

NAME (Print): _____

SIGNATURE: _____

EID: _____

Chemistry 320M/328M
Dr. Brent Iverson
1st Homework
August 25, 2022

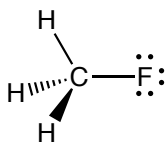
**Please print the
first three letters
of your last name
in the three boxes**

--	--	--

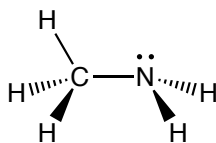
(5 pts) Fill in the blank with the most appropriate word(s) or number(s).

1. The most important question in chemistry is: _____?
2. Atoms prefer a _____ valence shell of electrons. The vast majority of stable _____ in molecules takes place in such a way that this is accomplished.
3. Neutral Oxygen atoms take part in _____ bond(s) and has _____ pair(s) of electrons.
4. An Oxygen atom with a negative 1 formal charge (-1) takes part in _____ bond(s) and has _____ pair(s) of electrons.
5. When two atoms of different electronegativities form a covalent bond, the majority of shared electron density is found around the _____ electronegative atom.
6. (4 pts) Use the $\text{+} \longrightarrow$ symbol to indicate on the structure the direction of the bond dipole moment of the bond listed.

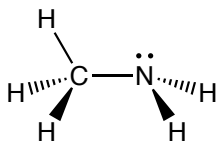
A. C-F



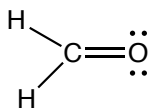
C. N-H



B. C-N

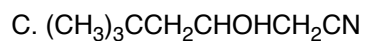
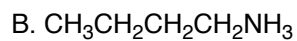
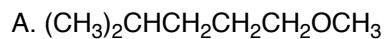


D. C=O

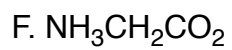
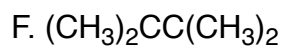
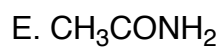
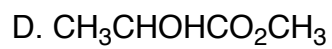


7. (1 pt) As I said in class, the most important thing is to find the most important thing. Well, here is for emphasis, one more time. What is the most important question in Chemistry?

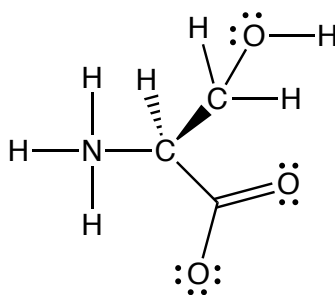
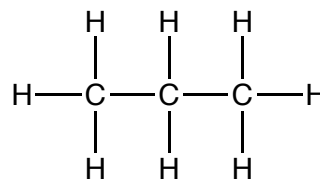
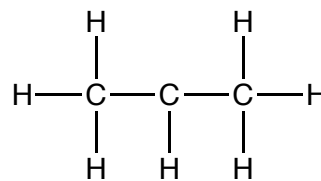
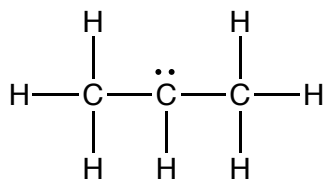
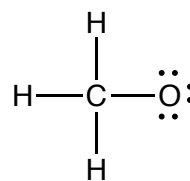
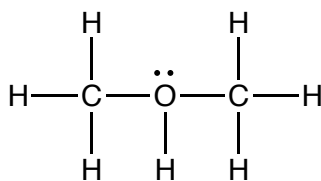
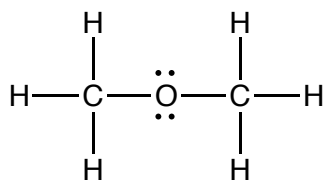
8. (14 pts) For the following molecular formulas, draw complete Lewis structures in which all atom (even H atoms) are drawn, lines are used as bonds, and all lone pairs and formal charges are drawn.



8 (cont.)



9. (8 pt) Put all appropriate formal charges on the following molecules.



10. (1 pts each) Fill in each blank with the word or words that best completes the sentences.

For organic chemistry, it is best to think of electrons as _____.

The electron density in molecules can be described mathematically by adding the wave functions of all the atomic orbitals for all the atoms in the entire molecule, an approach referred to as _____ theory.

The wave functions for the valence atomic orbitals on each atom can be added together first, a process referred to as _____, before looking for overlap with orbitals from other atoms. This approach is called _____ theory.

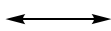
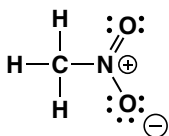
You need to be able to think about all _____ bonding in molecules as being derived from the overlap of _____ orbitals and all pi bonding as being derived from overlap of unhybridized _____ orbitals.

Three (or more) atom "pi-ways" are the situation resonance _____ structures are usually trying to describe. Individual _____ structures can only describe pi bonding between _____ atoms, not _____ or more, explaining why the _____ structures are needed for these situations.

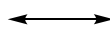
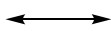
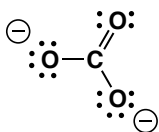
For pi bonding and therefore pi delocalization to occur over more than _____ atoms (i.e. pi-ways), parallel _____ orbitals are needed on ALL of the adjacent atoms involved, explaining why ALL of these atoms must be _____ (or _____) hybridized and why these systems are planar.

11. (1 or 2 pts each) The following molecules are best represented as the hybrid of contributing structures. **Draw the most important contributing structures** in the spaces provided, including all lone pairs and formal charges. **For all but the structures on the right in each problem, use arrows to indicate the movement of electrons to give the structures you drew.** You might want to read these directions again to make sure you know what we want.

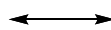
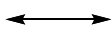
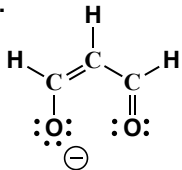
A.



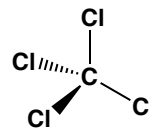
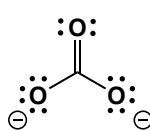
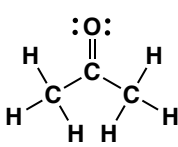
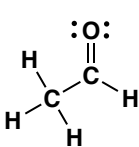
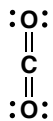
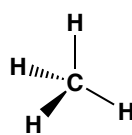
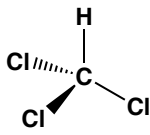
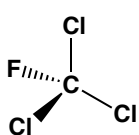
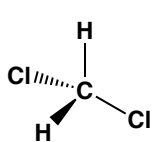
B.



C.

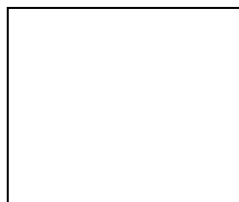
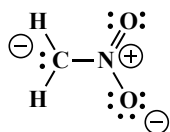


12. (1 pt each) Circle any molecule that has an overall molecular dipole moment (this one might be considered pretty hard, there is a lot to think about).

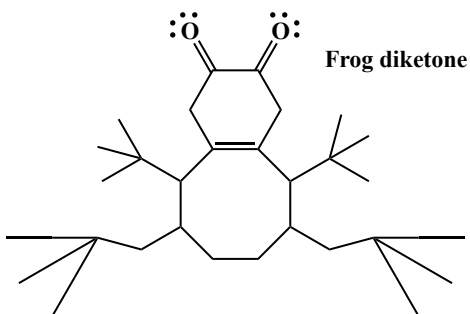
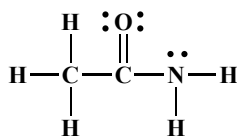


13. (2 pts each) The following molecules are best represented as the hybrid of three contributing structures. **Draw the second and third important contributing structures** in the spaces provided, including all lone pairs and formal charges. **For the two structures on the left in each problem, use arrows to indicate the movement of electrons to give the structures you drew.** You might want to read these directions again to make sure you know what we want.

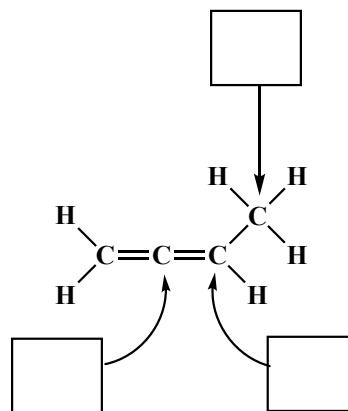
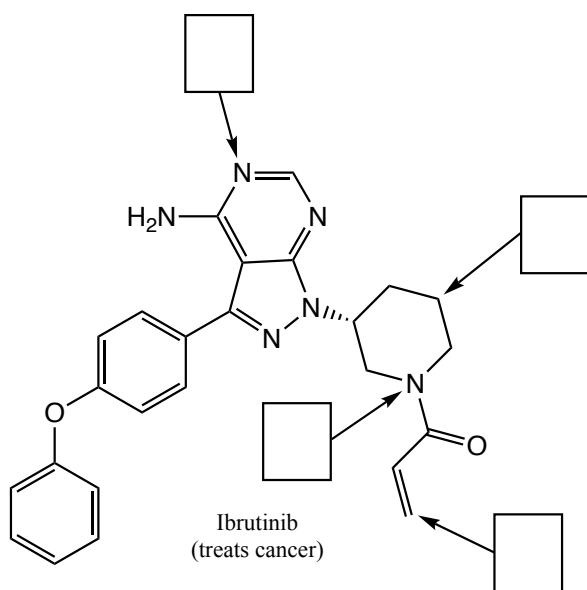
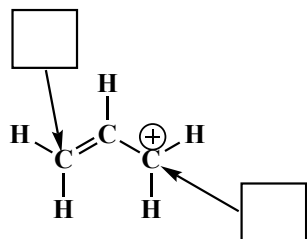
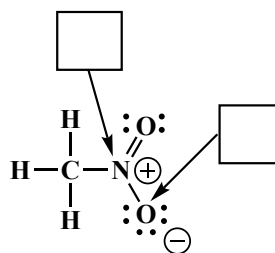
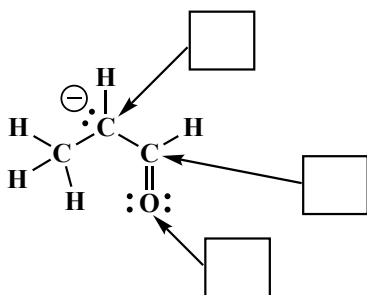
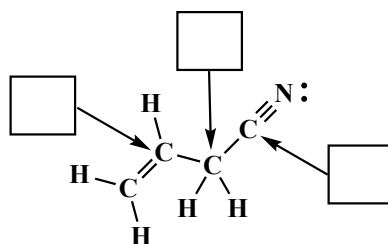
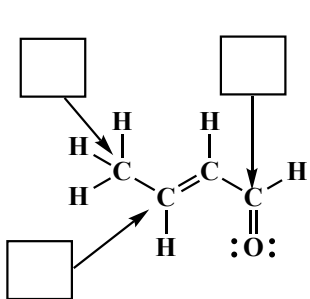
A



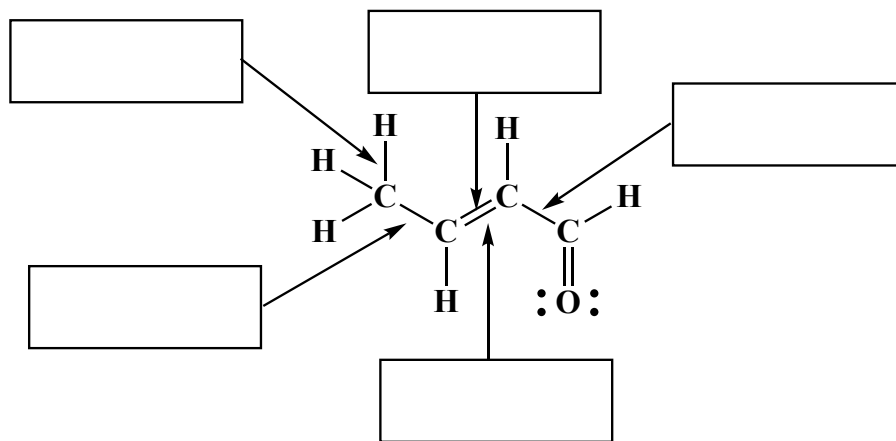
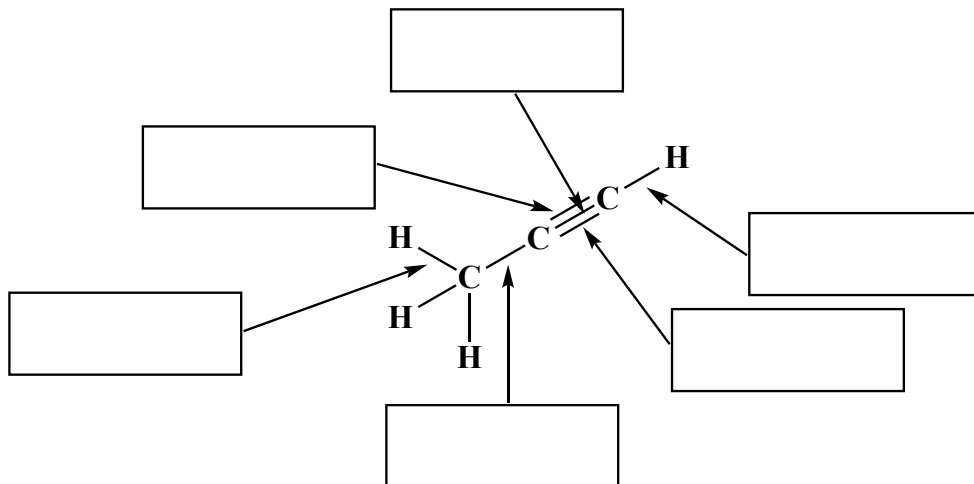
B.

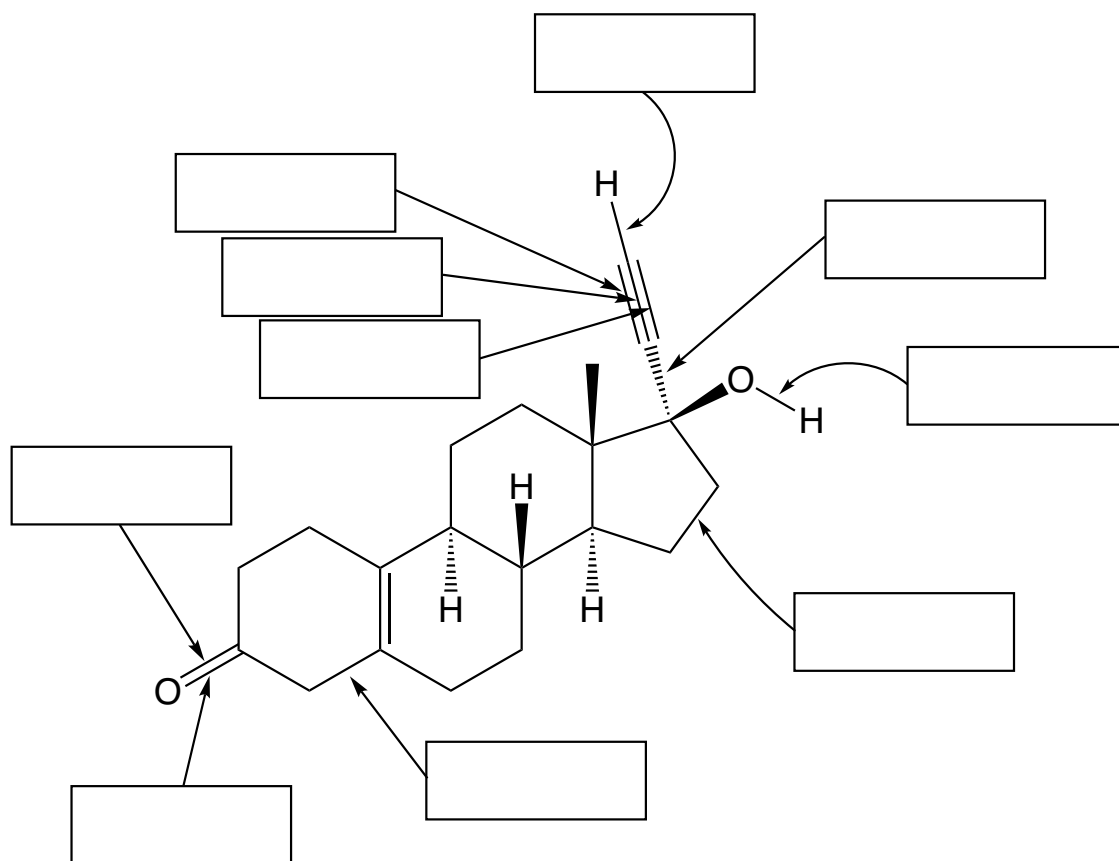


14. (20 pts) For the following molecules, write the hybridization state of each atom indicated by the arrow.



15. (11 pts) Describe each bond indicated with an arrow as the overlap of orbitals. For example, an answer might be $\sigma_{\text{Csp}^3-\text{Csp}^3}$.



15 (cont). (10 pts)

Noretynodrel (a contraceptive)

16. (3 pts) Write the first three “Golden Rules of Chemistry” that we have presented in this class (I want the first three I presented so far). Hint: These are not the first three listed the website, we jump around with the rules!

17. (5 pts) One of the most difficult aspects of organic chemistry is learning how to think creatively about synthesis, which is the construction of valuable complex molecules from cheap simpler ones. To be successful, one must be able to look at a final molecule, recognize the right details, then work backwards using known reactions until reaching the beginning, namely a simpler starting molecule. This type of thinking is new to most students and many find it very difficult to master at first. Based on conversations with previous students, we are trying something new this year in an attempt to prepare you long before we hit actual synthesis problems. What we are going to do is provide a brief situation for you to analyze. We want you think about ways that scenario could have come about, working backwards to the beginning.


The following is a two-sentence description of a specific scenario. Think creatively, then provide a brief description of a sequence of events that could have lead to the situation described in the scenario.

"The last man on Earth sat alone in a room. There was a knock on the door."

Submitting PDF homework in Gradescope

For the majority of your paper-based and handwritten Gradescope assignments, you need to scan hard copies of your pages and save them as a PDF before submitting. No scanner? No problem. This guide will teach you how to scan your work on an iOS (Page 1) and Android device (Page 2) and then how to submit your scans in Gradescope from your computer, phone, or tablet (Page 3). If you are using a scanner to scan your work, skip to Page 3.

Scanning on iOS Devices

- DOWNLOAD:** In the App Store, download **Scannable**  by Evernote (our recommended app for iOS devices). You can also download and follow a similar process with **Genius Scan** or another scanning app that produces high-quality PDFs.
- SCAN:** Open **Scannable**. Click the **three dots** > **Settings** > **File Type** > **PDF**. Then, click the **back arrow** > **Done**. Hold your phone above each page. The app will scan each page automatically as soon as it finds it. When you've scanned every page, click the **check mark**.
- REVIEW:** Review your scans. Make sure all pages are in one PDF. If your scans are blurry, use the **TIPS FOR SCANNING** on the right. Name your file by tapping the **file name** next to the PDF icon.
- SHARE:** Click **Send**. Then, click **Mail** to email the scans to yourself or click **Share** > **Save to Files** or **Dropbox** (or another cloud service). You may need to scroll to find all the "Save to..." options on your phone. Now, see Page 3 to learn how to log in and submit your scans.

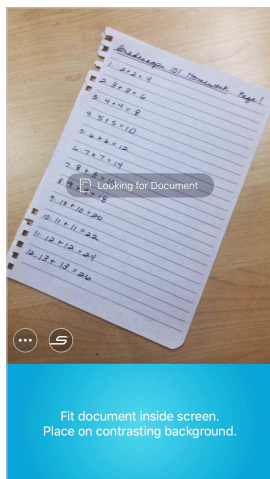
TIPS FOR SCANNING:

Use dark lettering: Use the darkest pen, pencil, or font color possible to do your work.

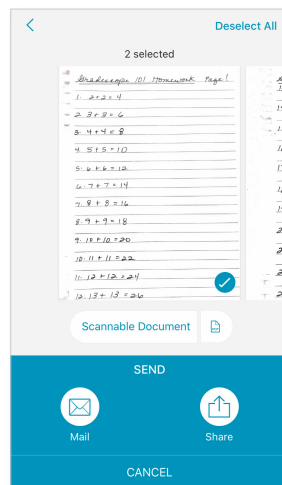
Scan on a flat surface: Scan on a dark table with high contrast to your paper.

Steady your hands: Hold your phone at a bird's eye view and scan your pages slowly with steady hands.

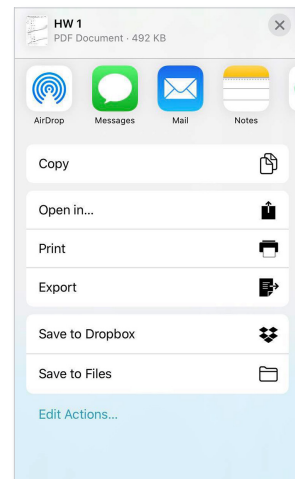
Restore photos, if needed: If your scans are blurry after clicking the check mark, select the **thumbnail** of the scan > **Slider icon** > **Restore**.



Step 2. **SCAN**



Step 3. **REVIEW**



Step 4. **SHARE**