

Name: \_\_\_\_\_

Date: \_\_\_\_\_

- [2 pt] 1. Give 2 failures of Lewis Structure that Valence Bond Theory (VBT) solves.
- [4 pt] 2. Define the following terms: (1) Promotion of an electron (2) Hybridization. For each include a sketch of an energy level diagram illustrating the term for a C-C single bond.
- [3 pt] 3. Illustrate the concept of hybridization using (atomic orbitals like, s,p,d,f) showing the results of an  $sp^3$  hybridization below. What is the shape **and** bond angle of the resulting orbitals?
- [6 pt] 4. Answer the following questions about  $sp^2$  hybridization:
- (a) Draw the energy level diagrams associated with the promotion and hybridization of the orbitals.
  
  
  
  
  
  
  
  
  
  
  - (b) Show the hybridization using orbitals (s,p,d,f). Properly label each orbital.
  
  
  
  
  
  
  
  
  
  
  - (c) What shape **and** bond angle are predicted.

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- [6 pt] 5. Answer the following questions about sp hybridization:
- (a) Draw the energy level diagrams associated with the promotion and hybridization of the orbitals.
  
  
  
  
  
  
  
  
  
  
  - (b) Show the hybridization using orbitals. Properly label each orbital.
  
  
  
  
  
  
  
  
  
  
  - (c) What shape **and** bond angle are predicted.
- [4 pt] 6. In Valence Bond Theory, what is the difference in the spatial distribution of the electrons in a  $\sigma$  bond and a  $\pi$  bond? (Answer in a sentence **and** sketch a picture illustrating each).
- [5 pt] 7. Draw a picture illustrating the bonding in  $\text{CH}_2=\text{CH}_2$  using Lewis structures **AND** using Valence Bond Theory. For the VBT picture label the orbitals. Also draw an arrow pointing out which bonds are  $\sigma$ -bonds and which are  $\pi$ -bonds