Chemistry 2331H Tuesday, September 10

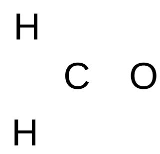
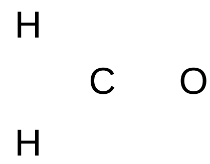
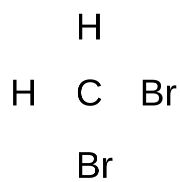
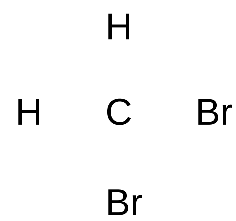
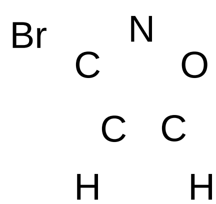
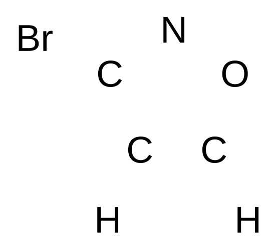
Workshop 1
Drawing Organic Molecules

1. In this exercise, we'll construct molecules from the atoms in the chart below. For each atom, in each empty box: (i) give the electronic configuration; and (ii) give the number of valence electrons available for forming bonds and non-bonding electron pairs.

atom	electronic configuration	# of valence electrons
H	$1s^1$	1
C		
N		
O		
S	$1s^2 2s^2 2p^6 3s^2 3p^4$	6
Br		

2. Complete the molecular structures below by drawing bonds between neighboring atoms as well as non-bonding electron pairs (or "lone pairs") in each arrangement of atoms. For each arrangement, draw: (i) a Lewis *dot* structure, in which bonds and lone pairs are all illustrated as dots; and (ii) a Lewis *dash-bond* structure, with lines for bonds (but still with dots for lone pairs).

	Lewis *dot* structures	Lewis *dash-bond* structures
ammonia (NH_3)	H N H H	H N H H

	Lewis *dot* structures	Lewis *dash-bond* structures
formaldehyde (H_2CO)		
dibromomethane (CH_2Br_2)		
3-*bromo-1,2-oxazole* (C_3H_2NOBr)		

3. For each of the molecular formulae below, draw two possible Lewis dash-bond structures. Arrange the atoms however you like, but make sure that all atoms obey the octet rule.

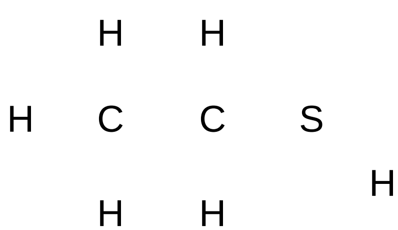
CH_3NO

C_4H_6O

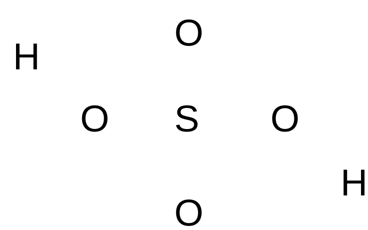
For later: Re-draw all of these as line-angle structures, by not drawing H's on carbon or lone pairs on any atom.

4. Starting in Period 3, elements can break the octet rule by having a valence shell of more than 8 electrons. This is possible because the valence shell can involve *d*-orbitals in addition to *s*- and *p*-orbitals (which would total only eight). For example, sulfur (S) can use its 6 valence electrons to form 2, 4 or even 6 bonds.

   For each arrangement of atoms below, draw Lewis dash-bond structures (including lone pairs).



ethanethiol
(added to natural gas so that it smells; obeys octet rule)



sulfuric acid
(disobeys octet rule; S has 12 electrons in valence shell)