

WORKSHEET – “bonding and hybridization”.

Describe the bonding about the C atom in formaldehyde, CH₂O, using valence bond theory.

1. First, draw Lewis structure. (NO guessing!!Count valence electrons!!!)
2. Then sketch the molecule CH₂O below showing its' geometry. Make a LARGE drawing!!

3. Decide, if the molecule is polar. Show the molecular dipole moment on the picture above.

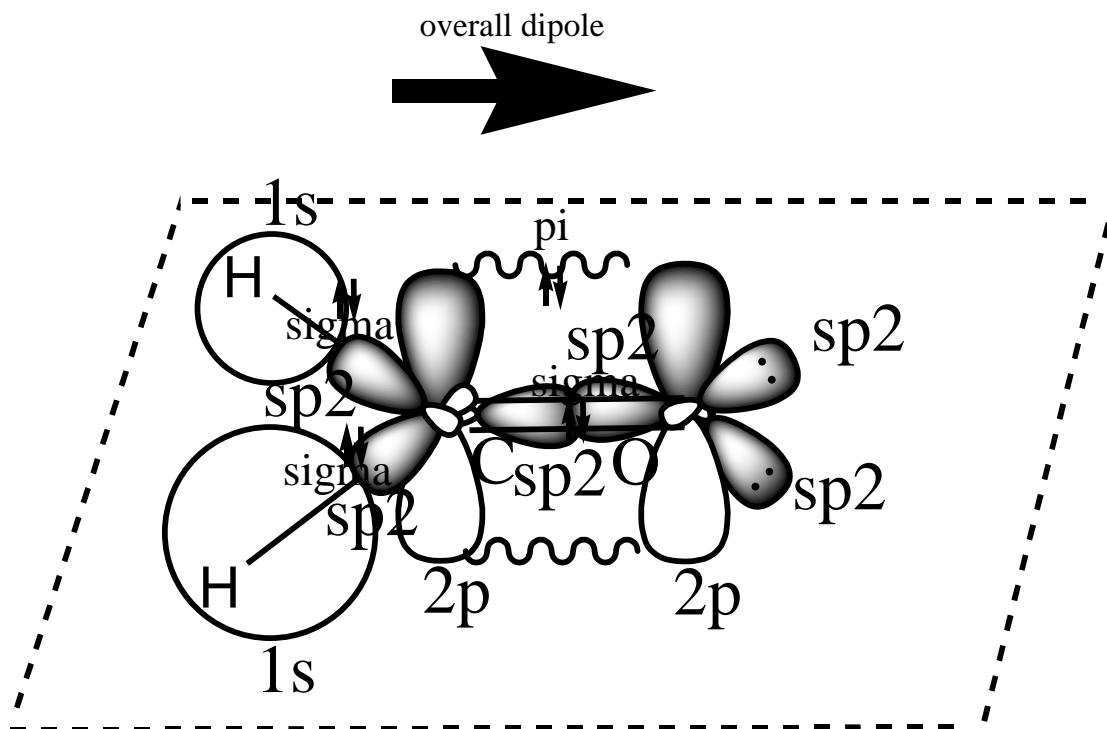
4. Now, fill in the description of the bonding in this molecule, while sketching in the orbitals you are discussing on your picture above:

- The C and O atoms are _____ hybridized; each atom has an un-hybridized _____ orbital perpendicular to the plane of the hybrid orbitals on that atom.
- Each C—H bond is formed by the overlap of the _____ orbital on the H atom with an _____ hybrid orbital on C.
- The C—O bond consists of a _____ and a _____ orbital, each doubly occupied.
- The _____ (σ/π ?) bond is formed by the overlap of an _____ hybrid orbital on the C atom with an _____ hybrid orbital on the O atom.
- The _____ (σ/π ?) bond is formed by the overlap of the _____ orbital on C with the _____ orbital on O.

SOLUTION: WORKSHEET – “bonding and hybridization”. -KEY

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KEY:

Describe the bonding about the C atom in formaldehyde, CH₂O, using valence bond theory.

Answer: The C and O atoms are sp^2 hybridized; each atom has an unhybridized $2p$ orbital perpendicular to the plane of the hybrid orbitals on that atom. Each C—H bond is formed by the overlap of the $1s$ orbital on the H atom with an sp^2 hybrid orbital on C. The C=O bond consists of a σ and a π orbital, each doubly occupied. The σ bond is formed by the overlap of an sp^2 hybrid orbital on the C atom with an sp^2 hybrid orbital on the O atom. The π bond is formed by the overlap of the $2p$ orbital on C with the $2p$ orbital on O.