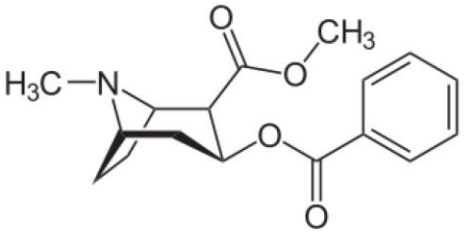
CHEM 113 Tutorial #3 Questions

Question 1. Fill in the with information regarding the electron group geometry, molecular shape, dipole and hybridization on then central atom of the four molecules listed in the following table.

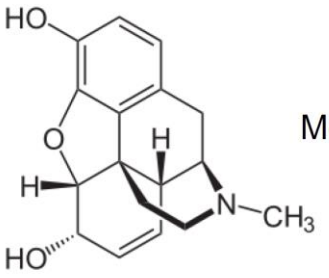
Molecular Formula	Central atom electron group geometry (electron arrangement)	Molecular shape	Is the molecule polar? (yes or no)	Hybridization at the central atom
ClF_5				
SCl_2				
BeF_2				
SeF_5Cl				

Question 2. Diamond and graphite are both materials composed solely of carbon atoms. However, they exhibit dramatically different properties. Diamond is the hardest material known, whereas graphite is soft and shears easily (that's why it is used in pencil lead). The difference in properties is related to the structures of these materials. In diamond, each carbon atom is bonded to four other carbon atoms, which leads to a three-dimensional network of carbon-carbon bonds. In graphite, each carbon is bonded to three other carbon atoms, which leads to a material composed of carbon sheets (two-dimensional layers) that are stacked on top of each other. Explain the differences in the structures of diamond and graphite using arguments based on VSEPR theory, orbital hybridization and molecular orbital theory (hint: you may want to look at the part of the notes that describes how the hybrid orbitals on carbon determine the geometry in ethene).

Question 3: Indicate all the functional groups on the following two molecules.



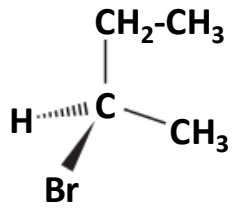
Cocaine



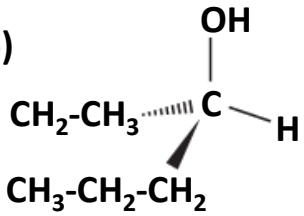
Morphine

Question 4. i) name the following compounds, including whether the chiral centre is "*R*" or "*S*".

a)

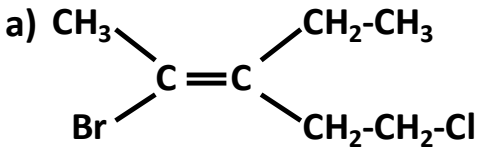


b)



ii) Name the following compounds, including whether the isomer is E or Z.

a)



b)