Valence Bond Theory Practice Problem

Example: HCN \[ 1 + 4 + 5 = \frac{10}{2} = 5 \text{ e}^- \text{ns} \]

1. Draw the Lewis structure for HCN:
   \[ H - C \equiv N: \]

2. The shape around C is \underline{linear}, and the bond angle is \underline{180°}.

3. Electron configuration for C: \[ 1s^2 \, 2s^2 \, 2p^2 \]

4. Given the shape around each C atom, C has \underline{sp} atomic hybrid orbitals.

5. Draw the atomic orbital diagram for the valence electrons in C, promoting electrons, so C can form 2 bonds.
   \[ \text{2s} \quad \text{2p} \quad \text{sp} \]

6. Show the atomic orbital diagrams for the formation of the hybrid orbitals for the C atom below:
   \[ \text{atomic orbital diagram before hybridizing} \quad \text{hybridization} \quad \text{atomic orbital diagram after hybridizing} \]

7. Sketch the molecule below showing the hybridized and unhybridized atomic orbitals on the carbon and nitrogen atoms.