question No: 2(c).

(i) H_2S:

Since, Hydrogen sulfide consists of non-polar H-S bonds, the molecule is non polar.

(ii) CO:

CO is polar because atoms of different electronegativities are sharing electrons in a covalent bond.

(iii) CO_2:

CO_2 is non-polar because it has a linear, symmetrical structure, with 2 oxygen atoms of equal electronegativity.

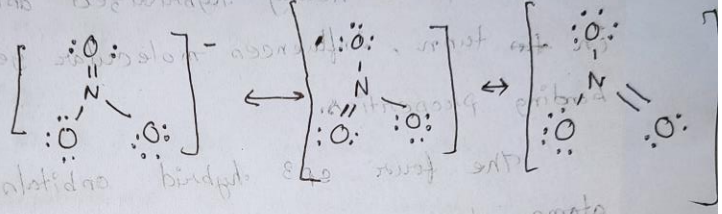
Answer to question NO:3(d).

Hybridization is the idea that, atomic orbitals fuse to form newly hybridized orbitals, which in ~~the~~ turn, influences molecular geometry & bonding properties.

The four sp3 hybrid orbitals of nitrogen atoms of ammonia is formed by the ~~overlap~~ overlapping of three half filled orbitals of nitrogen atom with s-orbital of 3 hydrogen atoms. ~~There~~ There remains a full filled sp3 hybrid orbital. Geometry in case ammonia is pyramidal due to presence of lone pair.

Answer to question No: 3(b):

The structure of NO_3^- is an equal mixture of three resonance structures:



Answer to question No: 3(c).

The second quantum number is usually referred to as the azimuthal quantum number & it describes the shape & size of the electron orbital.

The third quantum m number is known as the magnetic quantum number & it describes the orientation of the orbital in the three dimensional space.