1A. Draw valid Lewis structures for organic and inorganic compounds.

1A.1 Draw a valid Lewis structure for the following molecules and ions.

a) CH_3Cl b) H_2S c) NHF_2 d) CS_2 e) H_2CSe

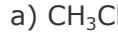
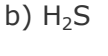
f) BH_3 g) CH_2Br_2 h) Br^- i) OCH_3^- j) H_3O^+

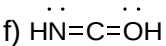
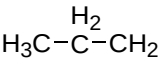
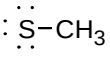
k) $NH_2Br_2^+$ l) BCl_4^-

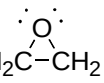
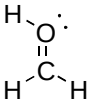
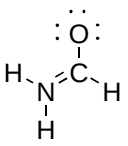
1B. Determine formal charge of atoms in a molecule.

OCSL: 1.33-1.45

1B.1 Indicate any non-zero formal charges on atoms in the following molecules. All lone pairs are drawn.

a)  b)  c) CH_3 d) NH_4 e) 

f)  g) BH_4 h) $H_3P{-}CH_3$ i)  j) 

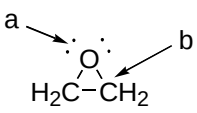
k)  l)  m)  n) 

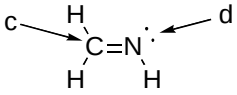
1C. Determine the geometry (shape) of atoms in a molecule and predict bond angles.

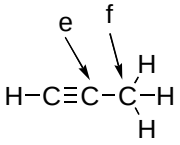
OCSL: 4.1-4.20

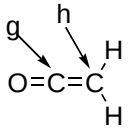
1C.1 Determine the geometry and bond angle around the central atom for the molecules and ions in problem 1A.1

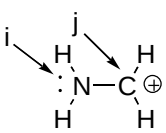
1C.2 Determine the geometry and bond angle around the indicated atoms.

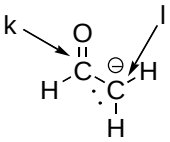








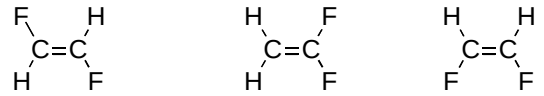


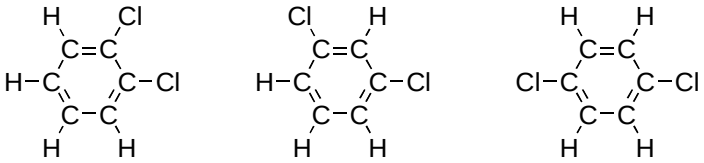


1D. Determine if molecules are polar or non-polar, draw net dipole direction.

1D.1 Redraw the Lewis structures from 1A.1 a-g. Indicate if the molecules are polar or non-polar. If polar, draw the direction of the net dipole over the Lewis structure.

1D.2 Do the following pairs of isomers have the same net dipole? Draw the direction of the net dipole if any.

a) 

b) 

1E. Determine hybridization of atoms in a molecule.

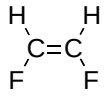
OCSL: 4.1-4.20

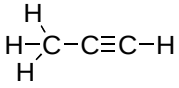
1E.1 Indicate the hybridization of the central atom for the molecules and ions in 1A.1

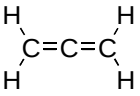
1E.2 Indicate the hybridization of the indicated atoms in problem 1C.2

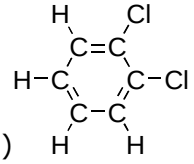
1F. Identify and pi and sigma bonds in a molecule.

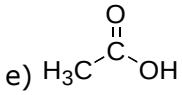
1F.1 Determine the number of σ bonds and the number of π bonds in the following molecules:

a) 

b) 

c) 

d) 

e) 

1G. Interpret and expand condensed structures.

1G.1 Redraw the following molecules as Lewis or skeletal structures.

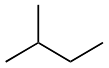
a) $CH_3CH(CH_3)_2$ b) $(CH_3)_3C(CH_2)_3CH_3$ c) $CH_3CHBrCH(CH_3)CH_2CH_3$ d) $CH_3CH_2COCH_3$

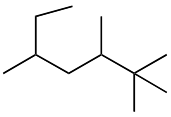
e) $CH_3(CH_2)_4CO_2H$ f) $CH_3CO_2CH_3$ g)$(CH_3)_2CHOCOCH_3$ h) $CH_3CH(OH)CH_2OH$

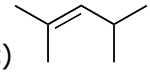
1H. Convert to and from skeletal structures, determine the number of carbons, hydrogens and lone pairs in a skeletal structure.

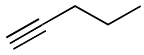
OCSL: 1.1 – 1.32, 1.46-1.68

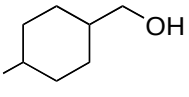
1H.1 Draw the expanded form of the following structures.

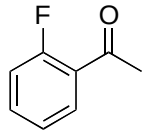
a) 

b) 

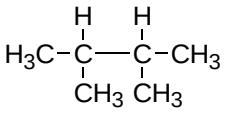
c) 

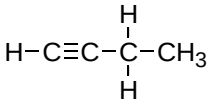
d) 

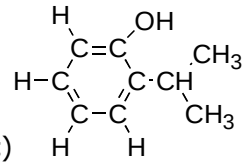
e) 

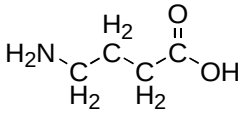
f) 

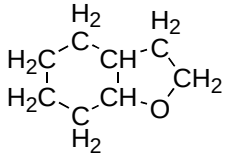
1H.2 Convert the following to skeletal structures.

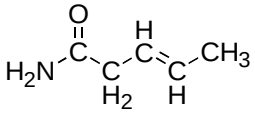
a) 

b) 

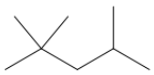
c) 

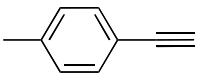
d) 

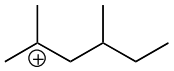
e) 

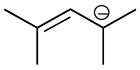
f) 

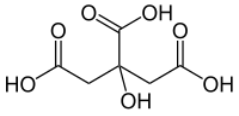
1H.3 Determine the number of hydrogens, carbons and lone pairs in the following molecules.

a) 

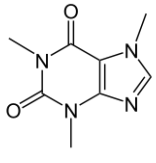
b) 

c) 

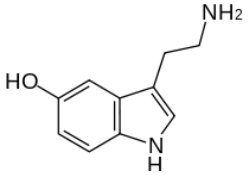
d) 

e) 

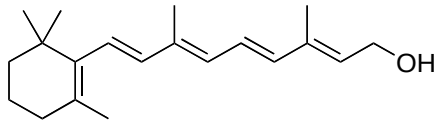
citric acid

f) 

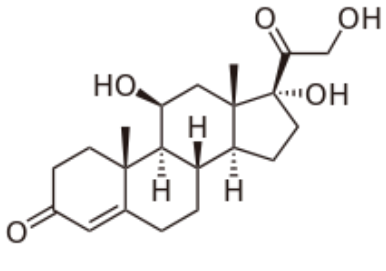
caffeine

g) 

serotonin

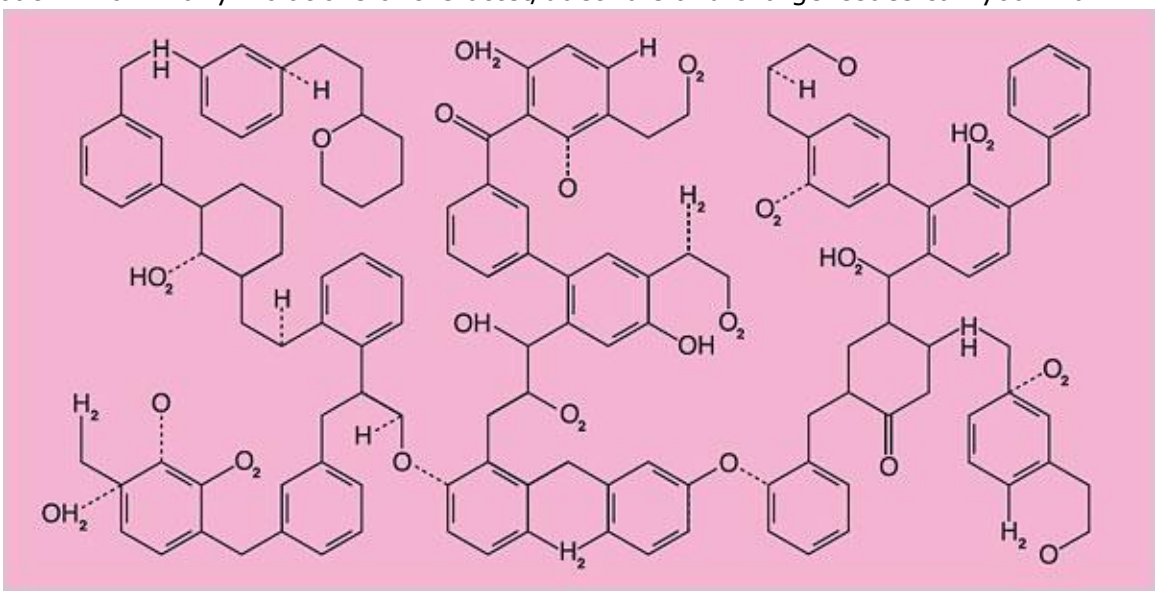
h) 

retinol (vitamin A)

i) 

cortisol

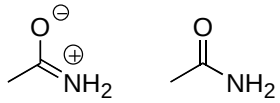
1H.4 The following "structure" accompanied a book review in the New York Times for *Bonk* by Mary Roach. How many violations of the octet/duet rule and charge issues can you find?

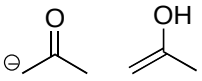


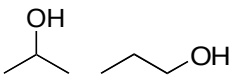
1I. Given a molecule draw all possible resonance structures, recognize where resonance is not possible.

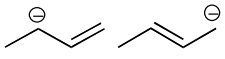
OCSL: 2.1-2.73

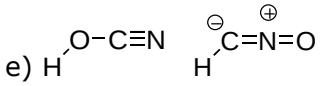
1I.1 Which of the following pairs are resonance structures?

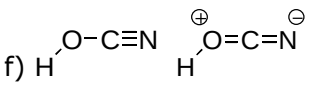
a) 

b) 

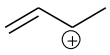
c) 

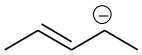
d) 

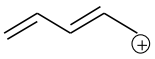
e) 

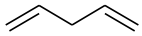
f) 

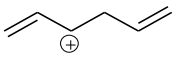
1I.2 Draw all possible resonance structures for the following molecules and ions.

a) 

b) 

c) 

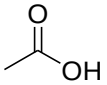
d) 

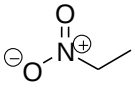
e) 

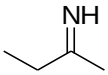
f) 

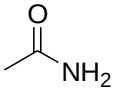
g) 

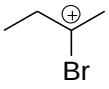
h) 

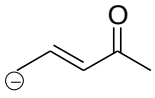
i) 

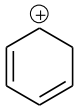
j) 

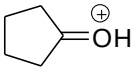
k) 

l) 

m) 

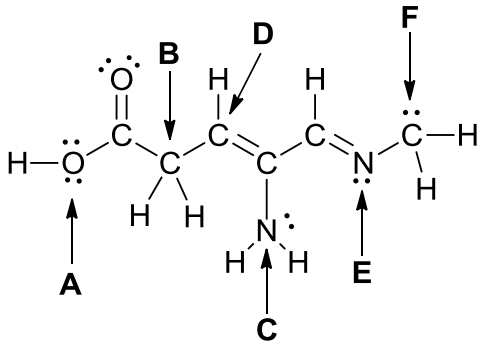
n) 

o) 

p) 

1X. Cumulative and Content Questions

1X.1 Determine the geometry, angle, and hybridization at the indicated atoms. Determine the total number of carbons, hydrogens, and pi bonds and lone pairs.

a) 

b)