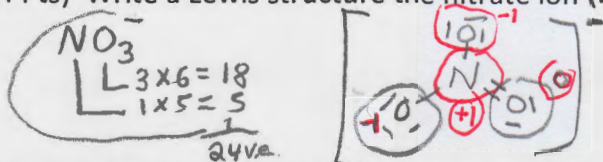
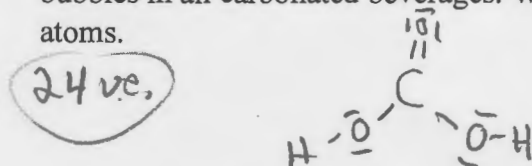


Key

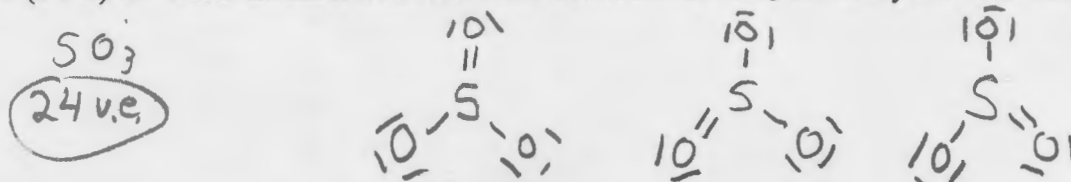
1. (4 Pts) Write a Lewis structure the nitrate ion (
- NO_3^{1-}
-) and show the formal charge of each atom.



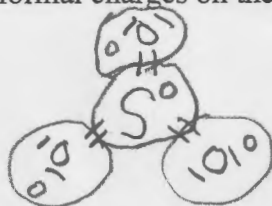
2. (4 Pts) Carbonic acid,
- H_2CO_3
- , is a weak acid that contributes to the taste and produces the carbon dioxide bubbles in all carbonated beverages. Write a Lewis structure for
- H_2CO_3
- . (Hint: the H's are attached to oxygen atoms.)



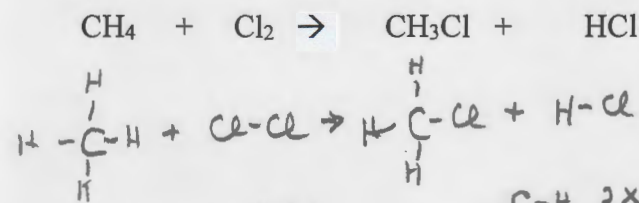
3. (3 Pts) a. Write all the Lewis resonance structures for
- SO_3
- that obey the octet rule.



- b. (3 Pts) Write a Lewis structure for
- SO_3
- that expands the octet to minimize formal charge and if necessary places negative formal charges on the most electronegative atom(s).



4. (5 Pts) Use bond energies to estimate the enthalpy change for the reaction of one mole of
- CH_4
- with chlorine gas to give
- CH_3Cl
- and hydrogen chloride.



$$\begin{aligned} \text{C-H } 4 \times 414 &= 1656 \\ \text{Cl-Cl } 1 \times 326 &= 326 \\ \hline &+ 1899 \text{ kJ} \end{aligned}$$

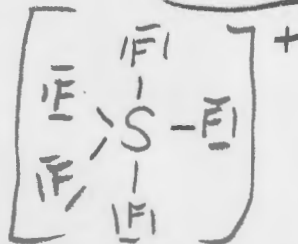
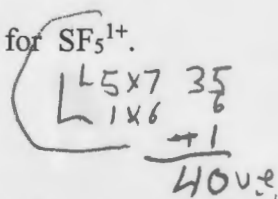
$$\begin{aligned} \text{C-H } 3 \times 414 &= 1242 \\ \text{C-Cl } 1 \times 326 &= 326 \\ \text{H-Cl } 1 \times 432 &= 432 \\ \hline &- 2000 \text{ kJ} \end{aligned}$$

$$\begin{aligned} \text{BE(C-H)} &= 414 \text{ kJ/mol} \\ \text{BE(C-Cl)} &= 326 \text{ kJ/mol} \\ \text{BE(H-Cl)} &= 432 \text{ kJ/mol} \\ \text{BE(Cl-Cl)} &= 243 \text{ kJ/mol} \end{aligned}$$

$$\begin{aligned} &- 2000 \\ &+ 1899 \end{aligned}$$

$$\underline{-101 \text{ kJ}}$$

5. (4 Pts) Write a Lewis structure for
- SF_5^{1+}
- .



6. (2 Pts) Is the molecule
- CH_2Cl_2
- polar or non polar? (electronegativity values: C 2.5, H 2.1, Cl 3.0)

