For O AOs, assume the 2p energy = −14 eV and 2s energy = −18 eV. The energy of each sp³ hybrid AO will be...

- 20% 1. −14 eV  
- 20% 2. −15 eV  
- 20% 3. −16 eV  
- 20% 4. −17 eV  
- 20% 5. −18 eV

Next: Continue “Hybrid AOs and Polyatomic MOs”, http://goo.gl/6hBD8X: Formic acid, HC(O)OH; formate, HC(O)O⁻
For 0 AOs, assume the 2p energy $-14$ eV and 2s energy $-18$ eV. The energy of each sp$^3$ hybrid AOs will be ...

\[
\frac{3 \times (-14 \text{ eV}) + 1 \times (-18 \text{ eV})}{4} = -15 \text{ eV}
\]
sp$^3$ hybrid AO-MO correlation diagram of HOH

\[
\begin{array}{c}
1s 1s \\
\sigma^* \sigma^* \\
sp^3sp^1 \\
\sigma \sigma \\
2p_{xy} \\
\sigma^* \\
sp^3sp^1sp^3sp^1 \\
\sigma \sigma \\
2s \\
\end{array}
\]
Polyatomic MO recipe: Formaldehyde, $\text{H}_2\text{CO}$

1. Use the Lewis structure to get...
   - the number of electron pairs
   - make hybrid AO’s on each central atom;
     terminal atoms (except H) have same hybrids as central atom

2. Sketch the $\sigma$ framework and place pairs...
   - in each bonding $\sigma$ MO
   - in each nonbonding hybrid AO

Formaldehyde, $\text{H}_2\text{CO}$, $\sigma$ framework

6 pairs in Lewis structure, 5 pairs in $\sigma$ framework,
and so 1 pair in (localized) $\pi$ framework.
H₂CO sp² σ framework

6 pairs in Lewis structure, 5 pairs in σ framework, and so 1 pair in (localized) π framework.

Polyatomic MO recipe: Formaldehyde, H₂CO

1. Use the Lewis structure to get ...
   - the number of electron pairs
   - make hybrid AO’s on each atom;
     terminal atoms (except H) have same hybrids as central atom
2. Sketch the σ framework and place pairs ...
   - in each bonding σ MO
   - in each nonbonding hybrid AO
3. Sketch the π framework MO’s:
   - mark as bonding, nonbonding, and antibonding
   - place remaining pairs (Auf Bau)
   - get the π bond order

H₂CO π framework

1 pair in (localized) π framework

1 pair in π (bonding); bond order 1