

1. Methyl isocyanate (CH_3NCO) is a hazardous compound, which is commonly used as a pesticide.
 - a) Draw the Lewis structure of methyl isocyanate, including all nonbonding electrons.

 - b) What would you predict the C—N—C bond angle to be? Explain.

 - c) How many σ -bonds are present in methyl isocyanate? How many π -bonds?

 - d) Draw a representation of the overlapping atomic orbitals that form the C—O bond in this molecule.

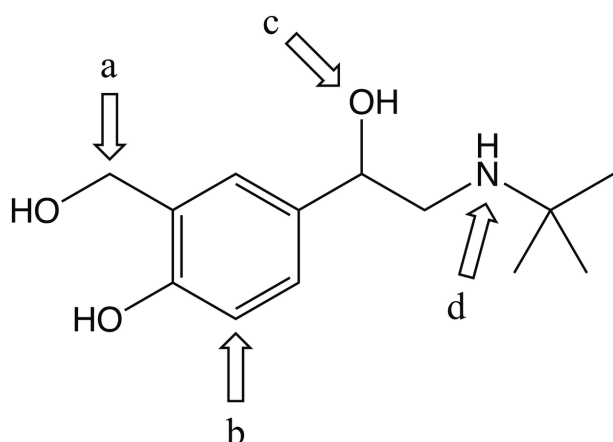
2. Draw each of the following molecules, showing their geometry clearly, and indicate each bond dipole on your picture. Which molecule will have the largest molecular dipole moment?



3. The species NO_2 , NO_2^+ , and NO_2^- have different bond angles. Arrange the three compounds in order of decreasing bond angle (Hint: Drawing Lewis structures will help).

4. Albuterol is used in inhalers to help treat wheezing and shortness of breath caused by asthma, and is one of the top ten most prescribed drugs.

Indicate the molecular geometry and hybridization of atoms a-d in the structure below. (Hint: draw in any hydrogen atoms and lone pairs not explicitly shown).



a:

b:

c:

d:

5. Draw an MO diagram of the cyanide anion. What is the bond order of the CN bond? Is the cyanide anion paramagnetic or diamagnetic?