Department of Chemistry
University of Texas at Austin

LEWIS STRUCTURES PRACTICE WORKSHEET

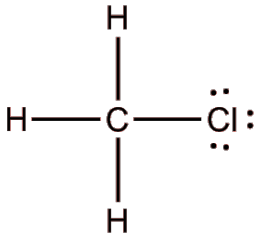
Draw the Lewis Structures for each of the following molecules. If you are not sure if your structure is correct, do a formal charge check. You should consult the Lewis structure rules and a periodic table while doing this exercise. A periodic table will be available for the exam, but the list of rules will not be available, so this is a chance to practice using the rules to help you remember them!

1. CH_3Cl

$C: central\ atom$
$H_3: always\ terminal$
$S = N_{(Needed)} - A_{(Available)}$

N	A
$C: 8$	$C: 4$
$H: 3\times2$	$H: 3\times1$
$6 - \frac{8}{2}$	$6 - \frac{7}{14}$

$S = 22 - 14$
$S = 8$
$\#bonds = \frac{8}{2}$

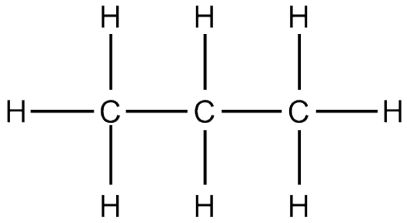


2. C_3H_8

$C's\ tend\ to\ be\ terminal$
$H_8: must\ be\ terminal$
$S = N - A$

$C: 3\times8$	$C: 3\times4$
$H: 8\times2$	$H: 8\times1$
$N = 40$	$A = 20$

$S = 40 - 20$
$\#bonds = \frac{20}{2} = 10\ bonds$



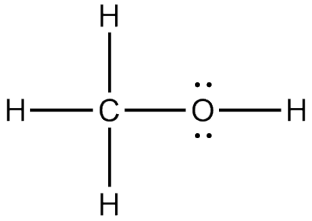
3. CH_3OH

$C: central\ atom$
$H_3\ \&\ H: must\ be\ terminal$

$Needed: 24$
$Available: 14$

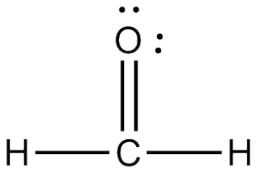
$Shared = 10$
$bonds = 5$

$Used\ 10\ of\ available\ 14e^-\ in\ bonds.\ Remaining\ 4e^-\ are\ to\ be\ placed\ on\ terminal\ atoms\ that\ have\ not\ satisfied\ octet.$



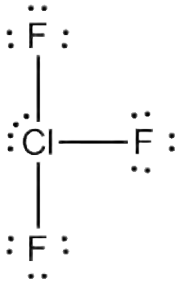
4. CH_2O

C: central atom
H_2: terminal
Needed = 20
Available = 12
Shared = 8
 # bonds = 4



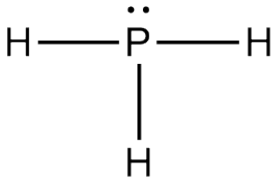
5. ClF_3

C: central atom
Needed = 32
Available = 28
~~*Shared = 4*~~
~~*# bonds = 2*~~
breaks rule probably expanded octet
After e^- are placed on terminal atoms to satisfy octet, still have 4 available e^-, place on central atom



6. PH_3

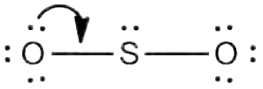
P: central atom
H_3: terminal atoms
N = 1
A = 8
S = 6
 # bonds = 3
After forming bonds, $2e^-$ left, place on central atom

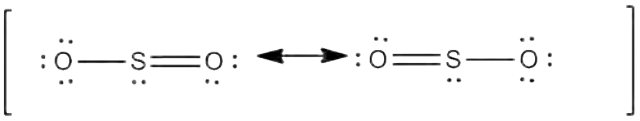


For these don't show S=N-A rule, although it is used to predict # bonds.

7. SO_2

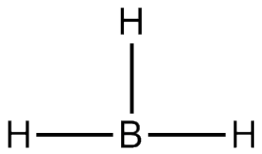
S: central atom
O_2: tend not to string together
A = $18e^-$
 # bonds = 3
1) satisfied octet on terminal, but still have $2e^-$, place on central atom
2) still need 2 more on central and predicting 3 bonds, so move a pair to make double bond





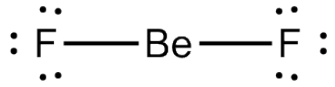
8. BH_3

B: exception to octet rule, stable with $6e^-$ in valence shell



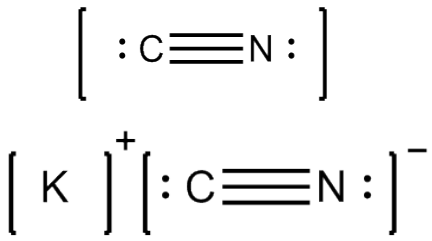
9. BeF_2

Be: exception to octet rule, stable with $4e^-$ in valence shell



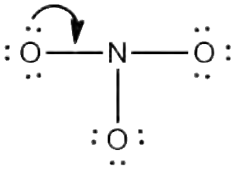
10. KCN

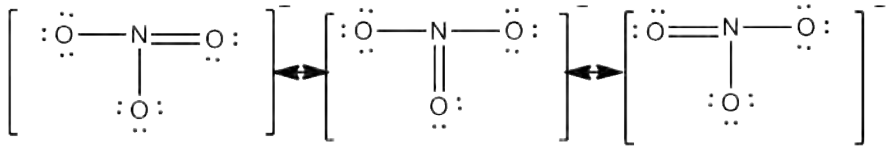
K^+: metal cation
CN^-: polyatomic anion, follows rules for anions
Needed $e^- = 16$
Available $e^- = 10e^-$
$C = 4$
$N = 5$
$(-) = 1$
$10e^-$
 # bonds $= 16 - 10 = \frac{6}{2} = 3$ bonds



11. NO_3^-

N: central atom
O_3: tend not to string together
Notice, polyatomic ion add negative charge as one available extra e-
Available $= 24e^-$
 # bonds $= 4$ bonds
Double bond could be in any of three locations, so resonance!





12. XeO_4

$S = N - A$ rule $= 40 - 32 = 8e -$
4 single bonds works for octet but FC is +4 on the Xe in that structure (bad). Using double bonds to oxygens makes all atoms have 0 for FC. So octet expands to 16 on the Xe.