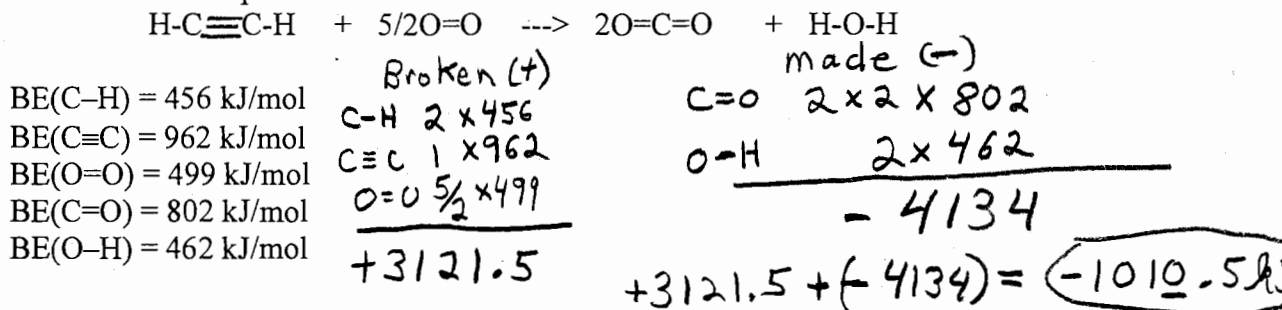1. (4 Pts) Estimate the enthalpy change for the combustion of one mole of acetylene, $C_2H_2$, to form carbon dioxide and water vapor.

$$H-C\equiv C-H \quad + \quad 5/2\,O=O \quad ---> \quad 2\,O=C=O \quad + \quad H-O-H$$

BE(C–H) = 456 kJ/mol
BE(C≡C) = 962 kJ/mol
BE(O=O) = 499 kJ/mol
BE(C=O) = 802 kJ/mol
BE(O–H) = 462 kJ/mol

Broken (+)
C–H  2×456
C≡C  1×962
O=O  5/2×499
———————
+3121.5

made (−)
C=O  2×2×802
O–H  2×462
———————
− 4134

$$+3121.5 + (−4134) = \boxed{−1010.5\,kJ}$$

2. (5 Pts) Write a Lewis structure for the nitrate ion, $NO_3^-$, showing all formal charges.
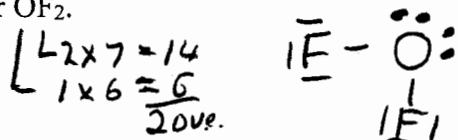
$NO_3^-$
3×6 = 18
1×5 = 5
add 1
——
24
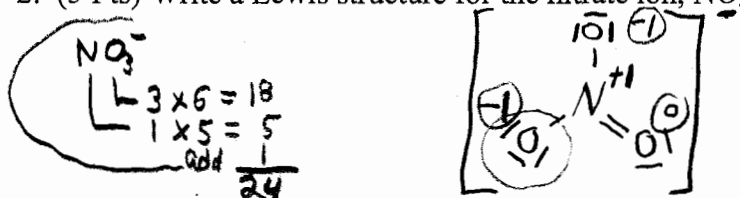
3. (1 Pt) What type of bonding is present in the compound $Al(ClO_3)_3$ (ionic, covalent, or **both**)

ionic between $Al^{3+}$ and $ClO_3^-$ then covalent between Cl and O

4. (4 Pts) Write a Lewis structure for the chlorite ion, $ClO_2^-$, that obeys the octet rule, showing all formal charges.
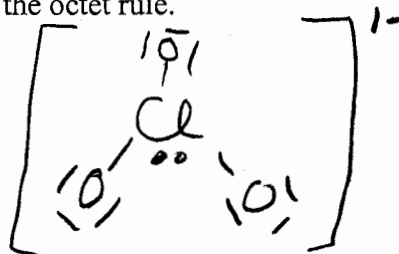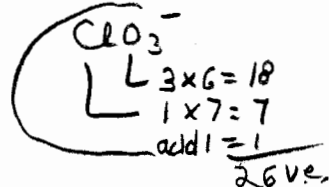
2×6 = 12
1×7 = 7
add 1
——
20
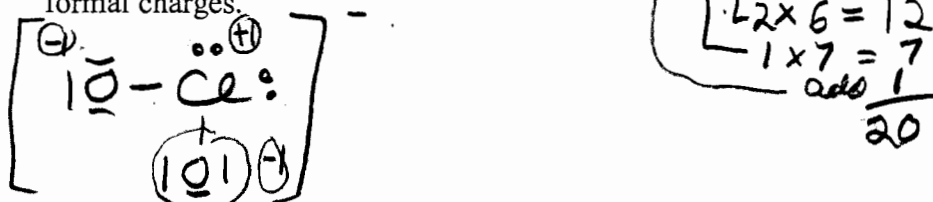
5. (3 Pts) Write a Lewis structure for $OF_2$.

2×7 = 14
1×6 = 6
——
20 ve.

6. (4 Pts) Write a Lewis structure for the chlorate ion, $ClO_3^-$, that obeys the octet rule, and give the total number of resonance structures for $ClO_3^-$ that obey the octet rule.

Number of resonance structures ___1___

$ClO_3^-$
3×6 = 18
1×7 = 7
add 1 = 1
——
26 ve.

7. (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 $H_2CO_3$, The hydrogens are attached to oxygens.

$H_2CO_3$
3×6 = 18
1×4 = 4
2×1 = 2
——
24 ve.