FA24 Chem0350 Homework 1. Submit study group answers on Gradescope by 11:59 PM on Tuesday, Feb 6 (provide answers on this 5 page pdf)

Page 1 – make sure this is the first page of your uploaded pdf file.

Names of Students in Group (PRINT NEATLY). After uploading to GRADESCOPE, link each student's name to the submitted pdf.
1. (submitting student)
2.
3.
4.
5.

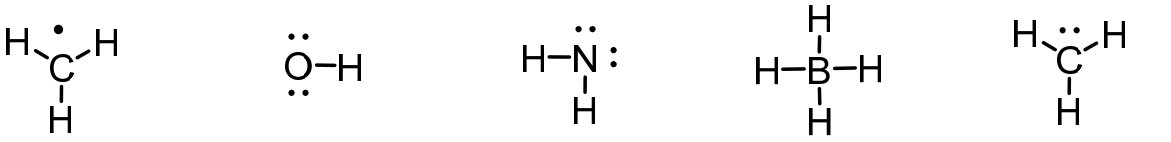
Make sure this is page 1 of your uploaded pdf file.

FA24 Chem0350 Homework 1. Submit study group answers on Gradescope by 11:59 PM on Tuesday, Feb 6 (provide answers on this 5 page pdf)

1. In the dashed box below each of the following structures, write the formal charge (FC) of the B, C, N or O atom.

After *including* the B, C, N, O FC, in the solid box below the dashed box, write

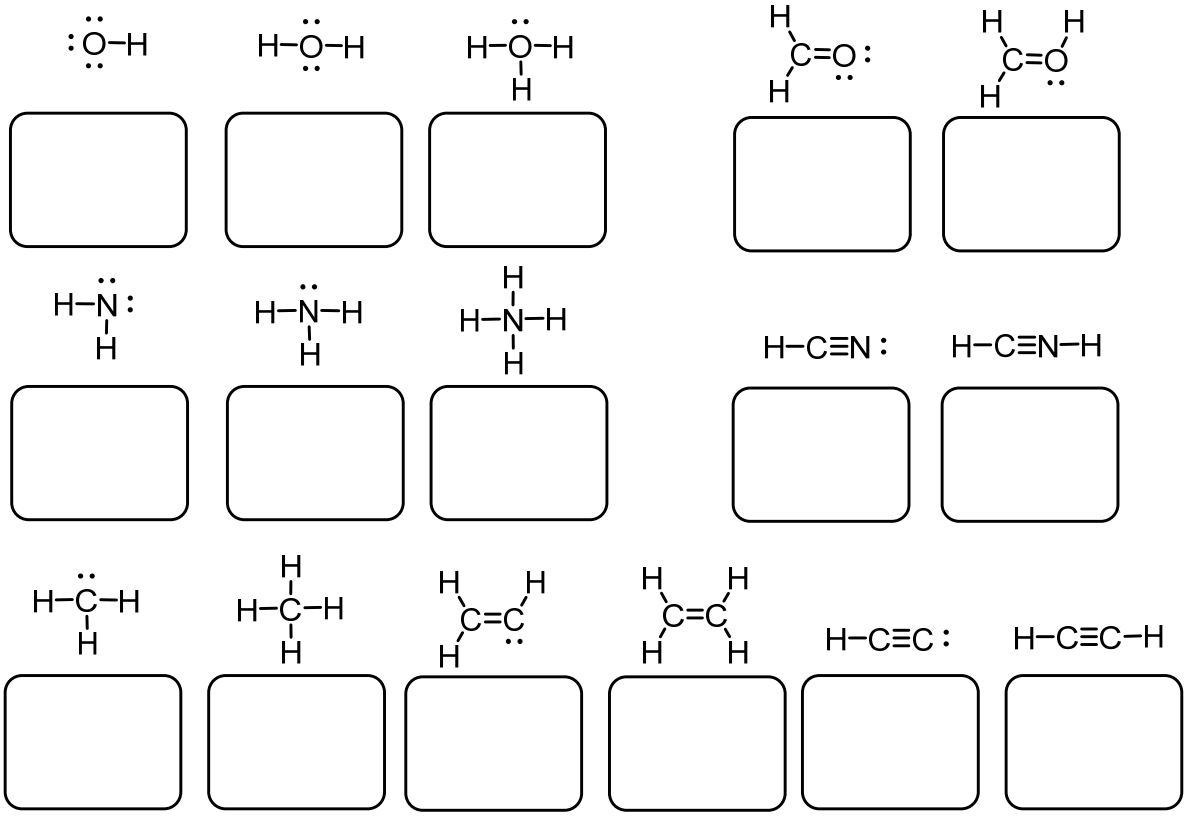
S (stable) if the structure has complete valence shells ("octets") on all atoms
U (unstable) if the structure has an incomplete "octet" on any atom.
I (impossible) if the structure has more electrons than its valence shell can hold



Make sure this is page 2 of your uploaded pdf file.

FA24 Chem0350 Homework 1. Submit study group answers on Gradescope by 11:59 PM on Tuesday, Feb 6 (provide answers on this 5 page pdf)

2. The following structures have complete "octets" on all atoms but may be missing **the formal charge label that should be drawn adjacent to an atom with non-zero formal charge**. In the box, write the formal charge (-1, 0 or 1) on the C, N, or O atom. (In structures with two 2nd row atoms, ONLY PROVIDE THE FORMAL CHARGE OF THE 2nd ROW ATOM ON THE RIGHT)



Summarize the above trends for C, N and O atoms with complete octets

A carbon atom with 4 bonds has formal charge = _____

A carbon atom with 3 bonds and 1 lone pair has formal charge = _____

A nitrogen atom with 4 bonds has formal charge = _____

A nitrogen atom with 3 bonds and 1 lone pair has formal charge = _____

A nitrogen atom with 2 bonds and 2 lone pairs has formal charge = _____

An oxygen atom with 3 bonds and 1 lone pair has formal charge = _____

An oxygen atom with 2 bonds and 2 lone pairs has formal charge = _____

An oxygen atom with 1 bond and 3 lone pairs has formal charge = _____

Make sure this is page 3 of your uploaded pdf file.

FA24 Chem0350 Homework 1. Submit study group answers on Gradescope by 11:59 PM on Tuesday, Feb 6 (provide answers on this 5 page pdf)

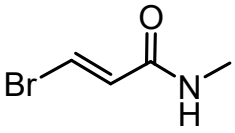
3. Line structures (skeletal structures) are used to simplify drawing of organic molecules. The following conventions must be used to **draw** or to **interpret** line structures.

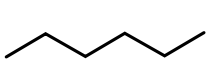
1. A carbon atom is present at the terminus of any line segment that is not labeled by a periodic table element symbol. The elemental symbol for carbon (C) is not drawn in line structures. (The carbon atom is implicit).

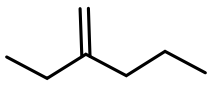
2. Hydrogen atoms bonded to an implicit carbon atom are not drawn. The number of **implicit hydrogen atoms** bonded to each implicit carbon atom is **evaluated** using the octet rule, the number of explicit bonds drawn to the implicit carbon atom and the formal charge (or unpaired electron) on the implicit carbon atom.

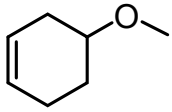
3) The presence of any other element in a structure (aka, a heteroatom) is explicitly indicated by writing its periodic table element signal at the end of a line segment. Hydrogen atoms bonded to heteroatoms (i.e. to elements other than carbon) MUST BE DRAWN explicitly.

Write the composition of each structure in the box below it. Use the following convention for the formula: $C_n H_y$ (all other elements in alphabetical order…see the 1st structure as an example)

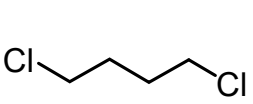


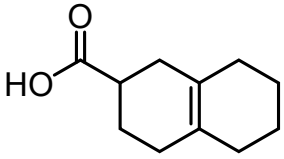


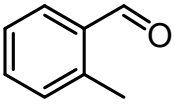




$C_4 H_6 Br N O$





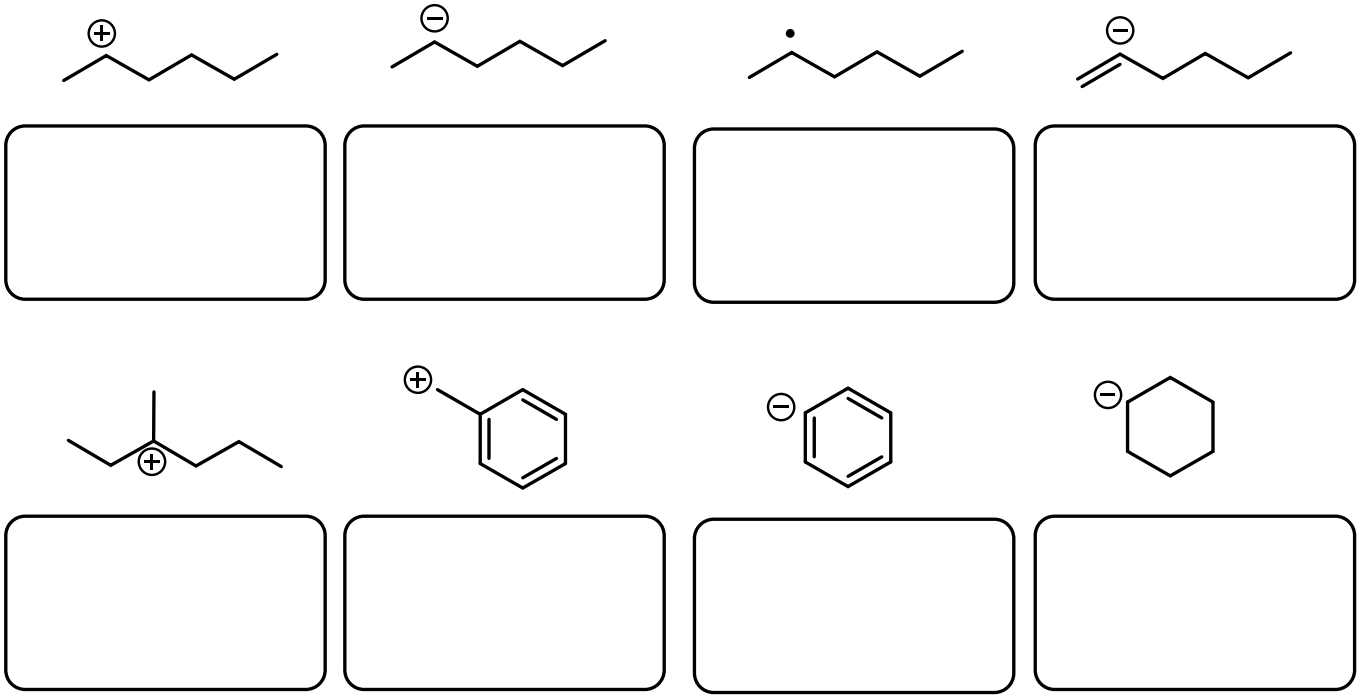


Make sure this is page 4 of your uploaded pdf file.

FA24 Chem0350 Homework 1. Submit study group answers on Gradescope by 11:59 PM on Tuesday, Feb 6 (provide answers on this 5 page pdf)

4. Many organic reactions proceed by forming high energy intermediates in which a reactive carbon atom does not have four bonds and may not have a complete octet. **These intermediates are drawn using line structures** (i.e. implicit carbons and implicit hydrogens bonded to implicit carbons) **with a non-zero formal charge and/or an unpaired electron indicated on the reactive carbon**. *To evaluate the number of implicit hydrogen atoms bonded to the reactive carbon, you must consider the formal charge and / or unpaired electron indicated on the reactive carbon*.

In the box below each structure, write the number of implicit hydrogen atoms bonded to the reactive carbon atom.



Hints.

a) use the formal charge equation to determine the (number of bonds + number of non-bonding electrons) on the reactive carbon atom.
b) Remember than • is drawn on an atom if it has an **unpaired electron**.
c) Use scrap paper to check your answer : redraw the structure showing the formal charge / unpaired electron AND explicit H's bonded to the reactive carbon. Then check the formal charge and octet count of the reactive carbon (maximum of 8 valence electrons).

Make sure this is page 5 of your uploaded pdf file.