

**PS #5 Practice Questions – Constructing Molecular Orbitals, Nucleophilic Attack on Carbonyl Groups**

**Part I.** Molecular orbitals (MO's). Refer to pages 95 – 110 in Clayden and Greeves for a discussion on orbitals of this type.

Draw the  $\sigma$  (**bonding**) MO that arises from the linear combination of two p orbitals.

Draw the  $\sigma^*$  (**antibonding**) MO that arises from the linear combination of two p orbitals.

Draw the  $\pi$  (**bonding**) MO that arises from the linear combination of two p orbitals.

Draw the  $\pi^*$  (**antibonding**) MO that arises from the linear combination of two p orbitals.

Construct the  $\sigma$  and  $\pi$  system of formaldehyde ( $\text{H}_2\text{CO}$ ).

Show the  $\pi^*$  bond on C-O in formaldehyde.

**Part II.** All of the following reactions involve nucleophilic attack on the electrophilic carbonyl carbon. Fill in the boxes with the appropriate product or reagent.

