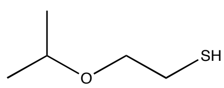
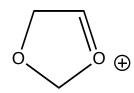
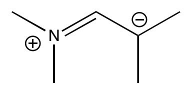
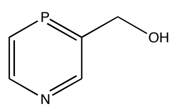
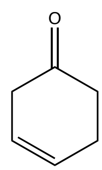
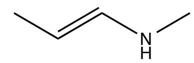
Chapter 2 Practice Problems

1. Redraw the following line-bond structures as Lewis dot structures showing all CH bonds and lone pairs as necessary.

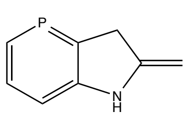
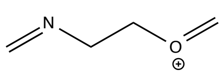
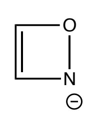
  

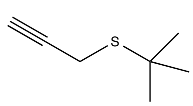
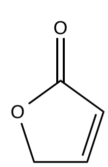
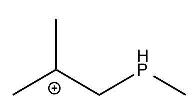
  

2. Convert the following condensed structures to line-bond structures

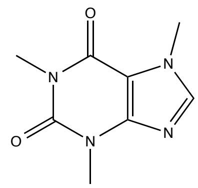
$CH_3CH_2CH_2NH_2$	$CH_3(CH_2)_3CHSHCH_3$	$CH_3CH_2CHOHCH_2COCH_3$
$CH_3C(CH_3)_2CH_2CH_2F$	$(CH_3CH_2)_3CNH_2$	$H_2C{=}CHOCH(CH_3)_2$
$(CH_3)_3CBr$	$CH_3CH_2CH_2CONHCH_3$	

3. Assign the hybridization to all atoms (other than hydrogen) in the following compounds

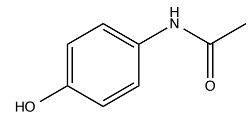
  

4. Redraw the compounds below explicitly showing all carbons, hydrogens and lone pairs:

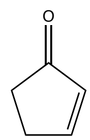


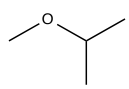
caffeine

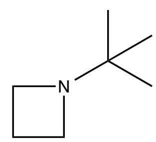


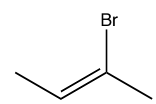
acetaminophen

5. The molecular formula of a compound is the total number of each type of atom present in the molecule. For organic compounds, it begins with the number of carbons, then hydrogens, followed by other atoms (e.g. $C_5H_8O_2$). Given the structures below, what are their molecular formulas?





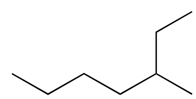


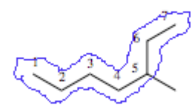


6. The molecular weight (MW) of a compound is determined by multiplying the atomic weight of each type of atom by the number of atoms present and summing up the total (to give MW in grams/mole). What is the molecular weight of each compound in question 10?

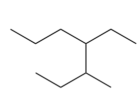
Example for $C_5H_8O_2$
C 5 x 12 = 60
H 8 x 1 = 8
O 2 x 16 = 32
MW = 100 g/mol

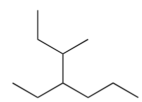
7. In the next chapter we will begin nomenclature. An important part of nomenclature is finding the longest continuous chain of carbons in a structure. For example, there are 7 carbons in the longest chain below and not the 6 that might first seem apparent. For each of the remaining structures, circle the longest ***continuous chain*** of carbons and write that number of carbons below the structure.

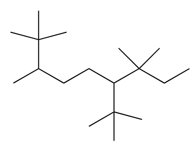


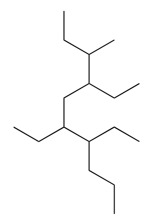


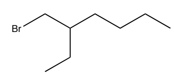
7 carbons!

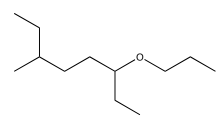












8. Draw all contributing Lewis dot structures for the sulfur dioxide SO_2 in which all atoms obey the octet rule by drawing one good Lewis dot structure and creating any remaining structures using the arrow method. Since sulfur is in row 3 it can accommodate more than an octet of electrons. Draw one additional Lewis dot structure in which the octet is exceeded.

9. What is the hybridization and geometry of each of the sulfur atoms in the structure of SO_2? Draw the hybrid form for SO_2 that reflects the predicted geometry and assign bond orders (i.e., 1 bond, 1 ½ bonds, etc) and formal charges on each of the atoms.

10. In class we drew resonance forms for the compound HNO_2. There is an isomer of HNO_2 in which the central nitrogen is attached to both oxygens, but one of the oxygens has an attached hydrogen. Draw a Lewis dot structure for this isomer of HNO_2, including lone pairs and formal charges as appropriate. What is the hybridization for each of the non-hydrogen atoms?

11. Any time there is an atom with a line pair connected to an atom that is part of a double bond (pi bond), a resonance structure can be drawn as show below in the example. Note that this often results in formal charges being created. Locate similar situations on the other 3 structures and use curved arrows to provide one additional resonance form for each (remember to include formal charges!).