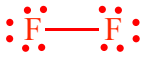
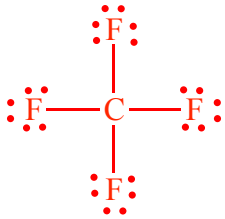
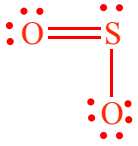
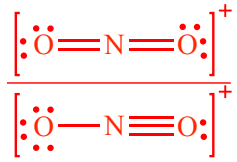
WKS – Chem Honors
Determining Lewis Structures

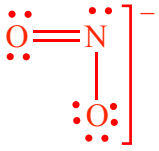
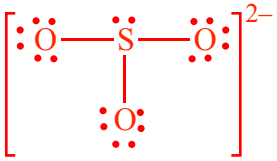
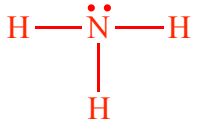
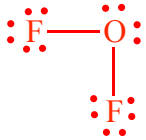
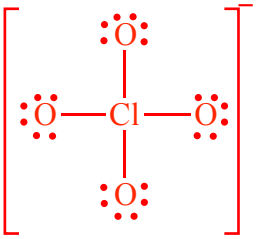
NAME Answer Key
Period _____ **Date** _____

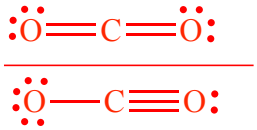
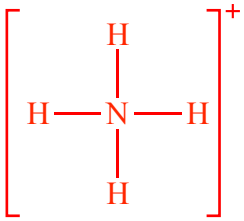
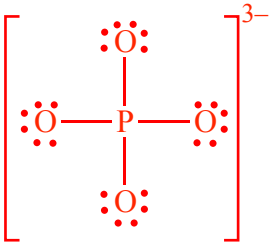
Process for Determining Lewis Structures

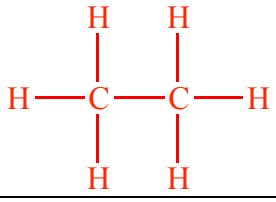
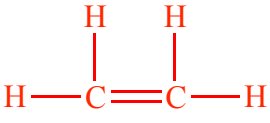
1. Determine arrangement of atoms in molecule: Put *terminal* atoms (usually the element with 2 or more atoms) around *central* atom (*usually* the single atom, or the least electronegative, or the one with the highest bonding capacity) attached by a single covalent bond. Multiple C or N atoms can bond in a row.
2. Count total valence electrons:
   - add total valence electrons from each atom
   - for polyatomic ions, each (–) charge adds one electron to the ion (it has gained an electron), each (+) charge removes one electron from the ion (it has lost an electron)
3. Subtract two electrons for each bond from your total. This is the number of remaining non-bonding electrons (lone pairs).
4. Distribute these as lone pairs of electrons evenly around terminal atoms to complete their octets (except H, which is complete with its single bond).
   - If there are any remaining electrons after all the terminal atoms are complete, they go on central atom (or atoms if you have C) as lone pairs.
5. If the central atom does not have an octet, "borrow" electron pairs from outer C, N, O, P, or S for double or triple bonds. Borrow one pair at a time, checking each time for an octet.
   - H, F, Cl, Br, I *never* form double bonds.
   - Note: central atoms with fewer than 4 valence electrons (i.e. Be, B) may not obtain an octet.
6. Put square brackets around polyatomic ions with the charge as a superscript

Determine the total valence electrons and draw the Lewis structures for these molecules and polyatomic ions:

Molecule	# v. e^-	Lewis Structure
1. F_2	2×7 = 14	
2. CF_4	4 4×7 = 32	
3. N_2	2×5 = 10	
4. SO_2	6 2×6 = 18	
5. NO_2^+	5 2×6 –1 = 16	

Molecule	# v. e^-	Lewis Structure
6. NO_2^-	5 2×6 +1 = 18	
7. SO_3^{2-}	6 3×6 +2 = 26	
8. NH_3	5 3×1 = 8	
9. OF_2	6 2×7 = 20	
10. ClO_4^-	7 4×6 +1 = 32	

Molecule	# v. e^-	Lewis Structure
11. CO_2	4 2×6 = 16	
12. CO	4 6 = 10	
13. CN^-	4 5 +1 = 10	
14. NH_4^+	5 4×1 –1 = 8	
15. PO_4^{3-}	5 4×6 +3 = 32	

Molecule	# v. e^-	Lewis Structure
16. C_2H_6	2×4 6×1 = 14	
17. C_2H_4	2×4 4×1 = 12	
18. C_2H_2	2×4 2×1 = 10	
19. N_2H_2	2×5 2×2 = 12	

20. What is the role of the central atom when drawing the Lewis structure for a molecule?
It holds the molecule together since all terminal atoms are bonded to it.