Exercise 5.5
Sigma Bonds and Pi Bonds in Valence Bond Theory

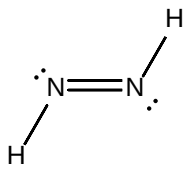
1. Complete the following sentences.

(a) According to VB theory, a single bond consists of ____ sigma bond(s) and ____ pi bond(s).

(b) According to VB theory, a double bond consists of ____ sigma bond(s) and ____ pi bond(s).

(c) According to VB theory, a triple bond consists of ____ sigma bond(s) and ____ pi bond(s).

2. The Lewis structure for N_2H_2 is shown below. Consider this molecule according to valence bond theory.



(a) Name the set of hybrid atomic orbitals used by each N atom.

(b) Clearly indicate which orbitals contribute to each σ bond in N_2H_2.
Answer on the diagram above.

(c) Clearly indicate which orbitals contribute to each π bond in N_2H_2.
Answer on the diagram above.

3. Consider the bonding in $COBr_2$ according to valence bond theory.

(a) Draw a Lewis structure for $COBr_2$.

(b) What is the hybridization of the carbon atom in $COBr_2$?

(c) Clearly indicate which atomic orbitals combine to make each σ bond in $COBr_2$.
Answer on the diagram you drew in part (a).

(d) Clearly indicate which atomic orbitals combine to make each π bond in $COBr_2$.
Answer on the diagram you drew in part (a).