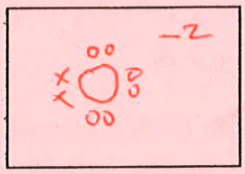
HOMEWORK ASSIGNMENT #1 ORGANIC CHEMISTRY I (20 pts)

(due Monday 29 Aug 2011)

Your name: Answers

1a) Draw the most stable **Lewis dot** electronic configuration for O in CaO and **clearly indicate its charge** in your drawing:

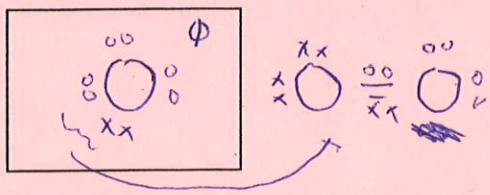


1b) Write down the equivalent, ***complete*** electronic configuration for the above species. (remember: complete configuration means starting with $1s^2 2s^2$...etc)

$1s^2 2s^2 2p^6$ (looks like Ne)

1c) Does O as drawn above appear to obey the octet rule ? YES NO

2a) Draw the most stable Lewis dot electronic configuration for one of the O in O_2 and **clearly indicate its charge** in your drawing:



2b) Write down the equivalent, complete electronic configuration for the above species:

$1s^2 2s^2 2p^6$ as drawn

($1s^2 2s^2 2p^4$ shared)

2c) Does O as drawn above appear to obey the octet rule ? YES NO

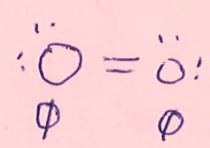
2d) Compare your answers in 1c and 2c. Explain why both O are stable in the two compounds despite the disparity you should have observed in your answers.

In 1a the O has completely taken all e^- → ionic octet

In 2a the O shares $2e^-$ → covalent octet

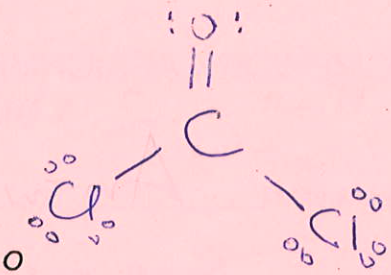
3. Draw the most stable Lewis structures for the covalent and polar covalent compounds below. Make sure to indicate any formal charge present on each atom:

a) O_2

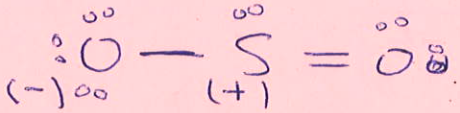


b) CO

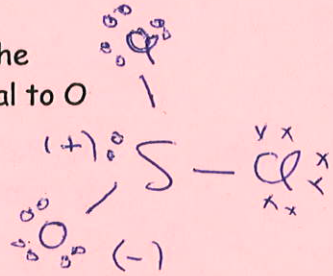
c) phosgene , $COCl_2$ note: C is central to O and both Cl



d) sulfur dioxide, SO_2 note: S is centrally bonded to both O

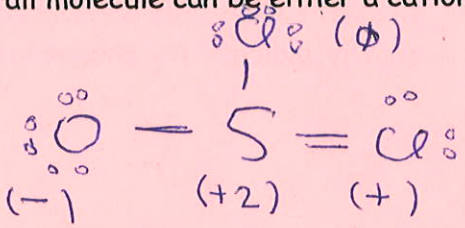


3a) Given that thionyl chloride ($SOCl_2$) is entirely single-bonded, what are the expected formal charges on the individual atoms ? Assume S is central to O both Cl (2 pts total)

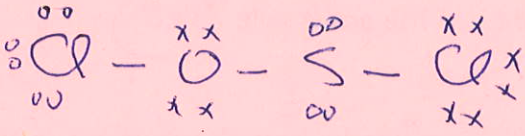


S +1 O −1 Cl(#1) Ø Cl(#2) Ø

3b) If the S is double-bonded to one of the Cl, ***draw*** the most stable Lewis structure with the formula $SOCl_2$ which obeys the octet rule . Indicate any formal charges on each atom. (Assume S is central to O and both Cl. The overall molecule can be either a cation or an anion, e.g. it can hold a net charge) (2 pts)

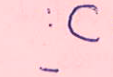


3c) If you don't make any assumptions about how $SOCl_2$ atoms are connected, draw a structure that minimizes total charge, individual formal charges and best satisfies the octet rule for all the atoms (3 pts)



] no formal charge on any atom.

4.) Explain why CO is over 200 times more likely to react with the iron in your blood than O_2 ? (The reactivity difference explains why you can asphyxiate yourself by sitting in your car as it runs in a closed garage.) {2 pts)



Formal charge on CO (see pix) means it binds electrostatically to Fe^{3+} in heme. O_2 has no formal charge and so binds less strongly

Extra credit (3 pts)

Decide whether the pairs below are the same or different chemical species and briefly explain ***why*** they are the same or different: