1. Consider the molecule SF$_6$. In your previous problem set you derived the molecular orbital diagram of SH$_6$. Now, you need to also consider the F 2p orbitals.

   a) Using the six F 2p sigma orbitals as a basis, generate a reducible representation $\Gamma_{6f}$ for this bonding framework.
   b) Decompose this reducible representation into a sum of irreducible representations.
   c) Sketch out all the symmetry adapted linear combinations (SALCs).
   d) Determine what are the valence orbitals on S. Using the character table determine how these orbitals transform in the point group determined. (i.e. to what reducible representations do they belong?)
   e) Sketch the bonding, non-bonding, and antibonding MO’s.
   f) Generate the molecular orbital diagram from your results in a-g, following the example done in class by placing the sulfur valence atomic orbitals on the left and the ligand (F) valence orbitals (2s and 2p) on the right. Match them in the center according to their symmetries and energies. Remember to fill in the correct number of electrons.
   g) Determine the bond order of the molecule.